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THE ENCYCLOPÆDIA BRITANNICA

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GAME TO GUN-METAL

GAME, a word which in its primary and widest significance means any amusement or sport, often combined in the early examples with "glee," "play," "joy," or "solace" It is a common Teutonic word, in O.E. *gamen*, in O.H G *gaman*. For "game," from the legal aspect, and the laws relating to its pursuit *see* GAME LAWS. The athletic contests of the ancient Greeks (ἀγῶνες) and the public shows (*ludi*) of the arena and amphitheatre of the ancient Romans are treated below (GAMES, CLASSICAL), the various forms of modern games, indoor and outdoor, whether of skill, strength or chance, are dealt with under their specific titles. A special use ("gaming" or "gambling") restricts the term to the playing of games for money, or to betting and wagering on the results of events, as in horse-racing, etc. (*see* GAMING AND WAGERING). *See* also CHILDREN'S GAMES

GAME LAWS, statutes which regulate the right to pursue and take or kill certain kinds of wild animals. For game laws in the U S. *see* page 2. In Great Britain by common law wild animals were only property when reduced into possession by being killed or captured. Hence statutes were required to protect sporting rights Royal rights were protected by special laws (*see* FOREST LAWS), but where royal rights do not exist the right to take or kill wild animals is incidental to the ownership or occupation of the land on which they are found In England the chief statutes are the Night Poaching Acts, 1828 and 1841, Game Act, 1831, Poaching Prevention Act, 1862, Ground Game Acts, 1880 and 1906, and acts for the protection of wild birds, of which the latest is the Protection of Lapwings Act, 1928

Pursuit of game on another's land without his consent is a trespass for which the pursuer is civilly liable, although when deer or hares are hunted with hounds or greyhounds there is no criminal liability In other cases trespassers may be prosecuted, but the game taken by a trespasser belongs to him unless it was both started and killed on the land of the one owner, when it belongs to such owner. Even so the killing and taking it away as part of one continuous act is not larceny (*R.* v. *Townley*, 1871, L R 1C. C R. 315). The young of wild animals, before they can fly or run away, belong to the owner of the land on which they are.

Classification of Animals.—Wild animals are classified for purposes of sport in England as follows —(1) Beasts of royal forest (hart and hind, boar, wolf and all beasts of venery); (2) beasts of chase (a forest in the hands of a subject) and park (an enclosed chase), viz , buck and doe, fox, marten and roe; (3) beasts of warren (roe, hare, rabbit, partridge, pheasant, woodcock, quail, rail and heron), (4) game as defined by the Night Poaching Act, 1828, and the Game Act, 1831, *i.e.*, pheasant, partridge, black game, grouse or red game, bustard and hare (in France game includes everything eatable that runs or flies), (5) wild fowl not mentioned above, *e g*, duck, snipe, plovers, (6) other wild birds, protected by the Wild Birds Protection Acts

Rights of chase, park and free warren depend on Crown grant or prescription founded on lost grant Free warren is quite different from ordinary warrens, in which hares or rabbits are bred by the owner of the soil for sport or profit Ground game in such warrens is protected under the Larceny Act, 1861, s. 17, as well as by the game laws In manors, the lord by his franchise had the sporting rights over the manor, but at the present time this right is restricted to the commons and wastes of the manor, the freehold whereof is in him, and does not extend to enclosed freeholds nor as a general rule to enclosed copyholds, unless at the time of enclosure the sporting rights were reserved to him by the Enclosure Act or award (*Sowerby* v *Smith*, 1873, L R 8 C P 514) The Game Act 1831 gives lords of manors and privileged persons certain rights as to appointing gamekeepers with special powers to protect game within the district over which their rights extend (ss 13, 14, 15, 16) The game laws in no way cut down the special privileges as to forest, park, chase or free warren (1831, s 9), and confirm the sporting right of lords of manors on the wastes of the manor (1831, s 10) On lands not affected by these rights, the right to kill or take game is presumably in the occupier. On letting land the owner may, subject to the qualifications hereinafter stated, reserve to himself the right to kill or take "game" or rabbits or other wild animals concurrently with or in exclusion of the tenant Where the exclusive right is in the landlord, the tenant is not only liable to forfeiture or damages for breaches of covenants in the lease, but is also liable to penalties on summary conviction if without the lessor's authority he pursues, kills or takes any "game" upon the land or gives permission to others to do so (1831, s 12). In effect he is made criminally liable for game trespass on lands in his own occupation, so far as relates to game, but not if he takes rabbits, snipe, woodcock, quails or rails.

The net effect of the common law and the game laws is to give the occupier of lands and the owner of sporting rights over them the following remedies against persons who infringe their right

to kill or take wild animals on the land. A stranger who enters on the land of another to take any wild animals is liable to the occupier for trespass on the land and for the animals started and killed on the land by the trespasser. He is also criminally liable for game trespass if he has entered on the land to search for or in pursuit of "game" or woodcock, snipe, quail, landrails or rabbits If the trespass is in the daytime the penalty may not exceed 40s, unless five or more persons go together, in which case the maximum penalty is £5 If a single offender refuses his name or address or gives a false address to the occupier or to the owner of the sporting rights or his representatives or refuses to leave the land, he may be arrested by them, and is liable to a penalty not exceeding £5, and if five or more concerned together in game trespass have a gun with them and use violence, intimidation or menace, to prevent the approach of persons entitled to take their names or order them off the land, they incur a further penalty up to £5

If the trespass is in search or pursuit of game *or rabbits* in the night-time, the maximum penalty on a first conviction is imprisonment with hard labour for three months, on a second, imprisonment, etc, for six months, and the offender may be put under sureties not to offend again for a year after a first conviction or for two years after a second conviction. For a first or second offence the conviction is summary, subject to appeal to quarter sessions, but for a third offence the offender is tried on indictment and is liable to penal servitude (three–seven years) or imprisonment with hard labour (two years) The offenders may be arrested by the owner or occupier of the land or their servants, and if the offenders assault or offer violence by firearms or offensive weapons they are liable to be indicted and on conviction punished to the same extent as in the last offence In 1844 the above penalties were extended to persons found by night on highways in search or pursuit of game If three or more trespass together on land by night to take or destroy game or rabbits, and any of them is armed with firearms, bludgeon or other offensive weapon, they are liable to be indicted and on conviction sentenced to penal servitude (3–14 years) or imprisonment with hard labour (two years) By "day" time is meant from the beginning of the first hour before sunrise to the end of the first hour after sunset It is illegal and severely punishable, however, to set traps or loaded spring guns for poachers, whereby any grievous bodily harm is intended or may be caused even to a trespasser, so that poachers can be prevented only by personal attendance on the scene of their activities; and the provisions of the game laws above stated are, so far as concerns private land, left to be enforced by private enterprise without the interference of the police, with the result that in some districts there are scenes of private nocturnal war Even in the Night Poaching Act, 1844, which applies to highways, the arrest of offenders is made by owners, occupiers or their game-keepers The police were not given any direct authority as to poachers until the Poaching Prevention Act, 1862 In all cases of summary conviction for poaching an appeal lies to quarter sessions In all cases of poaching the game, etc, taken may be forfeited by the court which tries the poacher

	England and Scotland	Ireland
Hare	March 1 to July 31	March 1 to July 31
Red deer (male)	None	Jan 1 to June 9
Fallow deer	None	Sept 29 to June 10
Pheasant	Feb 1 to Sept 30	Feb 1 to Sept. 30
Partridge	Feb 1 to Aug 31	Feb 1 to Aug. 31
Black game	Dec 10 to Aug 20*	Dec 10 to Aug 20
Grouse or red game	Dec 10 to Aug 12	Dec 10 to Aug. 12
Quail and landrail	March 1 to Aug 1	Jan 10 to Sept 19
Ptarmigan	Dec 10 to Aug 12†	Dec 10 to Aug 20
Bustard (wild turkey)	March 1 to Sept. 1‡	Jan 10 to Sept 1
Snipe, teal, widgeon, wild duck, woodcock and all other kinds	March 1 to Aug 1§	March 1 to Aug 1

*Sept. 1 in Devon, Somerset and New Forest.
†Scotland only
‡England only.
§Also in certain districts under Wild Birds Protection Orders Lapwings are also protected by the Protection of Lapwings Act, 1928.

Close Time.—Within periods known as "close time," and in England and Ireland on Sundays or Christmas Day, it is illegal to kill game. The present close times are in table in col. 1.

Licences.—The right to kill game is conditional on the possession of a game licence, subject to certain exceptions (Hares Acts, 1848, Game Licences Act, 1860). A licence is not required for beaters and assistants who go out with holders of a game licence The licence is granted by the Inland Revenue Department The issue is regulated by the Game Licences Act, 1860, as amended by the Customs and Inland Revenue Act, 1883 The licences now in use are of four kinds —

Those taken out after July 31—			
To expire on the next July 31	£3	0	0
To expire on the next Oct 31	2	0	0
Those taken out after Nov 1—			
To expire on the next July 31	2	0	0
Those taken out for any continuous period of 14 days specified in the licence	1	0	0

In the case of gamekeepers in Great Britain for whom the employer pays the duty on male servants, the annual licence fee is £2, but the licence extends only to lands on which the employer has a right to kill game A licence granted either in Great Britain or in Northern Ireland is effective throughout the United Kingdom; but not in the Irish Free State

The sale of game when killed is also subject to statutory regulation Gamekeepers may not sell game except under the authority of their employer (1831, ss 17, 25) Persons who hold a full game licence may sell game, but only to persons who hold a licence to deal in game These licences are annual (expiring on July 1), and are granted in London by justices of the peace, and in the rest of England by the council of the borough or urban or rural district in which the dealer seeks to carry on business (1831, s 18; 1893, c 73, s. 27), and a notice of the existence of the licence must be posted on the licensed premises A licence must be taken out for each shop Certain persons are disqualified for holding the licence (1831, s 18) The licensed dealer may buy British game only from persons who are lawfully entitled to sell game Conviction of an offence under the Game Act, 1831, avoids the licence (s 22) The local licence must also be supplemented by an excise licence for which a fee of £2 (£3 in the Irish Free State) is charged

Deer are not within the definition of game but to hunt or kill deer in enclosures in forests, chases or purlieus, or in enclosed land where deer is usually kept, or after a previous conviction to hunt or kill deer in the open parts of a forest, is a felony, and certain minor provisions are made as to arrest by foresters, forfeiture of venison unlawfully possessed and for unlawfully setting traps for deer. These enactments do not prevent a man from killing on his own land deer which have strayed there (*Threlkeld* v *Smith*, 1901, 2 K B 531) In Scotland the unlawful killing of deer is punished as theft

Damage to Crops by Game.—At common law the owner of land with sporting rights, and his sporting tenants, must use the reserved rights reasonably They are liable for any damage wilfully or unnecessarily done to the crops, etc, of the occupier, such as trampling down standing crops or breaking hedges or fences, but not for damage done by game bred on the land or frequenting it in the ordinary course of nature Modern legislation has greatly increased the rights of the occupiers As regards hares and rabbits the occupier's rights are regulated by the Ground Game Act, 1880 The occupier has the right to kill and take hares and rabbits on the land The right cannot be divested by contract, but where apart from the act the right to kill game on the land is vested in a person other than the occupier, such person has a right concurrent with the statutory right of the occupier to take hares and rabbits on the land. The act does not extend to common lands nor to lands over which rights of grazing or pasturage for not more than nine months in the year exist. The mode of exercise of the occupier's right is subject to certain limitations.

On moorland and unenclosed lands (which are not arable and do not consist of detached portions of less than 25 ac) the occupier may between Sept. 1 and March 1 kill and take ground game; but between Sept. 1 and Dec. 10 firearms may not be used (.880,

. 1 [3]; 1906, s. 2). In the case of such lands the occupiers and he owners of the sporting rights may between Sept. 1 and Dec. :o make and enforce for their joint benefit agreements for taking he ground game. The Agricultural Holdings Act, 1906 (operating rom 1909) deals, *inter alia*, with damage to crops by deer and winged game, but does not apply to damage by hares or rabbits The tenant of agricultural land without the right to kill is entitled o compensation for damage to his crops exceeding 1s per acre)ver the area affected if caused by game (s. 2). The right of the enant is indefeasible.

Scotland and Ireland.—By the law of Scotland all men have ight and privilege of game on their own estates as a real right ncident thereto, which does not pass by an agricultural lease :xcept by express words, or in the case of ground game by the ict of 1880. The landlord is liable to the tenant for damage lone to the surface of the lands in exercise of his right to the game and also for extraordinary damage by over-preserving or)ver-stocking Night poaching is punished by the same act as in England, and day poaching by an act of 1832 and the act of 1882. The provisions of the act of 1832 as to game trespass by lay apply also to deer, roe, rabbits, woodcock, snipe, rails and wild duck; but in other respects closely resemble those of the English act of 1831.

The common law as to game is the same for Ireland as for England. The game laws of Ireland are contained partly in acts passed)rior to the union (1698, 1707, 1787 and 1797), partly in acts imited to Ireland, and as to the rest in acts common to the whole United Kingdom which continue in force both in Northern Ireland ind in the Irish Free State.

Night poaching in Ireland is dealt with by an act of 1826 Tres)ass on lands in pursuit of game to which the landlord or lessor has by reservation exclusive right is summarily punishable under in act of 1864, which includes in the definition of game, wood:ock, snipe, quails, landrails, wild duck, widgeon and teal Under he Land Act, 1881, the landlord of a statutory holding may at he commencement of the term subject to the Ground Game Acts etain and exercise the exclusive right of taking "game" as above lefined.

A game licence is not required for taking or killing rabbits. But n other respects the law as to game licences and licences to deal in game is the same as in Great Britain

See Oke's *Game Laws* (5th ed, 1912); Nolan, *Sporting Rights* (1914). (W. F C.; F. G)

UNITED STATES AND CANADA

The United States established game laws for the protection)f game rather than the granting of exclusive hunting or fishing rights to any persons. As early as 1623 the Plymouth Colony)assed a law declaring all hunting and fishing to be free, except)n private property No class legislation exists Possession of game by killing belongs, subject to limitations of the State law, :o him who kills or catches, not, as in England, to the landowner)n whose property such game may be caught or bagged. During the season of reproduction, wild game and fish may not be molested

The U.S Department of Agriculture has as one of its functions the conservation and protection of wild game and migratory birds Among the most important enactments are the Migratory Bird Treaty Act, passed in 1918, and the Lacey Act, passed in 1900 The treaty act protects species that pass between the United States and Canada, and the Lacey Act regulates interstate commerce in game and controls the importation of foreign animals and birds, preventing illicit interstate traffic in game, and excluding injurious species of foreign birds and animals. The Federal migratory bird law may be further restricted by State legislation Each State has intricate and detailed laws of its own, often conflicting with those of another State.

The Migratory Bird Treaty Act, growing out of a convention between the United States and Great Britain signed in 1916, has resulted in greatly co-ordinated State laws relating to migratory game birds, and has given to the Department of Agriculture power to regulate within certain limits the capture, possession and disposition of migratory birds. Fundamental items found in such enactments include the abolition of spring shooting, suspension of sale and the prescription of definite, reasonable, daily bag limits, while, by the terms of the treaty, open seasons are restricted to a period not exceeding three and one-half months in any one year between Aug 15 and March 10.

Particularly important for the protection of game is the establishment of adequate breeding and resting grounds. Increasing commercial developments have made serious inroads upon the natural breeding and resting grounds of all wild life; drainage of marshes and lakes has been one means of destroying large water areas suitable for the production of game To offset this destruction of natural reproduction areas, the Government has set aside reservations, which either directly or indirectly protect wild life (*See* GAME RESERVES) There are administering agencies in national parks and other reservations to protect, incidentally, wild life. These include. the National Park Service, the Forest Service, the Bureau of Fisheries, the Bureau of Lighthouses and the War and Navy Departments. Under the Bureau of Biological Survey are 80 game and bird reservations, all of which are bird refuges and five of them are stocked with big game Additions to the number are made from year to year.

Federal and State laws alike allow the capture of game for propagation purposes under permit. Various restrictions govern the sale of game raised in captivity, additional licences and fees being required In some States traffic in such game is legal, and the game may be sold for food or scientific purposes The Federal regulations allow shooting of such game only in the open season of the State in which it is killed, provided migratory fowl raised in captivity shall have had removed, before attaining a certain age, a portion of the web of one foot

The first general game law in Alaska was enacted in 1902 and revised in 1908, though adequate provision for conservation in Alaska, particularly of game and land fur-bearing animals, came only in 1925, when the Alaska game law was passed This created a commission of five resident members, one of whom is the chief representative of the Bureau of Biological Survey in Alaska, and provides for fuller protection of wild life Eskimos and Indians are at liberty to hunt game at any time for the use of themselves and their immediate families for food and clothing

Common to nearly all States are the following provisions. hunting licences are required, with the fee for residents much lower than for non-residents, in many States licences on private property are not required by owners, while trespassing on another's property without permit is forbidden, no fishing licences are needed in some States by minors under 16 to 18 years of age; and in others minors under 17 may hunt without a licence if accompanied by a holder of a general licence. There are strict regulations for selling protected game Possession of game taken out of the State is usually subject to local laws, but possession of migratory birds is restricted to the open season and the first 10 or 15 days of the closed season In a few States reports must be made within a limited time to the State commissioner of game, stating the number and kind of game killed, and in several States the commissioner may close or open a season either because of depleted stocks or of depredations by game on crops.

In a few States aliens are not permitted to hunt or to own firearms, but special cases are excepted by the commissioners upon the payment of a large fee Special privileges are accorded soldiers, veterans of the Indian, Civil and World Wars in six States and in the Territory of Alaska to native-born Indians and Eskimos In New York State none but licensed Indians may hunt on Indian reservations.

Canada.—The Dominion of Canada has a general law prohibiting the export of deer carcasses, wild turkey, quail, partridge, prairie fowl and woodcock. The Migratory Birds Convention Act is supplemented by regulations similar to those governing the Migratory Bird Treaty Act in the United States. Full text of the regulations will be found in an annual publication by the commissioner of national parks of Canada, Ottawa

Each province makes its own laws and regulations for hunting game All non-residents must have licences, the cost of such

licences varying in amount according to the kind of game; residents' fees are lower, and in Manitoba no licence is required of a resident hunting on his own property. There are special regulations for guides, and, in the case of hunting big game, in Manitoba and Saskatchewan the costume worn by the hunter must be white. The licencee is required to report the number of big game and game-birds killed.

The laws governing the sale of game vary in all the provinces; in Ontario, some native game may be sold; in Nova Scotia, little game except rabbits in a certain season; in Prince Edward island all game lawfully killed (except migratory birds) may be sold; the same is true of Quebec, birch or spruce partridge being excepted also; New Brunswick forbids the sale of all game except that a licensed hunter may sell moose or deer lawfully killed by him; in Alberta, only heads of big game may be sold under special sale fees.

The export of all protected game is prohibited except in Yukon and Quebec; geese and brant in Prince Edward island; special permits, however, may be obtained from the commissioner Deer raised on private lands may be exported; all birds so raised must be killed by other means than shooting, and so tagged before they can be sold Most of the provinces allow game raised in captivity to be bought, sold and exported for propagation purposes

For open seasons on game for the United States, Canada, Newfoundland and Mexico, for bag limits and possession, and regulations regarding sale and interstate transportation of game, *see* bulletins issued annually by State and Provincial game commissioners and Farmers' *Bulletins* on game laws, compiled by the U.S. Department of Agriculture. Minor exceptions in individual States and Provinces may be found by consulting the game laws published by each (X.)

Game Protection in the U.S.—The game of the United States is in danger of extinction. This is due to the American system of "free shooting" for every citizen, the dictation of killing laws and regulations by the killers themselves, the reluctance of the killing majority to give up its killing "rights" so long as any game remains. For 50 years the laws of the United States have permitted wasteful killing of game Even in 1928 many open seasons were 50% too long, and many bag limits 40% too high All States save Pennsylvania and New Jersey tolerate the extra-deadly automatic and pump shotguns, the use of live decoys and the baiting of ducking waters. Along with these blunders are to be reckoned the loss of natural cover and food, exposure to natural enemies, the severity of extra hard winters and now the scourge of the hunting automobile. The net loss of marshes and lakes by drainage as a factor in waterfowl decrease has been much exaggerated, and so has the disappearance of heavy timber. Much harm was wrought during the six years from 1921 to 1927 by the policy of the eastern promoters of a certain public-shooting-grounds bill in opposing constructive Federal legislation while failing to enact their own measure. Unfortunately the American machinery for the destruction of American game is now so vast, so varied and so uncontrollable, its momentum is so great, that it is a question whether it will be possible to curb its power, or reverse it before the end of the game supply is reached.

All the game of the United States is divisible into two groups—killable and protected. The former includes the shreds and patches of about 25 species of birds, deer and black bear in quite a number of States, elk in three States, mountain sheep in Wyoming, white goats only in Idaho and Washington, and occasionally moose in Maine and Wyoming. Fugitive grizzly bear exist in five or six States, and black bear in probably 20 States Of the original stock of big game in the United States not more than 2% remains. In a few States cotton-tail rabbits are abundant; but squirrels are scarce nearly everywhere, and the raccoon is to be found in a few places only.

The killable upland game birds are down to the diseased and vanishing ruffed grouse, the pinnated, sharp-tailed and sage grouse, all weakly and hopelessly hanging on in less than one-half of their former States The wild turkey's area of extermination is large, and soon the guns will destroy the remainders of that gorgeous bird. The bob-white quail has disappeared from 14 of the 35 States it once inhabited and is rapidly being exterminated in the others. In California the steadily growing scarcity of native quail is causing much alarm. It needs real protection rather than "more water." The efforts made to breed the bob-white in captivity have served only to prove the futility of such efforts.

Prairie-chicken hunting is dead in nine States, sage grouse in seven, wild-turkey hunting is banned in 14 States, and from Maine to Minnesota the ruffed grouse seems to be disappearing The woodcock and snipe still are killable; but they are so rare that their pursuit is ethically quite wrong and generally fruitless. All other shore birds have become so scarce that now all of them are protected at all times. The ducks, brant and Canada goose, to a total of about ten species, are more or less abundant in a few spots in nine States, but are absent from about five-sixths of the great area they once inhabited in good numbers. The areas of practical extinction seem to be steadily widening. Twenty-six States have felt compelled by waterfowl scarcity to reduce their bag limits on waterfowl about 40% below the Federal Government's regulations. For official information regarding the extinction of game hunting in each of the 48 States and Canada, see *Game Laws of 1927-28*, published by the U S. Department of Agriculture.

The class of "protected" species includes all the "game" mammals and birds that are living in sanctuaries where they can never be hunted or killed Any game "preserve" that permits the hunting and killing of any of its wild inhabitants for "sport" is distinctly not a sanctuary, and for it the term "game preserve" is a misnomer that never should be employed

The numerous and costly efforts that have been made by many States in importing tender foreign quail to restock their lifeless game "areas" usually have been disappointing In another ten or 15 years, unless drastic action is taken, the killable game of the United States will be so completely gone that the sport of game hunting will be as dead as buffalo hunting The sizes of the 48 State armies of game destroyers stagger the imagination. The story is told by the annual hunting licences. For example, Pennsylvania and New York each turn out annually over 600,000 hunters The small State of New Jersey has 155,567 hunters; the large State of California has 252,017. In the autumn of 1926 the grand total of licensed hunters taking the field in the United States was 5,183,353 They were carried to their greatly expanded hunting-grounds, in quick time, by perhaps 2,000,000 automobiles All their guns are breech-loading and rapid-fire Of their shotguns, about 85% are of the super-deadly choke-bore, automatic and "pump" pattern, spraying out either five or six charges of shot without removal from the shoulder. The gunpowder used is of extra strength and super-deadliness. These hunters are assisted by guides, dogs, boats, blinds, decoys, baited waters and other devices to take unfair advantage of the helpless game Game birds are constantly harassed in flight and while trying to feed or rest, by the booming guns, plus the warfare of the predatory birds and mammals that sportsmen call "vermin." For the disappearance of game during the 30 years ending in 1928 the hunter himself is fully 90% to blame. *See* also NATIONAL PARKS. (W. T. H)

Measures for Game Protection.—The protection of wild life involves several elements, outstanding among which are the insurance of adequate habitat (*see* GAME RESERVES); the enactment and enforcement of wise conservation laws (*see* above); the control of both predatory animals and birds of prey; the remedying of conditions productive of diseases and parasites in breeding and feeding areas of wild life; the proper disposal of surpluses from the annual increase; and the cultivation of a proper attitude of mind on the part of sportsmen and the public generally toward game protection.

Of first importance in measures for game protection is provision for refuge areas, where wild birds and other species can feed, breed and rest undisturbed by man. In the United States, the rapid development of the once wild portions of the country has taken from many of the birds and mammals large areas of their former haunts. Because of this, a great responsibility devolves upon the public agencies of the State and Federal Governments charged with the protection and maintenance of the wild

life to do everything possible to re-establish in part at least these lost homes. Refuges that have been established in the United States have been effective in saving from threatened extinction such noble game animals as the buffalo, elk, antelope and the mountain sheep. The Upper Mississippi River Wild Life and Fish Refuge, which comprises large areas of low lands extending approximately 300 m down the Mississippi river from Wabasha, Minn, is beginning to serve well not only for the conservation of the waterfowl that come to this region in abundance but for the increase of such water-using animals as the beaver and muskrat. Several of the States have established refuges for waterfowl and also for upland birds, and a few of the Federal refuges set aside by executive order include marshland areas that serve various species of wild fowl and valuable fur animals.

Next in importance to the maintenance of refuge areas for game-protection purposes is the existence of adequate game laws, and both State and Federal Governments have made long strides in this respect. These laws deal with the limitations on the number of birds or animals that may be taken in a given period, definitions of proper open seasons on game, prohibition of the sale of game and of the use of devices of great destructiveness heretofore employed in hunting, requirements of reports to public agencies on the number and kind of animals and birds taken under licences issued, and the institution of an appropriate method of tagging in connection with big game and important fur-bearers to ensure that the animals have been legally taken and may be lawfully transported More and more noticeable is the tendency among public agencies to plan their enforcement programme to suit the needs of the birds or animals that are to be protected rather than to agree to a setting of seasons and limits that might be classed as political expedients Many of the State game commissions—and in the Federal Government, the Bureau of Biological Survey—by legislative act have been given broad authority to handle promptly and by regulation such restrictions as are deemed to be necessary for the welfare of the birds and animals involved

Another important factor in game protection is that which has to do with the control of predatory animals and birds of prey The Federal Government and many of the States are spending considerable sums to reduce the numbers of such predacious animals as the wolf, coyote, mountain lion and the bobcat. As a result of the campaign waged against the coyote by the Federal Government and its co-operators in the Western States the deer have increased rapidly, and the antelope, the very existence of which seemed to be threatened, is coming back because of the lessening of damage done to fawns by this predator. Attention is now being given in many quarters to the control of such birds of prey as the goshawk, the sharp-shinned and Cooper hawks, and the magpie and crow, which are locally injurious to beneficial birds. Control measures for the welfare of game animals and birds are necessary also in connection with the diseases and parasites to which they are subject when concentrated on natural feeding and breeding areas or on game preserves. Maladies such as that known as alkali poisoning develop among wild ducks and other species that are limited by the advancement of farming operations to waters that become in effect death-traps for the birds. Measures that have been undertaken to remedy these adverse conditions include the building of dikes for impounding fresh waters, a notable example of which is furnished in the Federal Bear River Migratory Bird Refuge, on the marshes at the north end of Great Salt Lake, Utah, a concentration area for the wild fowl of many surrounding States.

Just as there may be over-enthusiasm in other welfare activities, so may measures for game protection reach a stage that threatens danger to the very species sought to be protected. Such a danger arises when either refuge or non-refuge areas of limited size become so overstocked that the available food supply is no longer adequate for their support. Game conservation in such cases has demanded the disposal of the surplus, when it cannot be cared for by an extension of needed facilities In many cases the surplus has been disposed of by transplanting elsewhere, as in the case of buffalo and elk from fenced preserves and deer from open areas, and in others it has been necessary for the welfare of the main stock to utilize part of the surplus as food or for other purposes.

One other element in the game-protection programme may be briefly stated as that of a proper attitude of mind by the sportsmen of the country toward the wild life There are too many poachers, market hunters and night shooters, but the true sportsmen obey the game laws and urge by precept and otherwise such observance on their fellows, and there are now in the United States many noted organizations of sportsmen, bird lovers and other conservationists who are zealously working to bring about better protection for the beneficial forms of the bird and animal life of the country. (P. G R.)

GAME RESERVES. The great forest areas of Sussex and Hampshire, preserved by the early Norman kings, may be regarded as one of the forerunners of the modern game reserve. The game, however, was in this case preserved solely for hunting purposes, and not, as in the modern reserves, preserved for the sake of the game itself. Game preservation for the sake of sport has been carried on in Europe for many hundreds of years, but it is only comparatively recently that the idea of the modern game reserve has been evolved. These reserves are seen at their best in North America, Africa and the Far East. Canada and the United States are at present well ahead of the rest of the world in game preservation, but the reserves of Africa, the Malay Peninsula, and Australia are not far behind those of the New World in importance and organization In Canada there are 13 areas put apart as national parks, comprising a total area of 8,900 sq.m, and in the United States some 8,456 sq m are devoted to this purpose In addition, some 45,500 sq m are set aside in Canada as reserves These national parks are visited by large numbers of people and the financial support thus obtained is very considerable. The game reserves of Africa and other parts of the Old World, where game still abounds, are not supported in a similar fashion, since the number of European visitors to the reserves is limited. The most popular of the African reserves is the new national park of the dominion of South Africa, known as the Kruger National park; this reserve is attracting a large number of visitors and its popularity is steadily increasing The Kruger National park had its origin in a game sanctuary founded by President Kruger in 1898, it was then known as the Sabi reserve, occupying the country between the Crocodile and Sabi rivers near the boundaries of Portuguese East Africa After the South African War this area was considerably enlarged, the reserve extending from the Crocodile river in the south, all along the Portuguese boundary to the Limpopo and the Rhodesian border in the north, and from the Portuguese boundary in the east nearly as far as the Drakensberg in the west, a total area of 200m by 60 miles In 1926 the Union Government decided to make this reserve into a national park where the fauna of the country may be preserved for all time The extent of this park as it exists to-day is about 220m by 40m, the park extending from Komatipoort in the south along the Portuguese East African border to the junction of the territories of the Union, Rhodesia, and Portuguese East Africa on the Limpopo. Elephants are still to be found in this reserve, inhabiting the country around the Letaba and Tendi rivers, the animals wandering as far north as the Shingwedsi, and southwards to the Olifants rivers. In addition, considerable numbers of migrants from Portuguese territory have latterly made their appearance between the Shingwedsi and Limpopo rivers A few specimens of the black rhinoceros (*Rhinoceros* [*Diceros*] *bicornis*) remain, and giraffe are reported to be increasing in numbers. Zebra, eland, kudu, roan and sable antelope, waterbuck, impala, Reedbuck, bushbuck, duiker, steinbuck, klipspringer and blue wildebeest are also to be met with within the confines of the park. In addition warthogs and bushpigs are found in all suitable localities and the hippopotamus lives in all the larger rivers. Buffaloes, which in 1902 were represented by only about a dozen individuals, are now fairly numerous in the area between the Sabi and Crocodile rivers. The number of lions is steadily decreasing and the leopard is getting, year

by year, a rarer animal. The reserve also serves as a sanctuary to a great variety of bird life.

Similar reserves exist in Zululand, where in the Umfolozi reserve the Southern white rhinoceros (*Rhinoceros simus simus*) has its last home. In the Mkuze reserve the Nyala (or Inyala) is found in fair numbers, together with impala, kudu, waterbuck, and other large and medium-sized antelopes In these Zululand reserves it has been suggested that the shortage of food supply, which has had a very serious effect on certain species, was due in part to the presence of vast numbers of zebra and blue wildebeest (or brindled gnu); possibly the shooting of the larger carnivora within the reserves has upset the balance of nature.

In Northern Rhodesia there are three game reserves (1) Mweru Marsh reserve (2,500 sq m); (2) Kafue reserve (3,500 sq m); and the Victoria Falls reserve (80 sq miles) The Mweru Marsh Reserve is situated between Lake Mweru and the southern end of Lake Tanganyika; it is especially designed for the protection of elephants In addition, it contains hippopotamus, eland, kudu, situtunga, sable and roan antelopes, buffalo, and some of the smaller antelopes, such as duikers and oribis Pelicans and flamingoes and many other types of bird life abound The Kafue reserve is situated in the western half of the colony, the Kafue river running through the reserve from north to south Elephants are occasionally found, and reports have been received of the occurrence of the black rhinoceros in this reserve. The majority of the large and medium-sized antelopes found in the colony are to be met with The Victoria Falls reserve is a narrow strip of country, about 40m long, bordering the north side of the Zambesi river, the function of this reserve is to protect such animals as still survive in the neighbourhood of the Victoria Falls

In Central Africa there is the newly-formed national park at Kivu, in the eastern Belgian Congo, and the Birunga volcanoes lying to the north-east of Lake Kivu have been proclaimed a sanctuary for the eastern gorilla (*Gorilla gorilla beringeri*). Numerous other game reserves exist in Uganda, the Sudan, Kenya Colony, Tanganyika Territory and Nyasaland In Tanganyika Territory there are 11 different reserves, varying in size from about 240 to 2,600 sq miles The most important of these is the so-called Selous reserve on the Rufiji river; this is the main elephant refuge of Tanganyika Territory. The Kilimanjaro and Meru reserves are also of importance as including much dense forest country In the Kilimanjaro forest area, in addition to numerous elephants, there occur such animals as Abbots Duiker (*Cephalophus spadix*) and the black and white Colobus monkey (*Colobus caudatus*) This reserve occupies the high forest zones and alpine meadow areas of the mountain.

In Kenya Colony there are two large reserves, the Northern game reserve (25,000 sq m) extending from Nyiro, south-east of Lake Rudolf, nearly as far as Lake Baringo in the south, with an approximate width of about 60m, and the Southern game reserve occupying a large part of the Masai reserve, stretching from Nairobi in a south-easterly direction for upwards of 160m, the total area included in the reserve being about 15,000 sq miles. In the Northern reserve a number of desert forms occur, such as Waller's gazelle or gerenuk (*Lithocranius walleri*) and a variety of dik-diks (*Rhynchotragus kirki, smithi,* etc) In addition, elephant, rhinoceros, hippopotamus, giraffe (*G reticulata*), buffalo, eland, kudu, lesser kudu, beisa, topi, hartebeest, waterbuck, impalla, two forms of Grant's gazelle, Thomson's gazelle, klipspringer, Grevy's zebra, Grant's zebra, steinbuck, reedbuck and a variety of small duikers, together with a number of ostriches, inhabit this reserve In the Southern reserve most of these forms also occur, the giraffe is, however, the Masai type (*G. tippelskerchi*), the zebra, Burchell's zebra, and the oryx, the fringed-eared oryx (*Oryx callotis*). Lions, leopards and cheetahs are also fairly frequently met with

In Uganda the Semliki reserve contains elephants, buffaloes, waterbucks, kobs, and a variety of duikers. The Bunyoro game reserve contains numbers of elephants, but its area is far too limited for any real use as a general reserve Other natural Uganda sanctuaries are the Budongo forest and Bugoma forest in Bunyoro, the Kibale and Butara forests in Toro, the sleeping sickness areas of Kabula and Mawogola on the Ankole-Masaka border, southern Busoga, and the uninhabited areas of north Bulamezi, Buruti, and north-east Singo. In the Sudan there is a large game reserve situated between the White and Blue Niles and the Sobat river. In Nigeria there are four game reserves, one in the northern and three in the southern provinces The northern reserve is situated in the Bornu province and contains most of the game animals to be found in the northern provinces, this area contains an adequate supply of water and grazing and is sufficiently large to function as a game sanctuary The land around certain towns within this reserve is excluded from the reserve for a radius of 5 miles In the southern provinces the best of the reserves is bounded on the west, south, and east by the Gwate creek; the other two reserves, the Orle river reserve, and the Anambra river reserve are not so suited for the purposes of game preservation

In Asia the principal game reserves are in the Federated Malay States, Burma, and Ceylon. In Negri Sembilan there is a reserve of 68,000 ac. situated on the Serting river The country here is mostly low-lying with a few hills; a large part of it is covered with heavy forest and contains elephant, seladang, sambar, tapir, tiger, and large numbers of small game and birds In Pahang there are three reserves, (1) the Krau reserve of 130,000 ac; (2) the Gunong Tahan reserve totalling some 360,000 ac, and (3) the Sungei Lui reserve (42,500 acres) These reserves contain most of the species of big and small game found in Malaya except the Javan rhinoceros (*Rhinoceros sondaicus*) In Burma the area set aside for reserves is at present by no means extensive, but more and larger reserves will probably be formed in the near future The five reserves are (1) the Pidaung sanctuary (260½ sq m) containing elephant, bison, sambar, hog-deer, tiger, leopard and bear, (2) the Kahilu reserve (200 sq m), containing the very rare Javan rhinoceros, (3) the Sheve-U-Daung sanctuary (81 sq m), which contains some specimens of the Sumatran rhinoceros (*R sumatrensis*), (4) the Maymyo sanctuary (49 sq m.), and (5) the Moscos islands (19 sq m.), contain Sambar and a variety of smaller game animals and birds

In Ceylon one of the most important reserves is the game sanctuary of the Southern province; it comprises the extreme eastern division of the Hambantota district situated between the Yala and Kumbukkan rivers In area this sanctuary is about 150 sq m, and the entry into it can only be obtained on permission of the forest officers It abounds in large and small game, sambar and the spotted deer being very abundant, and elephants, leopards, bears, and pigs are also to be met with. Another type of reserve in the Southern province is the resident sportsman's reserve, which adjoins the game sanctuary on the west. During the open season it is possible for the resident sportsman (of not less than six months' residence) to shoot in this reserve on licences to be obtained from the revenue officer of the district The game in this reserve, although increasing in numbers, is not nearly so abundant as it is in the sanctuary. A similar sportsman's reserve has been formed in the Eastern province, with an area of about 300 sq m, bounded on the east by the sea and the west by the Uva province boundary; in the north it extends as far as the Pottuvil-Mupane road, and southwards reaches Kumbukkan Oya Most of this reserve is bush country, with some large lagoons surrounded by park lands Elephants are sufficiently numerous to be a nuisance to sportsmen after smaller game, and sambar and spotted deer are numerous A sportsman's reserve is also maintained in the province of Uva, the reserve is situated in the southern part of the province and is open to resident sportsmen only.

In India the forests are frequently divided up into shooting blocks, usually of large size, one block being reserved as a game sanctuary. The formation of large game reserves, such as exist in Africa, is not possible in India, and to a large extent the game must be protected by shooting licences and the such small sanctuaries as may be formed in the centres of the game country.

In Australia there are a great number of reserves for the

preservation of native game. In Western Australia alone some 42 reserves have been formed for the protection of bird-life and the smaller marsupials. The national park of 3,349 ac. is situated at Swan View, about 14m. E. of Perth; grey kangaroos and some of the smaller marsupials are found in this park. In Queensland there are also a large number of game sanctuaries, including about 40 island reserves The national parks of Victoria, some 12 in number, serve to protect and preserve many rare birds and small marsupials. The largest of these parks is Wilson's promontory of over 100,000 ac and contains large numbers of the more common native animals Mt. Buffalo is another important reserve of 25,980 ac ; it contains a number of interesting birds but not many mammals The Grampians forest is another fine sanctuary in which kangaroos and wallabies are found These forest reserves have practically no inhabitants, but are accessible to the public by roads or tracks, with the exception of Mt Buffalo and Wilson's promontory, there are no hotels or rest-houses In addition to these national parks there are also about 180 reserves in Victoria, in many of which the platypus and other rare mammals thrive, and the kangaroo and wallaby find plenty of shelter in the forests Tasmania has a fine national park of 38,500 ac in the south-central part of the island, and over 160,000 ac are maintained as a game reserve in the region of Lake St Clair, Lincoln These two sanctuaries will ensure that the fast disappearing fauna of the island will be preserved for future generations The national park includes the Mount Field range and adjoining country, the altitude varies from 500 to 4,721 ft above sea-level, so that the fauna and flora of this region is both varied and interesting Among the larger mammals Bennett's wallaby (*Macropus bennetti*) is to be met with on the higher levels, and the smaller Rufous wallaby inhabits the scrub Ringtail and brush phalangers are fairly common, and kangaroo rats and marsupial mice (*Dromicia*) occur These latter, on account of their small size and nocturnal habits, are not often seen Wombats are common on the Broad river valley and on the open moors. The marsupial cats (*Dasyurus*) are found fairly frequently, and the Tasmanian devil and marsupial wolf (*Thylacinus cynocephalus*) are possibly also inhabitants of this area The platypus is to be found in the lakes and the spiny anteater is also a native of the park A large percentage of the Tasmanian birds are to be found within the boundaries, including specimens of the great wedge-tailed eagle. This national park, unlike so many of the reserves of Africa and elsewhere, is fairly easy to get to, trains run from Hobart to National park every week-day, and in the summer months a Sunday service is maintained

In New Zealand the national parks are chiefly maintained for the preservation of bird-life, and there are no native game animals. The parks are eight in number, of which the biggest are the Sounds National park, Tongariro, and Arthur's Pass Tongariro, in the North island, is remarkable for its beautiful scenery, containing within its boundaries the volcanic peaks of Ruapshu, Tongariro, and Ngarurhoe. Another North island park embraces the volcano known as Mt Egmont The most famous parks in the South island are the Sounds or Fiordland, and Tasman park (97,800 acres). The former park is noted for its sounds, or fiords, and the latter for the inclusion of Mt. Cook, the highest peak in the dominion All these parks function as valuable reserves for the preservation of the native fauna and flora The deer which have been introduced into New Zealand are not protected in these national parks, as the damage resulting from these animals is so serious that it has been found necessary to take steps to reduce their numbers.

In Africa the game reserves are usually in charge of the game warden, assisted by assistants and honorary game wardens There are also employed a number of native scouts. The staff, in addition to looking after the reserves, have to keep the large carnivora in check; a troublesome task in certain of the East African reserves. The staff of the Game Department in Kenya Colony consists of a game warden and four assistants; in addition there are 39 honorary game wardens whose powers are similar to those of the game warden, the game ordinance, stating that "Game warden includes assistant game warden and honorary game warden " In certain special cases, such as permits for export of game trophies, authority is vested only in the game warden. In addition there are a number of scouts, and valuable information is often received from casual natives Honorary game wardens also give much assistance in the Federated Malay States (J. G D)

THE UNITED STATES

The term "game preserve," instead of "game reserve," is used in the United States In its strictest sense it is limited to areas set aside for the protection of those species of wild mammals and birds that are defined by law or commonly hunted as "game " This is in contrast with the use of the term in England in connection with "shooting preserves " In its broadest sense, as here used, it is applied to Federal, State, municipal and private reservations where killing or disturbance of wild life is prohibited True game reservations are those established primarily for the protection of wild animals or birds, but such areas as national and State parks, national monuments and military and other reservations are of almost equal importance to the wild life forms, although their protection is incidental

Established in 1872, the Yellowstone National Park, famous for its scenic beauties, is one of the most important big-game sanctuaries in the United States, and protection and perpetuation of its wild life is of very general interest The elk of the park have been the subject of numerous Federal, State and other conservation measures The Elk Refuge, situated near Jackson, Wyo , with a present (1929) area of 4,225 ac , was established in 1912 to provide forage in winter for a herd of about 10,000 animals largely from the park region. Facilities for the winter care of big-game animals of the Yellowstone region are also being extended by the acquisition of areas in Montana north of the boundary of the park. Another example of an extensive area important in protecting wild life is found in Mount McKinley National Park, Alaska, the home of caribou and mountain sheep

Five executive departments administer reservations on which wild life is protected, as follows The Department of Agriculture, bird refuges and game preserves, the Department of the Interior, national parks, reclamation and irrigation projects and certain national monuments, War and Navy Departments, military reservations, Department of Commerce, Afognak and Pribilof, or Fur-Seal, island reservations, Alaska

The Bureau of Biological Survey of the U S Department of Agriculture, the chief Federal agency studying the distribution, habits and economic status of wild life, has under its charge 80 bird refuges and game preserves These have been established by executive orders, the first signed by President Roosevelt on March 14, 1903, and by special acts of Congress Five of the refuges are primarily preserves for buffalo, elk, deer, mountain sheep and antelope, and include the National Bison Range in Montana, Sullys Hill Game Preserve in North Dakota, Wind Cave Game Preserve in South Dakota, Niobrara Reservation in Nebraska and the Elk Refuge in Wyoming Two others, the Upper Mississippi River Wild Life and Fish Refuge, and the Bear River Migratory Bird Refuge, Great Salt Lake, Utah, are of special importance to migratory birds Most of the other refuges were established for the benefit of non-game species The Forest Service of the Department of Agriculture administers a number of Federal refuges for big game in national forest areas, the more important being the Wichita in Oklahoma, the Grand Canyon in Arizona and the Pisgah in North Carolina

Most of the States, and in some instances counties or municipalities, have dedicated areas to the conservation of wild animal and bird life. These refuges range from State lands, as in Alabama, where they are set aside as "forest reserves and game refuges," to those in some States acquired by purchase, those established on private premises by contract with the owners, or, as in California, where refuge districts are defined and closed to hunting by State law The refuge system in several States has been greatly aided by donations of private lands More than 237,000 ac have been added to the State refuges in Louisiana by gifts of private areas

In Pennsylvania, numerous refuges ranging from 1,200 to 3,000 ac. in extent, are established in the midst of several thousand acres of State-controlled forest and other areas Fire lanes are cleared and each refuge is marked by a single strand of wire high enough to permit free access of game The surplus animals from the protected area restock the surrounding region Many States in the West have designated extensive areas within Federal forest reserves as State game refuges, particularly in Wyoming, Montana, Idaho, Utah and California The authority of the several States to locate refuges on Federal, State or private lands is contrasted with that of the Federal Government which is restricted to the public domain and areas specially acquired. In a number of States authority to establish refuges by regulation has been conferred upon State game officials, and what are in effect refuges are created by law or by regulation, closing local areas to hunting or to the taking of particular kinds of game. A few States have entered a comparatively new field by acquiring areas where the public may hunt waterfowl or other game during the open season. Louisiana, since 1921, has operated Pass-a-l'Outre, a 60,000 ac. marsh and water area in Plaquemines parish as a public shooting ground In Utah a special area for public shooting is under operation by the State Reelfoot lake, Tenn., and the Susquehanna flats, at the head of Chesapeake bay, Md , are in effect public shooting areas Pennsylvania has maintained areas open to public shooting surrounding her State refuges for big game The Adirondack region and the Catskill park in New York also may be mentioned as public hunting areas for big game

Municipal preserves in some sections have proved highly attractive to wild life Among the best known of these are Lake Merritt, at Oakland, Calif ; the preserve at Daytona, Fla ; and Cook county park, at Chicago. What may be termed "private" game preserves are virtually numberless They may range from the premises of the farmer or landowner posted against public hunting, to those where extensive developments and improvements have been made for attracting bird and animal life and insuring its subsequent protection and care

Organizations of sportsmen and conservationists, as well as interested individuals, also establish and maintain sanctuaries for wild life The so-called "duck" clubs having shooting areas have set aside in many instances portions of their holdings as inviolate sanctuaries. The extent to which such areas have passed into private control has brought about a serious condition from the viewpoint of the unattached hunter The acquiring of marsh and water areas by individuals or clubs has often saved such areas to the wild fowl. Warden service, feed and even water has been supplied to render these preserves attractive to waterfowl, and in some cases sustenance is provided for a much greater number of the birds than the members kill. At some clubs also game keepers and breeding plants are maintained that produce for liberation more birds than are annually taken there Private quail-shooting preserves, some ranging from 10,000 to 20,000 ac , chiefly on leased lands, are maintained in some States in the South.

(F. L EA)

GAMES, CLASSICAL. 1 *Public Games*—The public games of Greece (*ἀγῶνες*) and Rome (*Ludi*) consisted in athletic contests and spectacles of various kinds, generally connected with and forming a part of a religious observance Probably no institution exercised a greater influence in moulding the national character, and producing that unique type of physical and intellectual beauty which we see reflected in Greek art and literature, than the public contests of Greece (*see* ATHLETE; GLADIATORS; ATHLETIC SPORTS).

The earliest games recorded are those at the funeral of Patroclus Greek games were in their origin connected with religion; either, as here, a part of the funeral rites, or else instituted in honour of a god, or as a thank-offering Each of the great contests was held near some shrine or sacred place and is associated with some deity or mythical hero It was not before the 4th century that this honour was paid to a living man (*see* Plutarch, *Lysander*, 18) The games of the *Iliad* and those of the *Odyssey* at the court of Alcinous show at what an early date the distinctive forms of Greek athletics—boxing, wrestling, putting the weight, the foot and the chariot race—were determined.

The *Olympian* games were the earliest, and to the last they remained the most celebrated of the four national festivals. Olympia was a naturally enclosed spot in the plain of Elis. There was the grove of Altis, in which were ranged the statues of the victorious athletes, and the temple of Olympian Zeus with the chryselephantine statue of the god, the masterpiece of Pheidias. There Heracles (so ran the legend which Pindar has introduced in one of his finest odes), when he had conquered Elis and slain its king Augeas, consecrated a temenos and instituted games in honour of his victory. A later legend, which probably embodies historical fact, tells how, when Greece was torn by dissensions and ravaged by pestilence, Iphitus enquired of the oracle for help, and was bidden restore the games which had fallen into desuetude, and there was, in the time of Pausanias, suspended in the temple of Hera at Olympia, a bronze disc whereon were inscribed, with the regulations of the games, the names of Iphitus and Lycurgus. From this we may safely infer that the games were a primitive observance of the Eleians and Pisans, and first acquired their celebrity from the powerful concurrence of Sparta The sacred armistice, or cessation of all hostilities during the month in which the games were to be held, is also credited to Iphitus.

In 776 B.C. the Eleians engraved the name of their countryman, Coroebus, as victor in the foot race, and thenceforward we have an almost unbroken list of the victors in each succeeding Olympiad or fourth recurrent year. For the next 50 years no names occur but those of Eleians or their next neighbours After 720 B C we find Corinthians and Megareans, and later still, Athenians and extra-Peloponnesians Thus what at first was nothing more than a village feast became a bond of union for all the branches of the Doric race, and grew in time to be the national festival. It survived even the extinction of Greek liberty, and had nearly completed 12 centuries when it was abolished by the decree of the Christian emperor, Theodosius, in the tenth year of his reign.

Let us attempt to call up the scene which Olympia in its palmy days must have presented as the great festival approached Heralds had proclaimed throughout Greece the "truce of God" Those white tents belong to the Hellanodicae, or ten judges of the games, chosen one for each tribe of the Eleians They have been here already ten months, receiving instruction in their duties All, too, or most of the athletes must have arrived, for they have been undergoing the indispensable training in the gymnasium of the Altis But along the "holy road" from the town of Elis a motley throng is crowding Conspicuous in the long train are the *θεωροί* or sacred deputies, clad in their robes of office, and bearing with them in their carriages of state, offerings to the shrine of the god There is no lack of noted visitors A feature of the mediaeval tournament and the modern racecourse is wanting Women might indeed compete and win prizes as the owners of teams, but all except the priestesses of Demeter were forbidden, matrons on pain of death, to enter the enclosure

At daybreak the athletes presented themselves in the Bouleuterium, where the judges were sitting, and proved by witnesses that they were of pure Hellenic descent, and had no stain, religious or civil, on their character Laying their hands on the bleeding victim, they swore that they had duly qualified themselves by ten months' continuous training in the gymnasium, and that they would use no fraud or guile in the sacred contests Thence they proceeded to the stadium, where they stripped to the skin and anointed themselves A herald proclaimed, "Let the runners put their feet to the line," and called on the spectators to challenge any disqualified by blood or character If no objection was made, they were started by the note of the trumpet, running in heats of four, ranged in places assigned by lot The foot-race was only one of 24 Olympian contests which Pausanias enumerates, though we must not suppose that these were all exhibited at any one festival Till the 77th Olympiad all was concluded in one day, but afterwards the feast was extended to five

The order of the games is for the most part a matter of conjecture, but, roughly speaking, the historical order of their institution was followed We will now describe in this ord r the

most important.

(1) The *Foot-race.*—For the first 13 Olympiads the δρόμος, or single lap of the stadium, which was 200yds. long, was the only contest. The δίαυλος, in which the course was traversed twice, was added in the 14th Olympiad, and in the 15th the δόλιχος, or long race, of 7, 12, or, according to the highest computation, 24 laps, about 2¾m. in length. We are told that the Spartan Ladas, after winning this race, dropped down dead at the goal. There was also, for a short time, a race in heavy armour, which Plato highly commends as a preparation for active service. (2) *Wrestling* was introduced in the 18th Olympiad. The importance attached to this exercise is shown by the very word *palaestra,* and Plutarch calls it the most artistic and cunning of athletic games. The practice differed little from that of modern times, save that the wrestler's limbs were anointed with oil and sprinkled with sand. The third throw, which decided the victory, passed into a proverb, and struggling on the ground, such as we see in the famous statue at Florence, was not allowed, at least at Olympia. (3) In the same year was introduced the πένταθλον (pentathlon), a combination of the five games enumerated in the well-known pentameter ascribed to Simonides: ἅλμα, ποδωκείην, δίσκον, ἄκοντα, πάλην. Only the first of these calls for any comment The only leap practised seems to have been the long jump The leapers increased their momentum by means of ἁλτῆρες or dumb-bells, which they swung in the act of leaping (4) The rules for boxing did not differ greatly from those of the modern ring (*see* PUGILISM), and the chief difference was in the use of the *caestus.* This, in Greek times, consisted of leather thongs bound round the boxer's fists and wrists, and the weighting with lead or iron or metal studs, which made the caestus more like a "knuckle-duster" than a boxing-glove, was a later Roman development. The killing of an antagonist, unless proved to be accidental, not only disqualified for a prize, but was severely punished The use of earguards and the comic allusions to broken ears, not noses, suggest that the Greek boxer did not hit out straight from the shoulder, but fought windmill fashion In the *pancratium,* a combination of wrestling and boxing, the use of the caestus, and even of the clenched fist, was disallowed. (5) The *chariot-race* had its origin in the 23rd Olympiad. Of the hippodrome, or racecourse, no traces remain, but from the description of Pausanias we may infer that the dimensions were approximately 1,600ft by 400ft Down the centre there ran a bank of earth, and at each end of this bank was a turning-post round which the chariots had to pass. "To shun the goal with rapid wheels" required both nerve and skill, and the charioteer played a more important part in the race than even the modern jockey Pausanias tells us that horses would shy as they passed the fatal spots The places of the chariots were determined by lot, and there were elaborate arrangements for giving the drivers a fair start The large outlay involved excluded all but rich competitors, and even kings and tyrants eagerly contested for the victory. Chariot-races with mules, with mares, with two horses in place of four, were successively introduced Races on horseback date from the 33rd Olympiad Lastly, there were athletic contests of a similar kind for boys, and a competition of heralds and trumpeters, introduced in the 93rd Olympiad.

The prizes were at first, as in the Homeric times, of some intrinsic value, but after the 6th Olympiad the only prize for each contest was a garland of wild olive The successful athlete received, in addition to the honours, very substantial rewards. A herald proclaimed his name, his parentage and his country; the Hellanodicae took from a table of ivory and gold the olive crown and placed it on his head, and in his hand a branch of palm; as he marched in the sacred revel to the temple of Zeus, his friends and admirers showered in his path flowers and costly gifts, singing the old song of Archilochus, τήνελλα καλλίνικε, and his name was canonized in the Greek calendar. Fresh honours and rewards awaited him on his return home. If he was an Athenian he received, according to the law of Solon, 500 drachmae, and free rations for life in the Prytaneum; if a Spartan, he had as his prerogative the post of honour in battle. Poets like Pindar, Simonides and Euripides sung his praises, and sculptors like Pheidias and Praxiteles were engaged by the State to carve his statue. And there were well-attested instances of altars being built and sacrifices offered to a successful athlete. An Olympian prize was regarded as the crown of human happiness. Cicero, with a Roman's contempt for Greek frivolity, observes with a sneer that an Olympian victor receives more honours than a triumphant general at Rome, and tells the story of the Rhodian Diagoras, who, having himself won the prize at Olympia, and seen his two sons crowned on the same day, was addressed by a Laconian in these words:—"Die, Diagoras, for thou hast nothing short of divinity to desire." Alcibiades, when setting forth his services to the State, puts first his victory at Olympia, and the prestige he had won for Athens by his magnificent display.

The *Pythian* games originated in a local festival held at Delphi, anciently called Pytho, in honour of the Pythian Apollo, and were especially devoted to musical competitions. The date at which they became a Panhellenic ἀγών (so Demosthenes calls them) cannot be determined, but the Pythiads as a chronological era date from 527 B C, by which time music had been added to all the Panhellenic contests. Now, too, these were held at the end of every fourth year; previously there had been an interval of eight years. The prize was a chaplet of laurel.

The *Nemean* games were biennial and date from 516 B C They were by origin an Argive festival in honour of Nemean Zeus, but in historical times were open to all Greece, and provided the established round of contests, except that no mention is made of a chariot-race A wreath of wild celery was the prize

The *Isthmian* games, which were held on the Isthmus of Corinth in the first and third years of each Olympiad. Their early importance is attested by the law of Solon which bestowed a reward of 100 drachmae on every Athenian who gained a victory. The festival was managed by the Corinthians, and after the city was destroyed by Mummius (146 B C) the presidency passed to the Sicyonians until Julius Caesar rebuilt Corinth (46 B.C.). They probably continued to exist till Christianity became the religion of the Roman empire The Athenians were closely connected with the festival, and had the privilege of *proedria,* the foremost seat at the games, while the Eleans were absolutely excluded from participation The games included gymnastic, equestrian and musical contests. The prize was a crown, at one time of parsley (or wild celery); later of pine The importance of the Isthmian games in later times is shown by the fact that Flamininus chose the occasion for proclaiming the liberation of Greece, 196 B C.

The *Ludi Publici* of the Romans, as in Greece, were intimately connected with religion At the beginning of each civil year it was the duty of the consuls to vow to the gods games for the safety of the commonwealth, and the expenses were defrayed by the treasury Thus, at no cost to themselves, the Roman public were enabled to indulge at the same time their religious feelings and their love of amusement. Their taste for games naturally grew till it became a passion, and under the empire games were looked upon by the mob as one of the two necessaries of life. The aediles who succeeded to this duty of the consuls were expected to supplement the State allowance from their private purse Political adventurers were not slow to discover so ready a road to popularity, and what at first had been exclusively a State charge, was taken up by men of wealth and ambition A victory over some barbarian horde, or the death of a relation, served as the pretext for a magnificent display. But the worst extravagance of private citizens was eclipsed by the reckless prodigality of the Caesars, who squandered the revenues of whole provinces in catering for the mob of idle sightseers on whose favour their throne depended But though public games played as important a part in Roman as in Greek history, and must be studied by the Roman historian as an integral factor in social and political life, yet, regarded solely as exhibitions, they are comparatively devoid of interest.

It is easy to explain the different feelings which the games of Greece and of Rome excite. The Greeks, at their best, were actors, the Romans, from first to last, were spectators It is true that even in Greek games the professional element played a

large and ever-increasing part. As early as the 6th century B C. Xenophanes complains that the wrestler's strength is preferred to the wisdom of the philosopher, and Euripides, in a well-known fragment, holds up to scorn the brawny, swaggering athlete But, what in Greece was a perversion and acknowledged to be such, the Romans not only practised but held up as their ideal. No Greek, however high in birth, was ashamed to compete in person for the Olympic crown. The Roman, though little inferior in gymnastic exercises, kept strictly to the privacy of the palaestra; and for a patrician to appear in public as a charioteer is stigmatized by the satirist as a mark of shameless effrontery

For the Roman world, the circus was at once a political club, a fashionable lounge, a rendezvous of gallantry, a betting ring, and a playground for the million Juvenal, speaking loosely, says that in his day it held the whole of Rome, but there is no reason to doubt the precise statement of P Victor, that in the Circus Maximus there were seats for 350,000 spectators.

Of the various *Ludi Circenses* it may be enough here to give a short account of the most important, the *Ludi Magni* or *Maximi*

Initiated, according to legend, by Tarquinius Priscus, the *Ludi Magni* were originally a votive feast to Capitoline Jupiter, promised by the general when he took the field, and performed on his return from the annual campaign They thus presented the appearance of a military spectacle, or rather a review of the whole burgess force, which marched in solemn procession from the capitol to the forum and thence to the circus, which lay between the Palatine and Aventine First came the sons of patricians, mounted on horseback, next the rest of the burghers ranged according to their military classes, after them the athletes, naked save for the girdle round their loins, then the company of dancers with the harp and flute players, next the priestly colleges bearing censers and other sacred instruments, and lastly the simulacra of the gods, carried aloft or drawn in cars. The games themselves were fourfold:—(1) the chariot race, (2) the *ludus Troiae;* (3) the military review; and (4) gymnastic contests Of these only the first two call for any comment (1) The chariot employed in the circus was the two-wheeled war car, at first drawn by two, afterwards by four, and more rarely by three horses. Originally only two chariots started for the prize, but under Caligula we read of as many as 24 heats run in the day, each of four chariots The distance traversed was 14 times the length of the circus or nearly 5m. The drivers were divided into companies, distinguished by colours, whence arose the factions of the circus which assumed such importance under the later emperors In republican times there were two factions, the white and the red; two more, the green and the blue, were added under the empire, and for a short time in Domitian's reign, there were also the gold and the purple Even in Juvenal's day party spirit ran so high that a defeat of the green was looked upon as a second Cannae After the seat of empire had been transferred to Constantinople these factions of the circus were made the basis of political cabals, which frequently resulted in sanguinary tumults, such as the famous Nika revolt (A D 532), in which 30,000 citizens lost their lives (2) The *Ludus Troiae* was a sham-fight on horseback, in which the actors were patrician youths. A description of it will be found in the 5th Aeneid (*See* also CIRCUS)

The two exhibitions we shall next notice, though occasionally given in the circus, belong more properly to the amphitheatre *Venatio* was the baiting of wild animals, who were pitted against one another or against men—captives, criminals or trained hunters called *bestiarii* The first certain instance on record of this amusement is in 186 B C, when M. Fulvius exhibited lions and tigers in the arena. The taste for these brutalizing spectacles grew apace, and the most distant provinces were ransacked by generals and proconsuls to supply the arena with rare animals—giraffes, tigers and crocodiles. Sulla provided for a single show 100 lions, and Pompey 600 lions, besides elephants, which were matched with Gaetulian hunters. Julius Caesar enjoys the doubtful honour of inventing the bull-fight. At the inauguration of the Colosseum 5,000 wild and 4,000 tame beasts were killed, and to commemorate Trajan's Dacian victories there was a butchery of 11,000 beasts The *naumachia* was a sea-fight, either in the arena, which was flooded for the occasion by a system of pipes and sluices, or on an artificial lake. The rival fleets were manned by prisoners of war or criminals, who often fought till one side was exterminated. In the sea-fight on Lake Fucinus, arranged by the emperor Claudius, 100 ships and 19,000 men were engaged.

But the special exhibition of the amphitheatre was the *munus gladiatorium,* which dates from the funeral games of Marcus and Decimus Brutus, given in honour of their father, 264 B C. It was probably borrowed from Etruria, and a refinement on the common savage custom of slaughtering slaves or captives on the grave of a warrior or chieftain. Nothing so clearly brings before us the vein of coarseness and inhumanity running through the character of the Roman as his passion for gladiatorial shows. Only after the conquest of Greece we hear of their introduction into Athens, and they were then admitted rather out of compliment to the conquerors than from any love of the sport. In spite of numerous prohibitions from Constantine downwards, they continued to flourish even as late as St Augustine. To a Christian martyr, if we may credit the story told by Theodoret and Cassiodorus, belongs the honour of their final abolition In the year 404 Telemachus, a monk who had travelled from the East on this sacred mission, rushed into the arena and endeavoured to separate the combatants He was instantly despatched by the praetor's orders, but Honorius, on hearing the report, issued an edict abolishing the games. (*See* GLADIATORS)

Of the other Roman games the briefest description must suffice The *Ludi Apollinares* were established in 212 B C, and were annual after 211 B C, consisting mainly of theatrical performances. The *Megalenses* were in honour of the great goddess, Cybele, instituted 204 B C, and from 191 B C celebrated annually Under the empire the festival assumed a more orgiastic character. Four of Terence's plays were produced at these games The *Ludi Saeculares* were celebrated at the beginning or end of each *saeculum,* a period variously interpreted by the Romans themselves as 100 or 110 years

Private Games.—There is quite naturally a much closer resemblance between the pursuits and amusements of children than of adults. Homer's children built castles in the sand, and Greek and Roman children alike had their dolls, their hoops, their skipping-ropes, their hobby-horses, their kites, their knuckle-bones and played at hopscotch, the tug-of-war, pitch and toss, blind-man's bluff, hide and seek, and kiss in the ring, or at closely analogous games Games of ball were popular in Greece from the days of Nausicaa, and at Rome there were five distinct kinds of ball, and more ways of playing with them It is strange that we can find in classical literature no analogy to cricket, tennis, golf or polo, and though the *follis* resembled our football, it was played with the hand and arm, not with the leg Cock-fighting was popular both at Athens and Rome, and quails were kept and put to various tests to prove their pluck

Under indoor games we may distinguish games of chance and games of skill. *Tesserae,* marked with pips like modern dice, were evolved from the *tali,* knuckle-bones with only four flat sides. The old Roman threw a hazard and called a main, just as did Charles Fox. The vice of gambling was lashed by Juvenal.

The primitive game of guessing the number of fingers simultaneously held up by the player and his opponent is still popular in Italy where it is known as "morra."

Athena found the suitors of Penelope seated upon cowhides and playing at πεσσοί, which was a form of draughts, an invention ascribed to Palamedes. In its earliest form it was played on a board with five lines and with five pieces Later we find eleven lines, and a further development was the division of the board into squares.

Duodecim scripta, as the name implies, was played on a board with 12 double lines and approximated very closely to our backgammon. There were 15 pieces on each side, and the moves were determined by a throw of the dice; "blots" might be taken, and the object of the player was to clear off all his own men. Lastly must be mentioned the *Cottabus* (*q.v.*), a game peculiar to the Greeks, and with them the usual accompaniment of a wine party. In its simplest form each guest threw what was left in his cup

into a metal basin, and the success of the throw, determined partly by the sound of the wine in falling, was reckoned a divination of love. For the various elaborations of the game, Athenaeus and Pollux must be consulted.

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GAMETE, in biology the name given to the special cells set apart in most plants and animals for sexual reproductive purposes. (*See* SEX.) They are usually of two kinds: (1) the *ovum,* which is large, stationary and heavily laden with food-materials (yolk); and (2) the *spermatozoon* or (in plants) *spermatozoid,* which is small, actively motile and, in all animals except the Arthropoda (insects, spiders, crabs, etc) and nematode worms, consisting of a head of nuclear material (*see* NUCLEUS) and a long vibratile tail In the higher plants (conifers and flowering plants) and in many fungi, this element is much modified (*see* PLANT), but in most of the lower plants the spermatozoid closely resembles the animal spermatozoon In some Algae (*q v*), both gametes are spermatozoon-like; and in certain Algae and Protozoa the whole organism acts as a gamete The two gametes, in all the above cases, fuse to form a *zygote,* which develops into the adult organism An organism producing ova is said to be female, one producing spermatozoa, male: one producing both, hermaphrodite. (*See* SEX, HEREDITY, CYTOLOGY, HERMAPHRODITE, EMBRYOLOGY)

GAMETOGENESIS, in embryology, the name given to an abnormal form of egg fertilisation due to the entrance of a number of spermatozoa into the ovum instead of one as in normal fertilisation. A corresponding number of male pronuclei are formed, and the subsequent development, if it takes place at all, is abnormal The spermatozoa and ova are called the gametes In the Arthropoda, selachians, amphibians and mammals the reproductive organs can admit of several spermatozoa normally entering the ovum, but of these only one forms a male pronucleus, the rest being absorbed. *See* EMBRYOLOGY, HEREDITY, SEX.

GAMING AND WAGERING. At common law no games were unlawful, but early legislation in England (1388, 1409, 1477 and 1541) sought to restrict games in the interests of archery The early Stuarts encouraged manly sports, but Puritan agitation secured the Sunday Observance Act, 1625, which prohibited most sports and pastimes on Sunday Cock-fighting and the setting of other animals to fight are offences against the Prevention of Cruelty to Animals Acts Other games have been declared illegal chiefly because of their tendency to promote gambling Such games include ace of hearts, pharaoh (faro), basset and hazard (1738), passage and all games with dice (1739), roulette or roly-poly (1744), lotteries (except under the Art Unions Act, 1846), *rouge et noir, baccarat-banque* (1884), *chemin-de-fer* (1895) and all card games which are not games of mere skill

Wagering has received a great deal of attention from parliament, but at common law an action would lie to enforce a wager In 1845 a general Gaming Act was passed by which all agreements by way of gaming or wagering are null and void and no action lies to recover money, even from a stakeholder, alleged to be won upon any wager Until the Gaming Act, 1892, however, agents who paid lost bets were able to recover the amounts paid from their principals.

Betting on Horse Races.—In England, although football matches and greyhound racing are also responsible for much betting, the general public bet chiefly on horse races. A large number of people make a living from the habit. Special editions of the evening papers are published giving "tips" and the odds quoted by the "bookmakers" or professional betting men, who by laying money against a number of horses and by shrewdly regulating the odds according to their knowledge and information and the desire of the public to support certain horses rather than others, usually manage to grow rich, while in the long run the backer of horses almost always loses money. On the more important races betting begins weeks or even months before the event The odds are governed largely by the public demand, and if a great many people bet on the one horse the price shortens until in many cases instead of laying money against a horse a bookmaker takes odds, *i e*, agrees to pay in the event of the horse winning a smaller sum than he will receive if it loses Bookmakers employ many agents and touts on commission, and despite attempts to check it, the habit of betting has grown into a pronounced and widespread evil

The Betting Act, 1853, renders liable to punishment keepers of places for the purpose of any person betting with persons resorting thereto, and the Licensing Act, 1872, penalizes licensed persons who allow their houses to be used in contravention of the 1853 Act The Act only applies to ready-money betting and to places used for betting with persons physically resorting thereto, so that bets by letter, telegram or telephone do not fall within its penalties The 1853 Act makes it an offence to advertise a betting house and an 1874 Act imposes penalties on persons advertising illegal betting

Street betting was penalized by the Metropolitan Streets Act, 1867, the Vagrancy Act, 1873, and by-laws made by local authorities. These measures were found to be inadequate and in 1906 the Street Betting Act was passed Severe penalties are imposed on anyone frequenting or loitering in a street or public place (other than a racecourse or adjacent ground on a race day) for the purpose of betting or settling bets Police constables may arrest for such an offence without warrant It is obvious, however, to anyone passing along the back streets of London or any large town that the Act is habitually broken Under the Act, to have a betting transaction with a person under the age of 16 is a more serious offence and infants are also protected by the Betting and Loans (Infants) Act, 1892, which makes it a misdemeanour to send, with a view to profit, to anyone known by the sender to be an infant, a document inviting him to enter into a betting or wagering transaction

By the Finance Act, 1926, bookmakers are required to take out a license and a betting tax is imposed Evasion of the tax has been so flagrant, however, that for the first time the use of the totalisator or *pari-mutuel* system has been authorized in England. This system, under which the whole sum staked on the horses in any race (less authorized deductions) is divided among the backers of the winning horses, has been in use on all French racecourses since 1866 and is in general use abroad. By the Racecourse Betting Act, 1928, the Betting Act, 1853, does not apply to any approved racecourse or any act done thereon on a day when horse races, but no other races, take place thereon, and totalisators may be lawfully set up and operated thereon by the Racecourse Betting Control Board, set up under the Act, or any person authorized by them It is, however, made an offence to have a betting transaction, whether by the totalisator or not, with a person apparently under the age of 17, whether such person is betting for himself or placing a bet for another person, unless it be proved that such person was at the time 17 or over

Lotteries.—At common law gaming and betting houses were illegal only if they constituted a public nuisance The 1541 Act penalized persons maintaining houses for illegal games, and in 1698 lotteries were declared public nuisances Lotteries, or the determining of prizes by lot, were used in the entertainments and festivals of Roman emperors, of the feudal and merchant princes of Europe and of Louis XIV's court In the Italian republics of the 16th century the lottery principle was applied to encourage the sale of merchandise. The institution became very popular in France and gradually assumed, despite the protest of the *parlements,* an important place in the Government finance In 1776 the biggest lotteries were merged in the *Loterie Royale* and all private lotteries were suppressed This lottery was suppressed in 1836 but in 1844 lotteries were authorized for the assistance of charity and the fine arts Lotteries were suppressed in Belgium

in 1830, Sweden in 1841 and Switzerland in 1865, but they are still common in many continental countries. The most important in the world is the Christmas "gordo" at Madrid, and the most generally popular is the Calcutta sweepstake on the result of the Derby. Lotteries have also been made illegal in Alaska (1899), Hawaii (1900) and Porto Rico (1902).

In England authorized lotteries were established as early as 1569, and from 1709 to 1824 the Government annually raised by lotteries large sums, averaging yearly from 1793 to 1824, £346,765. The prohibition of lotteries in general acts did not affect lotteries established or specially authorized by statute, but now the only lotteries which would be legal are those complying with the stringent conditions of the Art Unions Act 1846. The activity of parliament indicates the extent of the evil. The Act of 1698 was followed by Acts in 1721, 1722, 1733, 1738, 1739, 1744, 1751, and a number of 19th century Acts. In 1802 the definition of lottery was extended to include little-goes and any game or lottery not authorized by parliament, drawn by dice, lots, cards, balls, or by numbers or figures or by any other way, contrivance or device whatsoever Raffles and sweepstakes come within this definition and are illegal, and many devices by newspapers and tradesmen to attract customers by offering prizes have been suppressed Thus to sell goods with the benefit of a chance of securing a prize, or with the promise of a prize the value or nature of which depends on chance is an offence even though full value be given for the purchase price. Similarly a competition the result of which depends on chance is illegal. If, however, the result depends on skill, the competition is not a lottery, and organizers of competitions have been ingenious in keeping within the letter of the law while offering the public all the excitement of a lottery. Between 1920 and 1926 huge sums were raised, usually for charitable objects, by the offer of large cash prizes but since then the public appetite for such schemes has declined and several ambitious schemes have involved the promoters in loss The 1802 Act is aimed at the habitual use of a place for a forbidden purpose, but in 1823 the sale of lottery tickets is made in itself an offence. The advertisement of foreign or illegal lotteries was forbidden in 1836 and 1844 and, if detected, tickets in and advertisements of foreign lotteries are treated by the Customs as prohibited goods. The Gaming Act, 1845, greatly facilitates the search of suspected gaming-houses and the proof that they are such, and in 1854 further provisions were enacted to facilitate conviction and to provide summary penalties. Both public and private gaming houses come within the statutes but a single instance of playing an unlawful game for money in a private house is not an offence

No action can be brought in England on an English security given in settlement of gaming debts contracted where gaming is lawful (*Moulis* v. *Owen*, 1907, 1 K.B. 746), and probably not on a foreign security, by reason of the Gaming Act, 1835. But if by foreign law governing a gaming transaction a gaming debt is valid, the debt can be enforced in England (*Saxby* v. *Fulton*, 1909, 2 K B. 208)

Gambling in Stocks and Shares or in commodities falls within the Gaming Acts, but buying or selling by way of speculation is not penalized in any way unless the shares or stock of a joint stock banking company are being bought or sold, when the provisions of Leeman's Act, 1867, must be observed. The test is whether, although the transaction is in form commercial, the real intention of the parties is to make a mere wager on the price of the shares or commodity at a date fixed by the contract. The form, however, of all bargains on the Stock Exchange is calculated and intended to preclude people from setting up a Gaming Act defence, as a contracting party is entitled to call for delivery or acceptance of the stocks or shares named in the contract. But in many cases dealings with "outside stockbrokers" or "bucket shops" have been held to be mere wagers although the contracts purported to give the right to demand delivery or acceptance. The courts are entitled to examine into the true nature of a transaction.

In Scotland the courts refuse to try actions on wagers. The acts of 1710, 1835, 1906 and 1922 extend to Scotland, as do the Lottery Acts except that of 1698. The 1853 Act was extended to Scotland in 1874, and wide powers to suppress gaming houses, street betting, lotteries and gaming are conferred by the Burgh Police Act, 1892 and 1903. The weight of judicial opinion is that the Gaming Act 1845 does not apply to Scotland. In Ireland the law is substantially as in England but the provisions for a betting tax do not apply to the Irish Free State and the 1928 Act does not apply to Ireland. It is the custom in Northern Ireland, however, to pass legislation which closely follows that in England. In 1923 the Irish Free State passed an act in the terms of the Gaming Act, 1922, repealing s. 2 of the Gaming Act, 1835.

See Brandt on *Games* (1872); Oliphant, *Law of Horses, etc.* (6th ed., 1908); Coleridge, *Law of Gambling* (2nd ed, 1913), Schwabe, *Stock Exchange* (1905); Melsheimer, *Stock Exchange* (4th ed., 1905); Bewes, *Stock Exchange Law and Practice* (1910); Gregorio Leti, *Critique sur les loteries* (Amsterdam, 1697); J. Dessaulx, *De la passion du jeu* (1779); Endemann, *Beitrage zur Geschichte der Lotterie* (Bonn, 1882); Larson, *Lotterie und Volkswirtschaft* (1894); J. Ashton, *History of English Lotteries* (1893), *Annual Report of the American Historical Association* (1892). (F. G.)

AMERICA

Except in four States, where some form of wagering on horse racing has been legalized, all gaming and wagering is illegal in the United States, although devious plans have been evolved in many sections to evade existing laws and permit wagers, especially on the racing of horses or dogs Lotteries were permitted in some States as late as 1890, when the last authorized lottery passed with the demise of the famous Louisiana Lottery. Despite the fact that all forms of gaming with cards, dice, roulette wheels, or other mechanical devices are forbidden, they are carried on surreptitiously throughout the country generally.

Canada, although barring bookmakers, has legalized the mutuel or "iron men" machine system for handling of betting on horse races The system is under strict government supervision and is permitted where racing is conducted and on races run within the club enclosure only during the authorized meeting days assigned each club by the government.

Mexico, with the most pliable of wagering laws on the continent, shares with Cuba the distinction of being the centre of winter racing for North America, with huge racing establishments at Tia Juana and Juarez. Havana is the racing, as well as the government, seat of Cuba.

Horse Racing.—Of all forms of betting in the United States, horse racing attracts by far the greatest number of bettors, and has resulted in the creation of many large syndicates for the purpose

In the major cities these groups, in many instances, have their headquarters in steel encased rooms as protection against the "hijacker"—a comparatively recent product who preys upon successful gamblers or violators of other national prohibitory laws. Powerful influences have been built up by these syndicates and in some cases hundreds of thousands of dollars have been expended by them in order to secure the election of State officials known to be favourable to retention of legislation permitting betting on horse races or dog races.

In Kentucky, Maryland, Illinois and Nevada, the four States where race betting is legalized, the mutuel machine system, or some modification of it, is used at the racing tracks. In this system the bettors make their own odds, as against the old bookmaking system where definite, established odds against the chances of the various entries in a race are offered by the bookmaker.

In the mutuel system the bettor places his money on the horse (or dog) he favours. The money bet on all entries is then divided, less the "take," or percentage to the track management, among those who placed money on the entries who finished first, second and third.

Many times the amount of money bet by attendants at a race track is wagered daily in poolrooms with bookmakers, in practically all cities The bookmaker, who is of course operating surreptitiously, may, if he finds he has received more bets than he feels he wants to handle, "lay it off," through an agent at the track. Then, too, the huge sums bet by gambling syndicates go into the betting machines at the track through a betting com-

missioner who, much more skilled in rapidly computing odds at the last moment than the average racegoer, waits until he can determine a close approach to the exact odds and then bets the money for his syndicate

The percentage taken by the management varies at various tracks. In Mexico the bettor is further handicapped in his chances for return by the additional deduction required by the government over that taken by the track owners. In the United States the percentage taken is from 5½ to 11%, in Canada it is about 7% and in Mexico 5½% by the management and 7% by the government.

In States not authorizing the mutuel system two plans are used to evade the law In the certificate system, the bettor "buys an interest" in the horse, or dog, and is compensated proportionately if his choice is a winner. In another plan of evasion pictures of the various entries are sold to the bettors, pictures of the winning animals being bought back by the management at a price determined by the odds resulting from the total amount of money bet. Authorities in many States have, however, secured court ruling against these plans as illegal and in other cases have been the order, followed by long drawn out court battles as to the legality of the system

A third method of handling bets, where forbidden, is the oral system In this, used extensively at Eastern tracks, no money is paid the bookmaker by the bettor at the time the bet is placed. Both parties depend on the loser to pay off the following day

In the dissemination of information on racing, both to the public and to professional gamblers, thousands of persons and elaborate systems are employed. The compilation of charts showing past performances of all entries is gathered daily at a tremendous expense These charts are published by leading newspapers except where such publication is forbidden by State law. Then, too, an army of "clockers" or timers watch the daily training and performances of race horses at the various tracks. This information goes to two sources: to professional gamblers and syndicates for their own information, and to "handicappers," employed by newspapers to make selections of probable winners for the following day's racing These selections are then published by the papers for the benefit of their readers The network of telegraph wires used to convey this information from the various tracks rivals in magnitude those of the great press services which bring the world's news to the newspapers. Gambling syndicates have their own leased wires, running direct from the tracks into their headquarters, so that they do not have to share their information with anyone else

The handling of bets at all dog racing tracks is on the same basis as at the horse racing tracks, but has not the ramifications of the latter, very few bookmakers, away from the tracks, handling bets on dog racing, as compared to the thousands who accept bets on horse racing

Lotteries or Pools.—Various forms of lotteries or pools also are played daily by hundreds of thousands in the larger cities, especially among the smaller gamblers "Policy" and other lotteries which pay on terminal numbers of daily bank clearings, United States treasury balance and sales of shares on the Stock Exchange, attract them Agents for these pools are widespread It may be a woman or girl who daily canvasses bettors in her immediate neighbourhood or among her circle of friends, or the keeper of a little delicatessen or candy store who will accept the pennies of children from a nearby school. And the aggregate wagered daily in these small sums constitutes a tremendous total

Professional Baseball.—Professional baseball proves another medium for the gambler, both large and small. Although strictly opposed by law and club owners, oral betting is practised in baseball parks, and pool tickets on the total number of runs scored each day by various combinations of teams listed on the ticket are sold in all principal cities Large amounts are bet also by gamblers and syndicates on baseball and other sporting events, both professional and amateur The extent to which this has been carried was illustrated in 1919 when, it was charged, several members of a major league baseball team accepted money from a gambling syndicate to "throw" a World's Series to their opponents. All were driven from organized baseball as a result of the ensuing investigation

Slot Machines.—Slot machines and other mechanical devices, once legalized, have been driven to secret quarters in recent years The same is true of punchboards, which award money or merchandise prizes to those who punch winning numbers from the holes in the board. Keno or Lotto is permitted in some sections for the raffling off of articles, particularly in holiday seasons Authorities are not inclined, in a good many cases, to enforce the law against it where no money prizes are offered and especially if the raffle is held by members of some club or society

Cock-fighting.—Cock-fighting and pit fighting of dogs, once legal in the United States simply because there were no laws against them, have for many years been illegal Both are now obsolete in the United States except for rare instances.

Cock-fighting, once a national sport and gambling medium in Cuba, is now outlawed but carried on surreptitiously. In Mexico the practice goes on as usual (C. M.)

GAMMA RAYS (usually written γ-Rays) are electromagnetic radiations of very high frequency emitted by certain radioactive bodies (*see* RADIOACTIVITY). These radiations possess wave lengths of less than $\frac{1}{10}$ Angstrom unit or 10^{-10} of a centimeter. They mark the present upper limit of the spectrum of electromagnetic radiations (*See* X-RAYS: *Nature of*, fig. 1) The various interesting properties possessed by these rays are chiefly due to their extremely high frequency

GAMUT, a term in music used to mean generally the whole compass or range of notes possessed by an instrument or voice (from the Greek letter *gamma,* used as a musical symbol, and *ut,* the first syllable of the mediaeval hymn, *Sanctus Johannes*) Historically, however, the sense has developed from its stricter musical meaning of a scale (the recognized musical scale of any period), originating in the mediaeval "great scale," of which the invention has usually been ascribed to Guido of Arezzo (*q.v.*) in the 11th century. The whole question is somewhat obscure, but, in the evolution of musical notation out of the classical alphabetical system, the invention of the mediaeval gamut is more properly assigned to Hucbald (d 930) In his system of scales the semitone was always between the 2nd and 3rd of a tetrachord, as G, A, ♭ B C, so the ♮ B and ♯ F of the second octave were in false relation to the ♭ B and the ♮ F of the first two tetrachords. To this scale of four notes G, A, ♭ B, C were subsequently added a note below and a note above which made the hexachord with the semitone between the 3rd and 4th both up and down, as F, G, A, ♭ B, C, D It was at a much later date that the 7th, our leading note, was admitted into a key, and for this the first two letters of the last line of the above-named hymn "Sanctus Johannes" would have been used, save for the notion that as the note Mi was a semitone below Fa, the same vowel should be heard at a semitone below the upper Ut, and the syllable Si was substituted for Sa Long afterwards the syllable Ut was replaced by Do in Italy, but it is still retained in France; and in these two countries, with whatever others employ their nomenclature, the original Ut and the substituted Do stand for the sound defined by the letter C in English and German terminology. The literal musical alphabet thus accords with the syllabic:

A	B	C	D	E	F	G
La,	Si,	Ut or Do,	Re,	Mi,	Fa,	Sol.

In Germany a remnant of Greek use survives A was originally followed in the scale by the semitone above, as the classical Mesē was followed by Paramesē, and this note, namely ♭ B, is still called B in German, English ♮ B (French and Italian Si) being represented by the letter H The gamut which, whenever instituted, did not pass out of use until the 19th century, regarded the hexachord and not the octachord, employed both letters and syllables, made the former invariable while changing the latter according to key relationship, and acknowledged only the three keys of G, C and F (*See*, also, under MUSICAL NOTATION)

GANDA, a Bantu tribe of East Equatorial Africa The Hamitic invaders, while remaining the light-skinned aristocracy, have been much more absorbed by the local Bantu who form the

peasantry. Apart from this distinction of skin colour there is not much to distinguish the aristocracy from the peasantry (*bakopi*) in physical appearance, though there is in speech, and class distinction is no longer an ethnic one. Hair is thick and woolly and is kept short, and the Ganda alone among the surrounding Bantu tribes do not mutilate their persons in any way. Bracelets of iron, copper and ivory are worn but otherwise the people are not addicted to personal adornment They cover the whole body from chest to ankles with robes of bark-cloth, the manufacture of which is an important industry They live in large circular huts, divided by many partitions and thatched with unusual care and skill The walls and partitions are covered with a characteristic reed-work, and every home of importance has attached to it a series of neatly-kept courtyards surrounded by high fences of reed-work A number of these residences surrounded by luxuriant gardens go to form a loose settlement, of which the market place is the conspicuous feature The houses of the peasantry are simpler, of smaller dimensions and of ruder structure Broad roads, carried over swamps by solid causeways, radiate from the capital to the villages of chiefs

The Ganda are skilled watermen and maintain a large flotilla of war canoes Their canoes are in remarkable contrast to the dug-outs of most of their neighbours, their keel, false prow and sewn boards suggesting an Indonesian origin Their weapons consist of thrusting spears, a club which is used for war and executions, an oval shield of wickerwork with a central boss of wood or iron Children use bows and arrows They manufacture good pottery and artistic mats, and have a variety of musical instruments including the xylophone, flutes, harps, horns and drums The drums of the *kabaka* are a tribal property and each is individually named, special drummers being detailed by chiefs for monthly duty

Though they keep the usual domestic animals (their cattle being mostly of the short-horned, humped variety), they are essentially agriculturalists, the banana and sweet potato being the staple crop though a few cereals are also raised. All land except the clan burial grounds is the property of the *kabaka*, and individual holdings which are cultivated by a man's wife are granted him by his chief or directly by the king, or *kabaka*

The clans are totemic and exogamous, have each certain social and political functions and are graduated in social status and prestige by various factors which are not constant Certain clans are debarred from presenting a prince as candidate to the throne Clans and their subdivisions have their separate estates (*butaka*) which are the clan burial grounds in charge of clan functionaries called *bataka*, who among other duties have to select the male and female life servants of the *kabaka* Inheritance is patrilineal and the heir is one of the sons of the deceased, who is selected after the funeral by his brothers and sisters Wives are not inherited but live as widows (with considerable licence) in separate huts built for them by the heir. Polygyny is usual, and blood-brotherhood is a widely practised institution

Society is elaborately organized on a feudal system, at the centre of which is the *kabaka* who exercises direct and absolute rule He is assisted by three ministers, the *katikiro* or chief executive, the *mulamuzi* or chief justice and *muwanika* or treasurer, and a variety of lesser officials including his naval and military commanders-in-chief These ministers are also members of the *lukiko* or council, which consists of the chiefs of the 20 *saza* or counties into which the country is divided, together with three notables for each county and six additional men of importance for the kingdom—all nominated by the *kabaka* The functions of the *lukiko* are judicial, administrative and advisory. Each county is in charge of a chief appointed by the *kabaka* who assigns him estates on appointment, but neither these nor the chieftainship are hereditable and are held solely at the *kabaka's* pleasure. The counties are subdivided into approximately ten districts each called *gombolola* under district chiefs subordinate to the county chiefs, and these district chiefs have a varying number of petty headmen or *miruka* under them The peasants are tenants-at-will of the landholders, to whom they owe allegiance and service, including the maintenance of roads, personal labour, taxes and military obligations. Through all the hierarchy of chieftainship the same state and similar functionaries are maintained as at the royal court, and judicial procedure prescribes that with certain exceptions trials shall start at the lowest court and reach the *lukiko* by a series of appeals or commitments. The *kabaka's* mother has a very important position in the constitution.

Their religion combines ancestor worship with the worship of a number of natural phenomena, such as *Kiwanuka* the lightning, *Musisi* the earthquake *Kazoba* the firmament was the nearest approach to a high god, but such a conception is probably subsequent to Mohammedan and Christian influence and is not earlier than the comparatively modern deity *Katonda* There is a caste of priests and diviners called *Bamandwa,* and virgins were dedicated as brides to the nature deities

See E. Hornell, "Indonesian Culture in East Africa" (in *Man*, i, 1928), Sir H. H Johnston, *The Uganda Protectorate* (1902), J. Roscoe, *The Baganda* (1911). (J H. D)

GANDAK, a river of northern India It rises in the Nepal Himalayas, flows south-west until it reaches British territory, where it forms the boundary between the United Provinces and Bengal for a considerable distance and falls into the Ganges opposite Patna. A snow-fed stream, its floods endanger the surrounding plains, lying at a lower level than its banks; it is accordingly embanked

The LITTLE GANDAK rises in the Nepal hills, enters Gorakhpur district about 8 m west of the Gandak, and joins the Gogra just within the Saran district of Bengal

The BURHI (or old) GANDAK also rises in the Nepal hills, and runs roughly parallel to and east of the Gandak, of which it represents an old channel, passing Muzaffarpur, and joining the Ganges nearly opposite to Moughjr Its principal tributary is the Baghmati, which rises in the hills north of Kathmandu, flows southward through Tirhut, and joins the Burhi Gandak close to Rusera.

GANDAMAK: *see* AFGHANISTAN.

GANDERSHEIM, a town of Germany in the republic of Brunswick, in the deep valley of the Gande, 48 m S W of Brunswick Pop. (1925) 2,763 The convent church (*Stiftskirche*) contains the tombs of famous abbesses, and the famous abbey (now occupied by provincial government offices) dates from the 11th century. There are manufactures of linen, cigars, aluminium and wire.

The abbey of Gandersheim was founded by Duke Ludolf of Saxony in 856 His own daughter Hathumoda was the first abbess and under her successor, Louis III granted a privilege, by which the office of abbess was to continue in the ducal family of Saxony as long as any member was found competent and willing to accept the same. Otto III gave the abbey a market, a right of toll and a mint. The abbey was ultimately recognized as holding directly of the Empire, and the abbess had a vote in the imperial diet The conventual estates were of great extent, and the elector of Hanover and the king of Prussia were among its feudatories Protestantism was introduced in 1568 and the last Roman Catholic abbess died in 1589; but Protestant abbesses were appointed to the foundation, and continued to enjoy their imperial privileges till 1803, when Gandersheim was incorporated with Brunswick Gandersheim is famous for its literary memorials; Hroswitha, the famous Latin poet, was a member of the sisterhood in the 9th century; and the rhyming chronicle of Eberhard of Gandersheim is in all probability the earliest historical work in Low German.

GANDHARVA, (1) in Vedic Hindu mythology a celestial spirit of the highest sky, though in the *Avesta* he was a dragon-like monster, *Gandarewa,* dwelling in the sea, the abode of the white Haoma (*see* SOMA). But he was soon multiplied into a class of minor deities with various collective functions Gandharva's union with the Apsaras (*q.v.*) typifies marriage, and they are parents of the first men (*see* YAMA). He is also a herbalist Later, the Gandharvas preside over battles; the most popular being Tumburu, the "tambour" who leads them to watch those of men. They have their own breed of horses, their own land, located on both sides of the Indus, suggesting Gandhara, while Takshila and Pushkalavata were in Gandharva-desa and Gandhāra-desa respectively. But Gandharva-nagara,—"town" is some-

times spoken of as a real city or as only a mirage. (2) In Hindu law a *gandharva* marriage is informal, based on mutual consent.

See A. A. Macdonell, *Vedic Mythology*, and E. W. Hopkins, *Epic Mythology*, Strasbourg, 1897 and 1915.

GANDHI, MOHANDAS KARAMCHAND (1869–), Hindu nationalist leader, was born at Porbandar (Kathiawar, India) of a Bania family with official traditions. At the age of 19 he went to London, studied for a time at University college, and was called to the bar by the Inner Temple Soon after starting practice in the Bombay High Court he was called, in 1893, on professional business, to South Africa, where he threw himself at once into a long and bitter struggle for the liberties of the Indian settlers in that country. He became leader of the opposition to a variety of measures taken by the local authorities to discourage Asiatic immigration and to limit the rights of citizenship available to Asiatics already resident

It was in the course of this movement that his conception of resistance without violence developed, he relinquished his large income as an advocate, and founded a colony for his compatriots on Tolstoian lines near Durban As the price he paid for his championship of the Indians' grievances, besides being more than once arrested and imprisoned he suffered frequent indignities at the hands of opponents This neither checked his energies nor deterred him from rendering service of marked loyalty to the Government on three occasions, for he raised and commanded a Red Cross unit in the Boer War, he organized a plague hospital when the epidemic broke out in Johannesburg, and he led a stretcher-bearer party in the suppression of the Natal revolt of 1908. At last in 1914 a commission of inquiry into the Indian discontent recommended the removal of several of the worst injustices against which Gandhi had striven, and he felt justified in closing down his activities in South Africa and returning to India. There a wider field of political protest awaited him, and he was soon at work organizing, in connection with the home-rule movement, resistance to the British Government by "soul force" and non-cooperation

In Jan 1919 there were published two bills (subsequently known as the Rowlatt Acts) giving the Government emergency powers for dealing with revolutionary crimes and conspiracies, these had followed the proposals of a responsible commission which had investigated the subject, and the powers they conferred were safeguarded by elaborate protections against abuse But Gandhi declared them to be an insult, intended to discredit the Indian people on the eve of ostensible political reforms, and he denounced the bills as instruments of oppression He instituted a campaign of Satyagraha (literally, insistence on truth) or non-violent disobedience to unjust laws in the first instance, enlarging if necessary into disobedience to any law and complete non-cooperation with the Government Spreading rapidly, the agitation burst into violence in the Punjab and elsewhere, with results which shocked Gandhi into a temporary suspension of his civil disobedience Later in the year, he formed common cause with the Indian Mohammedans of the Khilafat party, aggrieved by the terms of peace which Great Britain was offering to Turkey, and in July 1920 he proclaimed a general campaign of "non-violent non-cooperation" Its points were the boycott of Government service, of the new legislatures and of the courts of law; the surrender of all public offices, and the withdrawal of children from Government schools, to which were subsequently added boycott of foreign goods and the adoption of the spinning-wheel as an emblem of economic independence

The agitation spread rapidly The unlettered people who saw his earnestness and asceticism, and heard his simple eloquence, regarded him as a saint, and invested him with the title of Mahatma, or Great Soul By 1921 Gandhi was at the zenith of his power. The National Congress, sitting at Christmas of that year, delegated its full authority to him, and empowered him to appoint his own successor But signs of change were now appearing The unrest into which the non-cooperation movement had plunged the country culminated in a series of grave outrages, some of a racial character, of which the Moplah outbreak was the worst, and others directed against the agencies of law and order. Gandhi met them by personal penances, and by repeated postponements of the date on which he had foretold that India would be liberated from British rule But he had generated forces which he had no power to recall or control, and plain people were getting alarmed at the consequences Muslim support was being deflected from him by the encouragement which Lord Reading's Government was giving to Islamic sentiment over Turkey, and his closest adherents were embarrassed by his frequent changes of policy. Consequently, when he was arrested in March 1922 and put on trial for conspiring to spread disaffection with a view to overthrowing the government of the country, the *coup* evoked little excitement Gandhi pleaded guilty, accepted responsibility for all that had happened and invited "the highest penalty that can be inflicted upon me for what in law is a deliberate crime and what appears to me to be the highest duty of a citizen"

Condemned to six years' simple imprisonment, he was released in Jan. 1924 after an operation in gaol for appendicitis, and the rest of his sentence was unconditionally remitted He came back to a party which had chosen other leaders, and was soon to reverse his policy of boycotting the administration Esteemed and consulted though he continued to be by his old followers, he was no longer a power to sway the masses, at the end of 1925 he announced his intentions of retiring from the world for a year; and his more recent incursions into politics have been ineffective The nationalist movement was switched on to lines more familiar to western constitutional usage To the Oriental mind Gandhi symbolised self-sacrifice and high idealism, western enthusiasts were not wanting who, like M Romain Rolland, compared him with the Founder of Christianity; and the transparency of his character commanded the personal liking of even strong opponents But he expected too much of human nature, he played recklessly with inflammable material, his economic nostrums were unpractical and he gave way to unexpected bursts of intolerance, as when he described the British government of India as "satanic" His endeavour to unite Hindus and Mohammedans lacked sincerity, but his enduring legacy to Indian politics will be the part he has taken in consolidating Hindu nationalism

See Romain Rolland, *Mahatma Gandhi* (Paris, 1924); Eng trans. by C D. Groth, 1924. (ME)

GANDÍA, a seaport of eastern Spain in the province of Valencia, on the Gandía-Alcóy and Alcira-Denia railways Pop (1920) 12,676 The town is on the left bank of the Alcóy or Sérpis, which drains a rich and densely populated plain The river enters the Mediterranean at the small harbour of Gandía (El Grao), 3 m N E Among the ancient buildings are the Gothic church, the college founded by the director-general of the Jesuits (1510–1572), and the palace of the dukes of Gandía The town manufactures leather, silk, velvet and ribbons, and exports fruit and imports coal, timber and flour

GANDO, an emirate of British West Africa, in the N W part of the protectorate of Nigeria, and west of the Niger river The state was established, *c* 1819, on the death of Othman Dan Fodio, the founder of the Fula empire, and its area and importance varied considerably during the 19th century, several of the Fula emirates being regarded as tributaries, while Gando itself was more or less dependent on Sokoto Gando in the middle of the century included both banks of the Niger at least as far north-west as Say The districts outside the British protectorate now belong to France Treaty relations with the British were entered into in 1884 and in 1903 the part assigned to the British sphere by agreement with France came definitely under the control of the administration in Nigeria. Gando is now included in the province of Sokoto The chief town is Gando, situated on the Sokoto, the first considerable affluent of the Niger from the east, about 60 m S W of the town of Sokoto

GANESHA or **GANESH,** in the post-Epic Hindu mythology, eldest son of Siva and Parvati His name means leader of (Siva's) attendants, he is a creator of obstacles and as such came to be placated for their removal. Depicted with an elephant's head, to symbolize his sagacity, he is the god of worldly wisdom, and is invoked on the first page of every book, especially in ledgers, as he bestows prosperity in trade He is worshipped all over

India, especially in the south, and is affected by six sects, under his six titles, Mahā-Ganapati, etc These hold him, not Siva, to be the real first cause and the Hairamba Ganapatiyas are taxed with unedifying rites.

See Hastings, *E.R E.*, vi., Edinburgh, 1913, *s.v.* GANAPATIYAS.

GANESH DATTA SHASTRI, SHRI JAGADGURU. (1861–), Indian philosopher, was born on July 12, 1861 He was educated at the Oriental college, Lahore, and Punjab university, and in 1882 became a teacher He held professorships of Sanskrit at Forman Christian college (1886–1907), Government college and Oriental college (1908–17) In 1917 he was appointed senior professor of Sanskrit and theology at Sanstan Dharam college, Lahore In 1926 he was invested by the Government of India with the highest Sanskrit title of *Mahāmahopādhyāya;* he is the first Punjabi on whom this title has been conferred.

His publications include Sanskrit-Hindi and Sanskrit-English-Hindi dictionaries, *Shastriyasiddhanta* (1909), *First Book of Hindi Language; Bhagavadgita* (the Song Divine, 1926), various manuals on religious teaching, and articles on philosophical, religious and social subjects

GANGES (GANGA), a great river of northern India, formed by drainage of the southern Himalayas It rises in the Garhwal state, its lower course focusses the river system of Bengal, and it falls into the Bay of Bengal after a course of 1;500 m It issues, under the name of the Bhagirathi, from an ice cave at the foot of a Himalayan snow-bed near Gangotri, 10,300 ft. above sea-level.

During its passage through the southern spurs of the Himalayas it receives the Jahnavi from the north-west, and subsequently the Alaknanda, after which the united stream takes the name of the Ganges Deo Prayag, their point of junction, is a celebrated place of pilgrimage, as is also Gangotri, the source of the parent stream At Sukhi it pierces through the Himalayas, and turns south-west to Hardwar, also a place of great sanctity It proceeds by a tortuous course through the districts of Dehra Dun, Saharanpur, Muzaffarnagar, Bulandshahr and Farukhabad, in which last district it receives the Ramganga Thus far the Ganges has been little more than a series of broad shoals, long deep pools and rapids, except during the melting of the snows and throughout the rainy season ·At Allahabad, however, it receives the Jumna, a large river, which rises also in the Himalayas farther west The combined river winds east by south-east through the United Provinces, receiving the Gumti and the Gogra at consecrated spots But the tongue of land at Allahabad, where the Jumna and the Ganges join, is the true Prayag, or place of pilgrimage, to which hundreds of thousands of devout Hindus repair to wash away their sins in the sacred river Here the great festival called the Maghmela is held

Shortly after passing the holy city of Benares the Ganges enters Behar, and after receiving the Sone from the south, passes Patna, and is joined by the Gandak, which rises in Nepal Farther east it receives the Kusi, and then, skirting the Rajmahal hills, turns sharply southward, passing near the ruined city of Gaur. The delta begins 220 m in a straight line, or 300 by the windings of the river, from the Bay of Bengal The main channel takes the name of the Padma or Padda, and proceeds in a south-easterly direction, past Pabna to Goalanda, above which it is joined by the Jamuna or main stream of the Brahmaputra The vast confluence receives further additions from the hill country to the east, and forms a broad estuary known as the Meghna, which enters the Bay of Bengal near Noakhali. This estuary, however, is only the largest and most easterly of a great number of mouths or channels The most westerly is the Hooghly, which receives the waters of a number of distributary channels that start from the parent Ganges above Murshidabad Between the Hooghly on the west and the Meghna on the east lies the delta Its northern angle consists of rich and fertile districts, such as Murshidabad, Nadia, Jessore and the 24 Parganas But towards its southern base, resting on the sea, the country sinks into a series of swamps, intercepted by a network of channels This waste is known as the Sundarbans, from the *sundari* tree, which grows in abundance in the seaboard tracts

The most important channel of the Ganges for commerce is the Hooghly (*q.v.*), on which stands Calcutta, about 90 m. from the mouth. Beyond this city the navigation is conducted by native craft Below Calcutta important boat routes through the delta connect the Hooghly with the eastern branches of the river.

The catchment basin of the Ganges is bounded north by a length of about 700 m of the Himalayan range, south by the Vindhya mountains, and east by the ranges which separate Bengal from Burma; area 432,480 sq m The average fall from Allahabad to Benares is 6 in per mile, from Benares to Calcutta, between 4 and 5 in ; from Calcutta to the sea, 1 to 2 in Great changes take place from time to time in the river-bed Extensive islands are thrown up, and attach themselves to the mainland, while the river deserts its old bed and seeks a new channel, it may be many miles off Many decayed or ruined cities attest such changes in ancient times

The Ganges is crossed by six railway bridges on its course as far as Benares; and there is another at Sara in Eastern Bengal

The UPPER GANGES CANAL and the LOWER GANGES CANAL, with headworks at Hardwar, are the two principal systems of perennial irrigation in the United Provinces They include 568 m of main canals, and irrigated 1,316,000 acres in 1920 New headworks have more lately been completed

GANGOTRI, a celebrated place of Hindu pilgrimage, in the Himalayas It is situated in the state of Tehri-Garhwal in the United Provinces, on the Bhagirathi, the chief head-stream of the Ganges, and contains a small temple about 20 ft high, in which are images representing Ganga, Bhagirathi and other figures of mythology The bed of the river adjoining the temple is divided off by the Brahmans into three basins, where the pilgrims bathe One of these portions is dedicated to Brahma, another to Vishnu and the third to Siva The pilgrimage to Gangotri is considered efficacious in washing away sin and ensuring eternal happiness The water taken from this sacred spot is exported by pilgrims to India and sold at a high price The elevation of the temple above the sea is 10,319 ft

GANGPUR, a feudatory State of India, in the province of Bihar and Orissa The country is for the most part an undulating plain, broken by detached ranges of hills The rivers are the Ib and the Brahmani, formed here by the union of the Sankh and the South Koel The State possesses considerable mineral resources A large coalfield also extends into it, deposits of manganese ore were first worked in 1908, and the output in 1921 was a little under 20,000 tons of ore; dolomite and limestone quarries are also worked The State has been opened up by the Bengal-Nagpur railway, which runs through it for about 70 miles Area, 2,492 sq m ; pop (1921) 300,271; estimated revenue, Rs 6,66,000

GANGRENE, a synonym in medicine for mortification (*q v*), or a local death in the animal body due to interruption of the circulation by various causes

GANGSTER, a member of a group or gang operating in the overcrowded sections of any large American community and participating in criminal practice for financial gain Originally the gangster was hardly more than a rowdy—the product of indolence and drink—who started on a career of idleness and petty thievery Joining a gang, he learned the tactics of gang warfare, struggling with fists and stones to help his gang gain supremacy over other rival groups Early in the present century the gangster became the paid agent of the unscrupulous politician of the period, who was quick to recognize his value in carrying out his schemes without incrimination Gang weapons changed during this time to clubs and blackjacks, and the gangster became a recognized element in the lower strata of big city life Drug traffic and later silk and fur stealing became popular outlets for his energies In labour unrest he became a notable factor The employment of gunmen to help foment labour troubles, the hiring of strong-arm men by the employers to protect "scabs" and by the unions to intimidate and maltreat the strike-breakers is a chapter in the history of labour conditions These professional "sluggers" used their dull periods for more peaceful diversions such as picking pockets and snatching purses When pistols came into general use the element of terror in gang methods increased

The argot of gangdom is distinctive A "cold meat party" is a gathering of gangsters to pay tribute to a comrade who has been "rubbed out" (killed). "Packing a rod" is carrying a gun, and electrocution, the fate which is potentially the meed of every gangster, is known as "baking" or "frying." A "gun Moll" is a woman who carries the weapons of a gangster, a "stool pigeon" an agent who is in the paid employ of an influential leader and who acts as his confidential aide in all delicate commissions. His position is particularly dangerous since he is open to overtures from hostile factions and his services can usually be bought by the highest bidder.

See F. H. Allport, *Social Psychology* (Boston, 1924); C. E Merriam, *New Aspects of Politics* (Chicago, 1925), P. H Furfey, *The Gang Age* (1926), F M Thrasher, *The Gang* (1927); and H. Asbury, *The Gangs of New York* (1928).

GANILH, CHARLES (1758–1836), French economist and financial writer, was born at Allanche (Cantal) on Jan 6, 1758. He was educated for the profession of law and practised as *avocat* During the revolutionary period he played an active part in public affairs, for which he suffered imprisonment, and under Napoleon he held several public offices He died in 1836 Ganilh is best known as the defender of the mercantile school in opposition to the views of Adam Smith and the English economists He wrote *Essai politique sur le revenue des peuples de l'antiquité, du moyen âge,* etc. (1808), *Des systèmes d'économie politique* (1809); *Théorie d'économie politique* (1815); *Dictionnaire analytique de l'économie politique* (1826).

GANIVET, ANGEL (1865–1898), Spanish essayist and novelist, was born at Granada He entered the diplomatic profession and was appointed consul at Antwerp, Helsingfors (where he published in 1896 his first book *Granada la Bella*) and Riga Ganivet shows a brilliant power of evocation in the novels *La Conquista del reino de Maya* . (1897) and *Los Trabajos del infatigable creador Pio Cio* (1898). His best work lies, however, in the field of the essay—in the *Idearium español* (1897), where, as in the *Epistolario* (1904), his original and suggestive thought has free play

GANJA, a town in the Azerbaijan A S S R., in 40° 43′ N. and 46° 20′ E., altitude 1,446 ft, on a northern spur of the Armenian plateau above the valley of the Kura river Pop (1926) 55,510, mainly Tatars and Armenians. Its position on the railway has facilitated wine, liquorice and textile manufactures, including wool, cotton and silk Calico mills constructed in 1925 have 66,000 spindles. It is the outlet for the copper mines of Kedabek and the sulphur pyrites of Chigari-dzor. Manganese is found in the district, which has cotton plantations, vineyards (those of the German colony being specially noted), fruit gardens and a silkworm breeding industry. Beekeeping is profitable The town is very old, and changed hands between Persians, Khazars and Arabs even in the seventh century. Later it was captured by Mongols, Persians, Georgians and Turks In 1804 it became Russian and was known as Elisavetpol until the formation of the Azerbaijan S.S R when it resumed its original name In 1826 the Russians under Paskevich defeated a Persian attack on the town. Amidst the ruins of old Ganja, 4 miles distant, is the "Green Mosque" and the beautiful mosque of the Persian Shah Abbas (1620) is in the modern town The Persian poet, Shah Nizam (Nizam-ed-Din), was born here in 1141 and his grave is said to be in the vicinity There is a marked contrast between the newer quarters, and the winding, narrow unhealthy ancient streets, with their low-roofed, windowless huts

GANJAM, district, British India, in the extreme north-east of the Madras Presidency It has an area of 4,798 sq m, largely mountainous and rocky, but interspersed with open valleys and fertile plains, with groves of trees. The mountainous tract known as the Maliyas, or chain of the Eastern Ghats, has an average height of about 2,000 ft. The hilly region, formerly the agency of Ganjam, is now included with the agencies of Vizagapatam and Godavari in one administrative division The chief rivers are the Rushikulya, the Vamsadhara and the Languliya Sea and river fisheries occupy many people The hilly region abounds in forests

Ganjam formed part of the ancient kingdom of Kalinga. The inaccessible country long kept the rising Mohammedan power at bay, and it was only a century after the first invasion of Orissa that a Mohammedan governor was sent to govern the Chicacole Circars, including the present district of Ganjam. In 1753 Chicacole and the Northern Circars were made over to the French In 1759 Masulipatam was taken by an English force sent from Bengal, and the French were compelled to abandon Ganjam and their other factories in the north In 1765 the Northern Circars (including Ganjam) were granted to the English by imperial firman, and in August 1768 an English factory was founded at Ganjam, protected by a fort The British found the district difficult to rule at first In 1816 Ganjam was overrun by the Pindaris; and in 1836 occurred the Gumsur campaign, when the British first came into contact with the aboriginal Kondhs, and suppressed their practice of human sacrifice

In 1921 the pop of the district was 1,835,562 It suffered severely from famine in 1919, and also from cyclones on two occasions The principal crops are rice, other food grains, pulse and oil seeds; 46% of the cultivated land is under irrigation and fish is caught and cured Salt is evaporated, as a government monopoly, along the coast Sugar is refined at Aska A considerable trade is conducted at the ports of Gopalpur and Calingapatam, which are only open roadsteads The district is traversed throughout by the East Coast railway (Bengal-Nagpur system) The headquarters station is Berhampur, the town of Ganjam occupied this position till 1815, when it was found unhealthy, and its importance declined

GANNET, or SOLAN GOOSE, *Sula bassana,* a large sea-bird. It breeds in enormous numbers in certain stations in the north Atlantic (of which the Bass Rock in the Firth of Forth, and Bird Rock in the Gulf of St Lawrence, are the most famous), arriving about the end of March and leaving again in the autumn During the non-breeding season it ranges over the whole of the north Atlantic

The plumage in both sexes is white, with the outer edge of the wing black and some bare patches of dark blue skin round the eye The young are clad in brown, white-tipped feathers. The nest is a shallow depression, usually in a mass of grass and seaweed The single egg is white, and the young are hatched blind and naked Striking mutual courtship ceremonies are performed The gannet feeds on fish, which it obtains by plunging into the water with closed wings, often from a considerable height Fishermen tow a board with a herring painted on it below the surface of the water; the bird dives, strikes the board and breaks its neck

The most remarkable structural features of the gannet are the closed nostrils, the aborted tongue and the system of subcutaneous air-spaces, which communicate with the lungs, and can be filled or emptied at will. These latter probably break the force of its plunge

In the southern hemisphere are two smaller forms, *S capensis* of South Africa and *S serrator* of Australia, while the tropical boobies, comprising four species, also belong here. One, *S variegata,* from Peru, retains its spotted plumage throughout life and is one of the guano birds

To the same genus belong the boobies, including the booby gannet (*S leucogastra*) of tropical and subtropical seas throughout the world, and Brewster's booby (*S brewsteri*) on the Pacific coast of North America

GANODONTA or **TAENIODONTA,** an extinct group of clawed mammals of the North American Eocene They include two families, the Stylinodontidae, which resemble the sloths in certain characters of teeth, skull and feet, and the Conoryctidae, with a less distinct resemblance to the armadillos In *Stylinodon* of the later Eocene the teeth are high-crowned, rootless, columnar oval prisms like those of the sloths, but retain an enamel covering, the skull is short-faced, deep-jawed, small-brained, limbs short and stout, pelvis deep, tail massive, fore foot of digging type with large compressed claws The Conoryctidae of the Paleocene are more primitive, with unreduced tritubercular teeth and related in skull and skeleton to primitive Insectivora The affinities of

the group are uncertain It is regarded by Osborn and Matthew as a side-branch from primitive edentate stock paralleling the ground-sloths.

GANOID, a name applied to fishes with rhombic bony scales covered on the outer surface with a layer of ganoine, a vitreous substance. It is now known that ganoid scales differ considerably in structure, and that the ganoids are not a natural group. Most fishes with ganoid scales are extinct, but the gar-pikes (*Lepidosteus*) survive in the fresh-waters of North America, and the *Polypteridae* in the rivers of Africa. (*See* FISH.)

GANS, EDUARD (1797–1839), German jurist, was born at Berlin on March 22, 1797, of Jewish parents. He studied law first at Berlin, then at Gottingen, and finally at Heidelberg, where he attended Hegel's lectures, and became thoroughly imbued with the principles of the Hegelian philosophy. In 1826 he was appointed professor in the Berlin faculty of law. His great work is *Erbrecht in weltgeschichtlicher Entwicklung* (1824, 1825, 1829 and 1835) The liberality of his views, especially on political matters, drew upon Gans the displeasure of the Prussian Government, and his course of lectures on the history of the last 50 years (published as *Vorlesungen uber d Geschichte d letzten funfzig Jahre,* Leipzig, 1833–34) was prohibited He died at Berlin on May 5, 1839

GANSBACHER, JOHANN BAPTIST (1778–1844), Austrian composer, was born in 1778 at Sterzing in Tirol He was a pupil of the celebrated Abbé Vogler and later during his second stay with Vogler, then (1810) living at Darmstadt, formed a close friendship with Weber and Meyerbeer His own numerous compositions have been long since forgotten

GANYMEDE, son of Tros (or Laomedon), king of Troy. Because of his surpassing beauty (his name, if Greek at all, may mean "glad in brightness"), he was carried off by the gods, or Zeus, or, according to a later myth, the eagle of Zeus or the god himself in eagle shape, to serve as cup-bearer (Homer, *Iliad,* v. 265, xx 232, Horace, *Odes,* iv 4 1; Ovid, *Met,* x 155) In compensation, Zeus gave his father a stud of immortal horses (or a golden vine, Lesches, *Ilias parva,* frag 6) From fairly early times (Theognis, 1,345 6th century B C), and perhaps especially among Dorians (a Cretan variant makes Minos the ravisher, Athenaeus 601 E, *cf* Plato, *Laws,* 636 C), his kidnapper was supposed to have a homosexual passion for him, hence the connotation which Catamitus, the popular Latin form of his name, had and has As divine cup-bearer, he was apparently credited with making the Nile rise (Pindar, frag 282, von Christ), and was later identified with the constellation Aquarius (pseudo-Eratosthenes, *catast,* 26)

See especially Weizsacker-Drexler in Roscher's *Lexikon, s v*

GAO, a town of French West Africa, the chief town of a circle, in the colony in the French Sudan, on the left bank of the Niger, 400 m by river below Timbuktu Pop about 5,000. The present town dates from the French occupation in 1900, of the ancient city there are scanty ruins, the chief being a truncated pyramid, the remains of the tomb (16th century) of Mohammed Askia, the Songhoi conqueror, and those of the great mosque The city of which the French settlement is the successor was founded by the Songhoi, probably in the 7th or 8th century, and became the capital of their empire. In the 14th century Gao was conquered by the king of Melle, and its great mosque was built (*c.* 1325) by the Melle sovereign Kunkur Musa on his return from a pilgrimage to Mecca.

In the 15th century the Songhoi regained power and Gao attained its greatest prosperity in the reign of Askia. It did not enjoy the commercial importance of Jenné nor the intellectual supremacy of Timbuktu, but was the political centre of the western Sudan for a long period. On the break up of the Songhoi power the city declined in importance. It became subject in 1590 to the *Ruma* of Timbuktu, from whom it was wrested in 1770 by the Tuareg, the last named surrendering possession to the French. The first European to reach Gao was Mungo Park (1805); he was followed in 1851 by Heinrich Barth, and in 1896 by the French naval lieutenant Hourst. A caravan route leads from Gao to Kano and Bornu From Gao upwards the Niger is navigable for over 1,000 miles.

See F. Dubois "La région de Gao" (*L'Afrique françaises* [1909]).

GAOL or **JAIL,** a prison (*q.v*). The two forms of the word are due to the parallel dual forms in Old Central and Norman French respectively, *jaiole* or *jaole,* and *gaiole* or *gayolle.* The form "gaol" still commonly survives in English, and is in official usage, *e g.,* "gaol-delivery," but the common pronunciation of both words, "jail," shows that this word has survived.

GAŌN (plur *Geōnim*) The transition from ancient to mediaeval Judaism was accomplished by four successive groups of rabbis (of whom the *Geōnim* were the last), whose teaching safeguarded tradition and whose advice or decisions were often invoked far beyond the limits of their schools or communities With the end of the *Geōnim* centralized authority in Judaism passed away and gave place to congregationalism. The age of codification succeeded and the general acceptance of codes prevented local autonomy from drifting into sectarianism. The invention of printing finally stereotyped the last code (Joseph Caro's *Shulhan 'Arūkh, q.v*) and retarded development. The four groups were:—

I. The *Tannā'im* (sing *Tannā,* or teacher, from Aramaic *Tenā,* he taught; the root corresponds to the Hebrew *Shanah,* hence *Mishnah*) were the scholars whose teaching is recorded in the *Mishnah* (*see* TALMUD). The last *tannā'im* belong to three generations (*a*) AD 70–100 Representative name, Johanan ben Zakkai who, leaving the beleaguered Jerusalem, founded a school at Jamnia in Judaea and saved Judaism from perishing with the Temple (*b*) 100–130 Representative name 'Aqiba (*q v*) who died a martyr in the fight for freedom against Hadrian (*c*) 130–160. Representative name, Judah the Prince, compiler of the *Mishnah* The schools moved to Galilee (Usha, Sepphoris)

II *'Amorā'im,* lit speaker, the spokesman of a *Tannā,* who repeated his discourses But after the *Mishnah* was compiled the *'Amora* became an independent teacher The age of the *'Amorā'im* lasted from the 2nd to the 5th centuries and their work was the *Gemara* In 350 the Palestinian schools decayed and were succeeded by the Babylonian schools at Nehardea, Sura and Pumbeditha Representative names, Rab (or Abba Arika, 175–247), Samuel (180–257) who arranged the calendar, and Ashi (352–427) who, with Rabina (d 499), may be said to have compiled the Talmud

III. The *Saboraim* (properly *Sebhōrā'ē,* plu of *Sābhōrā,* a reasoner) during the 6th century effected slight supplementary work. It was an era of persecution and creative thought was hampered. The Gaōn Sherira enumerates 12 *Saboraim.*

IV The *Geōnim* (*Gaōn*=Excellency, probably for *Geōn Ya'aqōbh,* Ps xlvii. 5) from the end of the 6th to the 11th centuries effected the transference of the centre of Judaism from Asia to Europe The Gaōnate was civilly subject to the Exilarch but throughout the *diaspora* enjoyed a wide authority Their *Responsa* are of great importance and they standardized the liturgy. Among the great *Geōnim* may be mentioned Sherira (ben Hanina of Pumbeditha, d 1000), author of the famous circular letter addressed to Jacob ben Nissim of Kairowan in which the history of the Talmudic and Gaonate periods is set forth; Amram (ben Sheshna, of Sura, d 875), the first authority to arrange a complete domestic and synagogal liturgy, and Ṣa'adia (*q v*) of Sura (892–942) who fought Karaism (*see* KARAITES), translated the scriptures into Arabic, compiled a dictionary and was a master of philosophy The last *Geōnim* of Sura and Pumbeditha were Samuel ben Ḥofni (d 1034) and Hai (d 1038) respectively.

BIBLIOGRAPHY—*See* the relevant articles in *Jew. Encycl.* and Hastings, *Encycl Rel and Eth* (where lists of Tannā'im and Geōnim are given). J Mann's *Jews in Egypt and Palestine* (Oxford, 1922) is a mine of information about details of the Gaonate. For general readers the histories of H Graetz (Philadelphia, 1891), of Margolis and Marx (*ib.* 1927) and I. Abrahams (*Short Hist of Jew Lit,* 1906), will be found useful. Benjamin of Tudela, who travelled in 1165, speaks of the Gaonate (Eng. trans. by M. Adler, *see* pp. 39 *sqq.* Lond., 1907).

GAP, the capital of an arrondissement in the French department of Hautes Alpes, 122 m. by rail from Marseilles Pop (1926) 7,024. It is the *Vapincum* of the Romans founded by Augustus about 14 B C In 1232 most of the region passed from

Provence by marriage to the dauphins of Viennois. The town itself, however, remained under the rule of the bishops until 1512, when it was annexed to the crown of France The town was sacked by the Huguenots in 1567 and 1577, and by the duke of Savoy in 1692 It was the birthplace of the reformer Guillaume Farel (1489–1565), who first preached his doctrines there about 1561–62.

Gap is built at a height of 2,418 ft on the right bank of the Luye (an affluent of the Durance). The 17th century cathedral has been entirely reconstructed (1866–1905) The prefecture contains scientific and archaeological collections, as well as the archives, which include many mss from the monastery of Durbon, etc. The episcopal see of Gap, now in the ecclesiastical province of Aix-en-Provence, is first mentioned in the 6th century, and in 1791 was enlarged by the annexation of that of Embrun

GAPAN, a municipality (with 8 *barrios* or districts) of the province of Nueva Ecija, Luzon, Philippine Islands, almost directly south of Cabanatuan, the capital Pop. (1918) 13,617 It is situated in a rich rice-growing region, and extensive forests in the vicinity contain fine hardwoods It is one of the chief commercial municipalities of the province In 1918 it had three rice mills with an output valued at 1,888,400 pesos Its six schools were all public Tagalog and Pampanga are the chief languages spoken

GAPON, GEORGII (1870–1906), Russian priest and revolutionary known as "Father Gapon," of Jewish origin, but became an orthodox priest. At one time he was an agent of the secret police, and was associated with the notorious Zubatov in Moscow. He then became Zubatov's agent in St Petersburg (Leningrad) to organize a workers' movement under police supervision, the movement soon got beyond the power of the police and came under socialist leaders Gapon led the unarmed crowd to present a petition to the tsar at the Winter palace (Jan 22), when the soldiers fired on the crowd Gapon vanished, but he was tracked by the revolutionaries and murdered, at Terioki, Finland, on April 11, 1906

GARANA: *see* GUARANA

GARARISH, a semi-nomadic tribe of Semitic origin, on the right bank of the Nile from Wādi Halfa to Merawi Many are agriculturists; they claim kinship with the Ababda, but are more Arab than Beja

GARASHANIN, ILIYA (1812–1874), Serbian statesman, was born on Jan. 28, 1812, at Garasha (Kragujewac) In 1836 Prince Milosh appointed him a colonel and commander of the then just organized regular army of Serbia In 1842 he was called to the position of assistant to the home minister, and from that time until his retirement from public life in 1867 he was repeatedly minister of home affairs. He rendered great services to his country as minister for foreign affairs He sought to replace the Russian protectorate over Serbia by the joint protectorate of all the great powers of Europe In 1853 he opposed co-operation with Russia against Turkey and the western powers His anti-Russian views led Prince Menshikov, while on his mission in Constantinople, 1853, peremptorily to demand his dismissal. Nevertheless his personal influence in the country secured the neutrality of Serbia during the Crimean War It was due to Garashanin that France proposed to the peace conference of Paris (1856) that the old constitution, granted to Serbia by Turkey as suzerain and Russia as protector in 1839, should be replaced by a more modern and liberal constitution, framed by a European international commission But the agreement of the powers was not secured Garashanin induced Prince Alexander Karageorgevich to convoke a national assembly, which had not been called to meet for ten years. The assembly was convoked for St. Andrew's Day 1858, but its first act was to dethrone Prince Alexander and to recall the old prince Milosh Obrenovich

When after the death of his father Milosh (in 1860) Prince Michael ascended the throne, he entrusted the premiership and foreign affairs to Iliya Garashanin The result of their policy was that Serbia was given a new, although somewhat conservative, constitution, and that she obtained, without war, the evacuation of all the fortresses garrisoned by the Turkish troops on the Serbian territory, including the fortress of Belgrade (1867). Garashanin was preparing a general rising of the Balkan nations against the Turkish rule, and had entered into confidential arrangements with the Rumanians, Bosnians, Albanians, Bulgarians and Greeks, and more especially with Montenegro. But the execution of his plans was frustrated by his sudden resignation (at the end of 1867), and by the assassination of Prince Michael a few months later (June 10, 1868). Although he was a Conservative in politics, and as such often in conflict with the leader of the Liberal movement, Yovan Ristich, he certainly was one of the ablest statesmen whom Serbia had in the 19th century

His son, NILUTIN GARASHANIN (1843–1898), entered parliament in 1874 He was minister of the interior (1880–83), and prime minister (1884–87) In 1894 he became ambassador in Paris, where he died on March 7, 1898

GARAT, DOMINIQUE JOSEPH (1749–1833), French writer and politician, was born at Bayonne on Sept. 8, 1749. After practising as an advocate at Bordeaux, he came to Paris, and became a contributor to the *Encyclopédie méthodique* and the *Mercure de France.* He gained a reputation by an *éloge* on Michel de L'Hôpital in 1778, and was three times crowned by the Academy for *éloges* on Suger, Montausier and Fontenelle In 1785 he became professor at the *Lycée* When deputy to the states-general in 1789, he served the popular cause by his narrative of the proceedings of the Assembly contributed to the *Journal de Paris* He played an undignified part in politics, and became a tool in the hands of others Danton made him minister of justice on Oct 9, 1792, and entrusted to him what he called the *commission affreuse* of communicating to Louis XVI his sentence of death In 1793 Garat became minister of the interior. Though himself uncorrupt, he acquiesced in corruption in his subordinates At last, disgusted with the excesses which he was unable to control, he resigned (Aug 15, 1793). On Oct. 2 he was arrested for Girondist sympathies but soon released He escaped further molestation owing to the friendship of Robespierre, whose literary *amour-propre* he had flattered On the 9th Thermidor, however, he took sides against Robespierre, and on Sept 12, 1794 he was named by the Convention as a member of the executive committee of public instruction In 1798 he was appointed ambassador to Naples, and in 1799 became a member, then president, of the Council of the Ancients After the revolution of the 18th Brumaire he was chosen a senator by Napoleon and created a count During the Hundred Days he was a member of the chamber of representatives He was a member of the Institute of France from 1803 until the restoration of Louis XVIII He died at Ustaritz near Bayonne on April 25, 1833 His elder brother Dominique (1735–1799) was also a deputy to the states-general

The works of Garat include, besides those already mentioned, *Considérations sur la Révolution Française* (1792), *Memoires sur la Révolution, ou exposé de ma conduite* (1795), *Mémoires sur la vie de M Suard, sur ses écrits, et sur le XVIIIe siècle* (1820) For the history of Garat's tenure of the ministry, *see* police reports of Dutard, in W. A Schmidt's *Tableaux de la Révolution Française* (3 vols, Leipzig, 1867–70)

GARAT, PIERRE-JEAN (1764–1823), French singer, nephew of Dominique Joseph Garat, was born in Bordeaux on April 25, 1764. Gifted with a voice of exceptional timbre and compass he was the favourite singer of Marie Antoinette, to whom he gave lessons At the beginning of the Revolution he accompanied Rode to England, where the two musicians appeared together in concerts He returned to Paris in 1794 but fell under suspicion, was imprisoned for a short time, and then left Paris for Hamburg He gained a great reputation in all the capitals of Europe, and retained his voice for a long period He was a keen partisan of Gluck in opposition to Handel On the institution of the Paris Conservatoire he became its first professor of singing, and had many famous pupils

See Bernard Miall, *Pierre Garat* (1913).

GARAY, JANOS (1812–1853), Hungarian poet and author, was born on Oct 10, 1812, at Szegszárd In 1834 he brought out at Pest an heroic poem, in hexameters, under the title *Csatár.* After this he issued in quick succession various historical dramas, among which the most successful were *Arbócz, Országh Ilona* and

Báthori Erzsébet—the first two published at Pest in 1837 and the last in 1840. Garay removed in 1838 to Pressburg, where he edited the political journal *Hirnök* (Herald). He returned to Pest in 1839, and in 1842 was admitted into the Kisfaludy Society, of which he became second secretary. He published a collection of his poems (1843); *Tollrajzok* (Sketches with the Pen, 1845); *Arpádok* (1847), a collection of ballads; *Balatoni Kagylók* (Shells from the Balaton Lake) (1848), lyrics; *Frangepán Kristófné* (Christopher Frangepan's Wife) (1846), a poetical romance; and, his last and most famous work, an historical poem in 12 cantos, with the title *Szent László* (Saint Ladislaus) (Eger, 1852) Garay was professor of Hungarian language and literature to the University of Pest in 1848–49. After about four years' illness he died on Nov 5, 1853, in great want

A collective edition of his poems was published at Pest the year after his death by F Ney (2nd ed 1860), and several of his poems were translated by Kertbeny. See *Garay János Összes kolteményei* (2nd ed., Pest, 1860); and *Dichtungen von Johann Garay* (2nd ed, Vienna, 1856).

GARBLE, originally a mediaeval commercial term in the Mediterranean ports, meaning to sort out, or to sift merchandise, such as spices, etc, in order to separate what was good from the refuse, hence to select the best of anything Similarly a "garbler" was an official appointed to sort out, or test the work of those who had sorted, the spices or drugs offered for sale in the London markets. In this sense the word is obsolete, but by inversion, or rather perversion, "garble" now means to sort out or select, chiefly from books or other literary works, or from public speeches, some portion which twists, mutilates or renders ineffective the meaning of the author or speaker

GARBORG, ARNE EVENSEN (1851–1924), Norwegian writer, was born on Jan. 25, 1851, at Thime He joined the movement for the creation of a Norwegian literary language based on the *landsmaal* or peasant dialect derived from old Norsk, in place of the Dano-Norwegian literary medium He wrote a series of novels deeply penetrated by religious feeling. In 1895 he wrote a cycle of lyric poems in the *landsmaal, Haugtussa* (1895), which describe a young girl's belief in the supernatural. He also translated the *Odyssey* (1918) and a selection from the *Mahabharata* (1921), and, for representation at the *landsmaal* theatre, which he and his wife had founded, Holberg's classical comedy, *Jeppe paa Berget* (1921). His collected works, *Skrifter i samling,* began to appear in 1908 Garborg died on Jan 14, 1924, at Asker

See Erik Lie, *Arne Garborg* (1914).

GARÇÃO, PEDRO ANTONIO JOAQUIM CORREA: *see* CORREA GARÇÃO, PEDRO ANTONIO JOAQUIM.

GARCIA (DEL POPOLO VICENTO), MANOEL (1775–1832), Spanish tenor singer and composer, was born in Seville on Jan. 22, 1775. At 17 he made his début on the stage at Cadiz, in an operetta which included songs of his own composition He had already a considerable reputation as a composer of light operas and as an operatic singer when he appeared in Paris in 1808, in Paer's opera *Griselda* At Naples later he created some famous rôles in Rossini's operas, and sang them until 1816 when he visited London and Paris. Between 1819 and 1823 he lived in Paris, singing in *Il Barbière, Otello, Don Giovanni,* etc, and producing some operas of his own—he wrote about 100 in all—of which *La Morte di Tasso* was the most important. But his greatest work was done as a teacher of singing in London and Paris. Of his principles and method he left an account in his *Metado di Canto,* the substance of which was subsequently incorporated by his son Manoel in his admirable *Traité complet de l'art du chant* (1847) He died in Paris on June 2, 1832.

His son, Manoel Garcia (1805–1906), who celebrated his hundredth birthday in London on March 17, 1905, was born at Madrid, and as a teacher became no less famous than his father. He was a professor at the Paris Conservatoire (1830–48), at the Royal Academy of Music, London (1848–95), and will be remembered, it is safe to say, so long as the art of singing is studied, as the inventor of the laryngoscope.

See M. Sterling Mackinlay, *Garcia the Centenarian and his Times* (London, 1908).

GARCÍA DE LA HUERTA, VICENTE ANTONIO (1734–1787), Spanish dramatist, published an unsatisfactory collection of Spanish plays entitled *Teatro Español* (1785–86), and various dramas, of which only *Raquel* now survives.

GARCÍA DE PAREDES, DIEGO (1466–1534), Spanish soldier and duellist, born at Trujillo, Estremadara. He served in his youth in the war of Granada; after killing a relative, Ruy Sanchez de Vargas, in a street fight, he fled to Rome, where he took service as a soldier of Pope Alexander VI., then in conflict with the barons of the Romagna A personal quarrel resulting in a murder obliged him to pass over to the enemy By his daring and strength he won the admiration and trust of the Colonnas, as also of Gonzalo de Córdoba He took part in the wars between Ferdinand V of Aragon and Louis XII on the frontier of Navarre, and once against the Turks on the Danube till 1530 His countrymen, crediting him with feats of fabulous strength, made him the hero of many Münchausen-like stories of personal prowess He was killed at a jumping-match at Bologna in 1534; his body was carried to Trujillo and there buried in the church of Santa Maria Mayor in 1545

GARD, a department in the south of France, part of the old province of Languedoc Pop (1926) 402,600. Area 2,270 sq m. It is bounded N by the departments of Lozère and Ardèche, E. by the Rhone, which separates it from Vaucluse and Bouches-du-Rhône, S. by the Mediterranean, S.W by Hérault and W. by Aveyron Gard is divided into three sharply-defined regions. The tree-clad Cévennes, with their deep and fruitful valleys, occupy the north-west, reaching a height of 5,120 ft. on the frontier of Lozère. The Garrigues, a dry, hilly limestone region stretches south from the Cévennes over about half the department, and grows cereals, vine and olive. The southern coastal plain is unhealthy because it has numerous lagoons and marshes, but it comprises the best arable land and vineyards in Gard

Besides the Rhone and the Ardèche, the principal rivers are the Cèze, Gard, Vidourle and Hérault. They all rise in the Cévennes, and the Cèze and the Gard feed the Rhone, the lower Vidourle forming the southwest boundary of the department The Hérault rises, and flows for a short part of its course, in the west of Gard The upper course of the river Gard is in mountain gorges, and melting snows often cause disastrous floods. Near Remoulins it is crossed by a celebrated Roman aqueduct—the Pont du Gard. The canal de Beaucaire extends from the Rhone at Beaucaire to Aigues-Mortes, which communicates with the Mediterranean at Grau-du-Roi by means of the Grand-Roubine canal.

The climate is warm in the south-east, colder in the north-west; it is rather changeable, and rain-storms are common. The cold and violent north-west wind known as the mistral is its worst drawback. Les Fumades (near Allègre) and Euzet have mineral springs. The chief grain crops are wheat and oats. Rye, barley and potatoes are also grown Gard is famed for its cattle, its breed of small horses, and its sheep, yielding very fine wool. In the rearing of silk-worms it ranks first among French departments The principal fruit trees are the olive, mulberry and chestnut. The vine is extensively cultivated and yields excellent red and white wines The department is rich in minerals, namely coal, iron, lime, lignite, asphalt, zinc, lead and copper, for the most part situated in the neighbourhoods of Alès and La Grand'-Combe and Le Vigan Much salt is obtained from the coastal marshes. The fisheries are productive Manufactures include silk, of which Alès is the chief centre, cotton and woollen fabrics, hosiery, carpets, ironware, hats (Anduze), gloves, paper, leather, earthenware and glass. There are important metallurgical works, the chief of which are those of Bessèges The exports of Gard include coal, lignite, coke, asphalt, building-stone, iron, steel, silk, hosiery, wine, olives, grapes and truffles.

The department is served by the P L.M. railway. It is divided into the arrondissements of Nîmes, Alès, Uzès and Le Vigan, with 40 cantons and 353 communes. The chief town is Nîmes, which is the seat of a bishopric of the province of Avignon and of a court of appeal. Gard belongs to the 15th military region (Marseilles), and to the académie (educational division) of Montpellier. Nîmes, Alès, Uzès, Aigues-Mortes, Beaucaire, Saint Gilles,

Bessèges, La Grand'-Combe and Villeneuve-lès-Avignon are the principal towns. Opposite the manufacturing town of Pont-St.-Esprit the Rhone is crossed by a fine mediaeval bridge more than 1,000 yd. long built by the Pontiff brethren. Le Vigan, an ancient town with several old houses, carries on silk-spinning.

GARDA, LAKE OF, the most easterly and the most extensive of the Lombard lakes (the *Lacus Benacus* of the Romans), surpassed in the Alpine region only by those of Geneva and Constance. The lake is now divided between the provinces of Verona, Brescia and Trento Its broad basin orographically represents the southern portion of the valley of the Adige, though that river now flows through a narrow trench which is separated from the lake by the long narrow ridge of the Monte Baldo (7,277 ft). The lake is fed by the Sarca at its north end, while at the southern extremity of the lake the Mincio flows out, on its way to join the Po. The area is about 143 sq.m., length 32¼ m , greatest breadth about 10 m., height of surface above sea-level 216 ft. and the greatest depth 1,135 feet Its upper northern end is narrow, but between Garda (east) and Salò (west) the lake expands gradually into a nearly circular basin Owing to this conformation the lake is much exposed to sudden and violent winds The steep grey limestone crags of Monte Baldo, on the eastern side of the lake, contrast strongly with the rich vegetation on the western and southern shores. The portion of the western shore that extends from Gargnano to Salò is the most sheltered and warmest part of the region, so that not merely does it resemble one continuous garden (producing lemons, figs, mulberries and olives) but is frequented in winter. The lovely promontory of Sermione (anc. Sirmio) at the southern end of the lake, has also an extremely luxuriant vegetation. It was a favourite residence of Catullus; but the large ruins of a Roman villa on the promontory belong to the imperial period, while there are also remains of the Lombard period, and a fine castle of the Scaligers. At the south end of the lake are the towns of Peschiera (14¼ m. by rail from Verona on the east) and of Desenzano (17½ m. by rail from Brescia on the west), which are 8¾ m distant from each other. There is a regular steamer service from these two towns On the west shore of the lake are Salò, Maderno, Toscolano (a place important in the early history of the printing press), Gargnano and Limone, while the rugged east shore can boast only of Bardolino and Garda. At the northern end of the lake is Riva

GARDELEGEN, a town in Prussian Saxony, on the main line of the Berlin-Hanover railway. Pop. (1925) 8,900 Gardelegen was founded in the 10th century, and on the neighbouring heath Margrave Louis I of Brandenburg gained, in 1343, a victory over Otto of Brunswick. It has a Romanesque church, and a hospital founded in 1285. There are considerable manufactures, notably agricultural machinery and buttons, and its beer has a great repute.

GARDEN, MARY (1877–), American operatic singer, was born at Aberdeen, Scotland, on Feb. 20, 1877. At the age of six she was brought to the United States. In 1888 her family settled in Chicago, where her early musical training was received She went to Paris in 1896, and studied under Trabadello, Chevallier and Fougère. She made her début at the Opéra Comique, Paris, April 3, 1900, in the title rôle of *Louise* Her first appearance in the United States was at New York in the title rôle of *Thais,* Nov. 25, 1907. In 1910 she became a member of the Chicago Civic Opera company, assuming, among others, the parts of Salomé, Thais, Mélisande and Louise. She was general director of the Chicago Opera Association in 1921–22. In 1927 she sang in *Pelléas et Mélisande* in Geneva, Switzerland; also in Paris in the opera *Resurrection.*

GARDEN, the ground enclosed and cultivated for the growth of fruit, flowers or vegetables (*see* HORTICULTURE). From the fact that Epicurus (*q.v*) taught in the gardens at Athens, the disciples of his school of philosophy were known as *οἱ ἀπὸ τῶν κήπων*—those from the gardens (Diog. Laertius x 10); and Cicero (*De finibus* v. 1, 3, and elsewhere) speaks of the *Horti Epicuri* (the gardens of Epicurus) Thus as the "Academy" refers to the Platonic and the "Porch" (*στοά*) to the Stoic school, so the "Garden" is the name given to the Epicurean school of philosophy. Apollodorus was known as *Κηποτύραννος*, the tyrant of the garden.

GARDEN CITIES, a term first used in 1869 by A T. Stewart in connection with the development of an estate on Long Island, N Y., are to be distinguished from "garden suburbs" which are, generally, merely suburbs with specially restrictive by-laws of an industrial city. (*See* TOWN AND CITY PLANNING and SOCIAL ARCHITECTURE.) The idea of a garden city, that is, a unit planned as a whole, was due to Sir Ebenezer Howard, who, in a book entitled *Tomorrow* (London 1898), outlined a scheme for the building of a new model town to be called "Garden City" The publication of this book led to the formation of the Garden Cities Association in 1899 and to the establishment of Letchworth, the first garden city, in 1903, and Welwyn, the second, in 1920 The main features of Howard's scheme were (1) the purchase of a large area of agricultural land within a ring fence; (2) the planning of a compact town upon it surrounded by a wide rural belt; (3) the town to accommodate population and industry, (4) the town to be limited in extent and never to encroach upon the rural belt; (5) the land values arising from the population to belong to the community that created them.

Howard based his scheme upon the admitted need for a remedy for the evils of the congestion of towns and the depopulation of the countryside. He pointed out the obvious facts that towns grew because people were attracted to them, and people left the country districts because they did not like them. The country must be made attractive, he said, and that can be done by establishing there the magnet of town-life A form of town which combined the undoubted social and economic advantages of towns with the undoubted benefits of the country would be superior to existing towns and would draw population to it The new town would be limited in extent because (1) it is possible, he considered, to get everything that is required in a town of about 30,000, while improved means of transportation would enable those who wished to do so to travel to the big city, and because (2) the inhabitants of the rural belt should be kept in close touch with town-life and rural interests should form part of the town's economy. If such towns were scattered over the country there would, he believed, be an end to rural depopulation and the overcrowding of the great towns would cease.

The "garden city" was to be created by a private corporation which would raise money on loan, lay out the town, construct the roads, drainage, public services, etc , and let the land on revisible leases, the rents increasing with the growth of population. Howard showed that the reasonable rents that could be got would be amply sufficient to pay a return on the expenditure, leaving a considerable surplus The rents, moreover, were to be "rate-rents," that is to say were to include such charges on property as were normally required to meet the expenditure of the local authority.

Unearned Increment of the Community.—Howard contended that his scheme was practicable for two main reasons The first was that by purchasing land at agricultural value and then bringing a large population to it the increment in land value would be sufficient to provide a substantial economic foundation The "unearned increment," created by increase of population in any particular place had hitherto invariably gone into private pockets, in his scheme it would be retained for the community That the amount of this "unearned increment" in general was great was well known. Proposals for taxation of land values were attempts to get possession of it Howard's scheme secured it for the community as it arose His second main reason was that there was a tendency for industry to leave the congested cities and to seek rural surroundings Manufacturers were establishing their works on the outskirts of towns and even in country villages, because they found the costs and conditions of working in the cities too onerous This tendency, Howard declared, should be organized There should be a concerted movement of industry from the over-burdened cities to the new free towns, the garden cities.

Howard's proposals came at a time when there was an increasing public interest in industrial housing. In the garden cities houses could be provided for the working classes under the best possible conditions both as to cost and surroundings Many of

those who were interested in the housing question were therefore attracted to the garden city idea In 1898 when Howard put forward his scheme there was no public interest in England in town-planning, but the advantages of planning a town in advance of building it were appreciated and gave additional point to Howard's contentions The housing and town-planning movements of the 20th century thus became closely associated with the garden city movement, and the influence of that movement upon them was profound, but the specific proposals for garden cities and the general ideas on which they were based were by no means expressed in the housing and town-planning activities that gained momentum in the early part of the century in England and reached their height in the years immediately after the World War

Letchworth and Welwyn.—There are two examples of garden cities in England and it should be noted that these are the only examples in the world

Letchworth was established in 1903 as the first garden city on Sir Ebenezer Howard's plan An area of 3,822 acres (afterwards increased to 4,552 acres) was purchased 35 miles from London and within 2½ miles of the old market town of Hitchin, in Hertfordshire A joint stock company, called First Garden City Ltd was formed to carry out the enterprise, with an authorized capital of £300,000, the dividend on which was limited to 5% per annum A plan was prepared for a town of about 32,000 inhabitants, with distinct areas for houses, shops and factories and a surrounding rural belt Development was started in 1904 The company constructed the roads, drainage system, water, gas and electricity supplies In 1928 the town had a population of about 14,000 with 80 industries, principally engineering works, but including corset-making, printing, book-binding, etc

On the formation of the scheme the First Garden City, Ltd, made a public issue of share capital but only a small part was taken up and the undertaking was mainly financed by mortgages, loans and debentures Interest has been paid on the bulk of the capital since the start, in 1913 a small dividend was paid on the share capital, in 1928 a start was made to pay off the accumulated arrears of dividend on the shares

Howard's scheme of revisible rents and rate-rents was found impracticable at Letchworth, the land being let on ordinary building leases for 99 years Rates are levied by the local authority as in other towns The growth of the town has been slow, less than half the ultimate population having been reached after 25 years

The second garden city was started after the war in 1920, when Welwyn Garden City was formed This second scheme was initiated by a joint stock company with an authorised share capital of £250,000 entitled to a dividend not exceeding 7% per annum

Welwyn, 20 miles from London, is a few miles north of Hatfield on the London and North Eastern Railway main line The estate consists of 2,383 acres, on which a town of 40,000 has been planned with a small rural belt When purchased the estate was completely rural and the company has constructed the roads, drainage, water, electricity and other supplies In 1928 the town had a population of 7,000 with a number of industries, including engineering, breakfast foods, cinema studios, printing, etc

The promoters of the scheme have had to contend with the difficulties of the post war period, and development has been slower than was anticipated The public issue of shares in 1920 was not successful and the scheme has been financed by debentures and loans The company was granted loans from the Public Works Loan Board for approved capital expenditure under the provisions of the Housing Act 1921 This has brought the scheme to some extent under the supervision of the Ministry of Health Interest on borrowed money has been paid from the start, but no dividend has yet been declared on the share capital

The features of Welwyn are its consistent architectural development, site planning, public gardens, and absence of small shops Being near to London a large proportion of the population is engaged in business there; but the site is well adapted for industrial purposes and industrial development is likely to be accelerated As at Letchworth land is let on building lease (but for 999 years) and rates are levied as in other towns. The company however undertakes certain public services (*e g.* sewage disposal) at its own expense, and provides funds for education, sport, etc.

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The United States has no "garden city" like Letchworth or Welwyn, England, and no development of the "garden village" as complete and significant as Port Sunlight or Bourneville, but it has had many "industrial housing schemes" carried out during the period of the garden city movement in England and some suburban developments that resemble the "garden city" These developments are of great variety in origin, and extent and merit Most of the industrial developments had some sort of general plan or layout In some it was the typical American gridiron, and in many other cases it did not show great skill or merit In only a few, even of the best, was there more than a street scheme The average of these developments in the United States would show below 12 houses to the gross acre—probably not more than six—with lots averaging at least 50 ft. in width by more than 100 ft in depth It is somewhat doubtful if an examination of the American schemes would disclose any element of co-operative or public ownership which is English in character rather than American, and yet in many industrial villages the land has been sold at a low price and without speculative profit While there was no legal or definite limit to the return from the invested capital, many of the industrial enterprises were conducted often at a financial return lower than that recognized as a reasonable rate The higher class suburban developments accept no such limitation. *See* SOCIAL ARCHITECTURE (J No)

GARDENIA, in botany, a genus of plants of the madder family (Rubiaceae), containing about 80 species of evergreen trees and shrubs, natives of the warmer parts of the Old World Several are grown in stoves or greenhouses for their handsome, sweet-scented white flowers The flowers are developed singly at the end of a branch or in the leaf-axils, and are funnel- or salver-shaped with a long tube The double forms of *Gardenia florida* (China), known as Cape-jasmine, and *G radicans* (Japan) are amongst the most beautiful and highly perfumed of any in cultivation Gardenias are readily propagated by cuttings They require plenty of heat and moisture in the growing season, and must be kept free from insects such as green fly, red spider and scale-insect

GARDENING: *see* HORTICULTURE

GARDINER, JAMES (1688–1745), Scottish soldier, was born at Carriden in Linlithgowshire, on Jan 11, 1688 The circumstances of his death (Sept 21, 1745) are described in Sir Walter Scott's *Waverley* In his early years he was reckless and profligate, but in 1719 a vision of Christ on the Cross led to his conversion, and from that time he lived a life of great devoutness

See P. Doddridge, *Life of James Gardiner* (1747, often reprinted)

GARDINER, SAMUEL RAWSON (1829–1902), English historian, son of Rawson Boddam Gardiner, was born near Alresford, Hants He was educated at Winchester and Christ Church, Oxford, where he took a first class in *literae humaniores*, and became a fellow of All Souls (1884) and Merton (1892) For some years he was professor of modern history at King's college, London. Gardiner, who was himself a descendant of Cromwell and Ireton, is the historian of the Puritan revolution, and has written its history in a *History of England from the Accession of James I to the Outbreak of the Civil War, 1603–1642* (10 vols, 1863–82), *History of the Great Civil War, 1642–1649* (4 vols, 1886), and *History of the Commonwealth and Protectorate, 1649–1660* (3 vols, 1894–1903) His researches in public and private collections of manuscripts at home, and in the archives of Simancas, Venice, Rome, Brussels and Paris, were indefatigable In his judgments of men and their actions he is unbiassed, and his appreciations of character exhibit a remarkable fineness of perception and a broad sympathy Throughout his work he gives a prominent place to everything which illustrates human progress in moral and religious, as well as political conceptions, and specially to the rise and development of the idea of religious toleration, finding his authorities not only

in the words and actions of men of mark, but in the writings of obscure pamphleteers, whose essays indicate currents in the tide of public opinion

Gardiner's style is clear and unadorned; he appeals constantly to the intellect rather than to the emotions, and is seldom picturesque, though in describing a few famous scenes, such as the execution of Charles I., he writes with pathos and dignity. Among the most noteworthy of his separate works are. *Prince Charles and the Spanish Marriage* (2 vols, 1869), *Outline of English History* (1st ed. 1887, later ed 1919); *Constitutional Documents of the Puritan Revolution, 1625–1660* (1st ed, 1889, 3rd ed, 1906), *Student's History of England* (2 vols, 1st ed 1890–91; later ed. 1920); *What Gunpowder Plot Was* (1897), *Oliver Cromwell* (1901). He edited collections of papers for the Camden Society, and from 1891 was editor of the *English Historical Review*

See H B Learned, *Samuel Rawson Gardiner* (1902), R G Usher, "Critical study of the historical method of S R Gardiner," in *Washington University Studies,* vol III, part II, no. 1. (1915).

GARDINER, STEPHEN (1493?–1555), English bishop and lord chancellor, was born at Bury St Edmunds, the son of a cloth merchant He was educated at Trinity Hall, Cambridge, and became doctor of civil law in 1520, and of canon law in the following year About 1525 he was made secretary to Cardinal Wolsey whom he accompanied on his important diplomatic mission to France in 1527 Next year Gardiner was sent by Wolsey to Italy with Edward Fox, provost of King's college, Cambridge, to promote the business of Henry's divorce from Catherine of Aragon Though he failed to procure the desired decretal commission, Gardiner by his great intrepidity, won from Clement his consent to a general commission for Campeggio and Wolsey to try the cause in England This, as Wolsey saw, was quite inadequate and he again instructed Gardiner to press the pope to send the desired decretal on, even if the latter was only to be shown to the king and himself and then destroyed At last the pope gave what was desired on the express conditions that Campeggio was to show it to the king and Wolsey and no one else, and then destroy it, the two legates holding their court under the general commission In 1529 Gardiner was sent again to Italy, but this time the pope would make no further concessions, or promise not to revoke the cause to Rome

Gardiner's services, however, were fully appreciated He was appointed the king's secretary He had been already some years archdeacon of Taunton, and the archdeaconry of Norfolk was added to it in March 1529, which two years later he resigned for that of Leicester In 1530 he was sent to Cambridge to procure the decision of the university as to the unlawfulness of marriage with a deceased brother's wife, in accordance with the new plan for settling the question without the pope's intervention In this he succeeded, though not without a good deal of artifice In Nov 1531 the king rewarded him with the bishopric of Winchester, vacant by Wolsey's death In 1532, nevertheless, he displeased the king by the part he took in the preparation of the famous "Answer of the Ordinaries" to the complaints brought against them in the House of Commons

His next important action was not so creditable, for he was "assistant" to Cranmer as counsel for the king, when the archbishop, in the absence of Catherine, pronounced her marriage with Henry null and void on May 23, 1533 Immediately afterwards he was sent to Marseilles, where an interview between the pope and Francis I took place in September, of which event Henry stood in great suspicion, as Francis had hitherto maintained the justice of his cause At this interview Bonner intimated the appeal of Henry VIII to a general council in case the pope should proceed to sentence against him This appeal, and also one on behalf of Cranmer presented with it, were drawn up by Gardiner In 1535 he and other bishops were called upon to vindicate the king's new title of "Supreme Head of the Church of England" The result was his celebrated *De vera obedientia,* the ablest of all the vindications of royal supremacy, reprinted in 1537 by the Swiss reformers In the same year he had a dispute with Cranmer about the visitation of his diocese He was also employed to answer the pope's brief threatening to deprive Henry of his kingdom During the next few years he was engaged in various embassies in France and Germany until 1538 when, owing to Cromwell's mistrust, he was replaced as ambassador in Paris by Bonner In 1539 he took part in the enactment of the severe statute of the Six Articles, which led to the resignation of bishops Latimer and Shaxton and the persecution of the Protestant party In 1540, on the death of Cromwell he was elected chancellor of the University of Cambridge A few years later he attempted to fasten a charge of heresy upon Archbishop Cranmer in connection with the Act of the Six Articles, and but for the intervention of the king would probably have succeeded Though he had supported the royal supremacy, Gardiner objected to the religious doctrines of the Reformation He had to contend with frequent storms of royal indignation, but the king had need of him quite as much as he had of Cranmer; for Gardiner, even under royal supremacy, was anxious to prove that England had not fallen away from the faith, while Cranmer's authority as primate was necessary to upholding that supremacy Thus Gardiner and the archbishop maintained opposite sides of the king's church policy; and though Gardiner was encouraged by the king to put up articles against the archbishop for heresy, the archbishop could always rely on the king's protection

Under Edward VI Gardiner was completely opposed to the policy of the dominant party both in ecclesiastical and in civil matters The religious changes he objected to both on principle and on the ground of their being moved during the king's minority, and he resisted Cranmer's project of a general visitation His remonstrances, however, were met by his committal to the Fleet, and the visitation of his diocese was held during his imprisonment Though soon released, it was not long before he was called before the council, and, refusing to give them satisfaction, was thrown into the Tower, where he remained for over five years His bishopric was given to Poynet, a chaplain of Cranmer's and bishop of Rochester On Mary's accession, Gardiner was restored to his bishopric, and as lord chancellor, set the crown on the queen's head at her coronation He also opened her first parliament and for some time was her leading councillor

He was now called upon, in advanced life, to undo not a little of of his early work—to vindicate the legitimacy of the queen's birth and the lawfulness of her mother's marriage, to restore the old religion, and to recant what he had written touching the royal supremacy It is said that he wrote a formal retraction of his *De vera obedientia* which is no longer extant As chancellor he negotiated the queen's marriage treaty with Philip, to which he shared the general repugnance, though he could not oppose her will In executing it, however, he provided that the Spaniards should in nowise interfere in the government of the country After the coming of Cardinal Pole, and the reconciliation of the realm to the see of Rome, he still remained in high favour He no doubt approved of the act, which passed the House of Lords while he presided there as chancellor, for the revival of the heresy laws Neither is there any doubt that he sat in judgment on Bishop Hooper, and on several other preachers whom he condemned to be degraded from the priesthood But he endeavoured to save the lives of Cranmer and Northumberland, and much as he was maligned by opponents, there are strong evidences that his natural disposition was humane and generous In May 1553 he went to Calais as one of the English commissioners to promote peace with France, but their efforts were ineffectual In Oct 1555 he again opened parliament as lord chancellor, but soon fell ill and died at Whitehall on Nov 12 He was buried in Winchester cathedral

Besides his conspicuous statesmanship and legal ability, Gardiner possessed a learning in divinity far from commonplace His part in the drawing up of doctrinal formularies in Henry VIII 's time is not clear, but at a later date he wrote tracts in defence of the Real Presence against Cranmer, some of which, being written in prison, were published abroad under a feigned name Controversial writings also passed between him and Bucer, with whom he had several interviews in Germany, when he was there as Henry VIII 's ambassador A friend of learning he took great interest in promoting the study of Greek at Cambridge He was, however, opposed to the new method of pronouncing the language intro-

duced by Sir John Cheke, and wrote letters to him and Sir Thomas Smith upon the subject, in which, according to Ascham, his opponents showed themselves the better critics, but he the superior genius. His house was spoken of by Leland as the seat of eloquence and the special abode of the muses

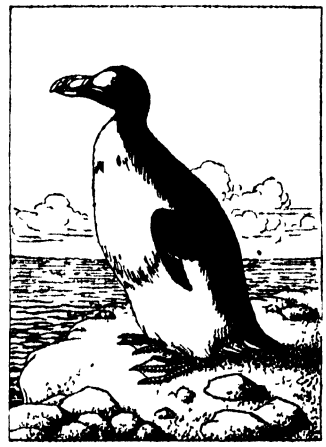
For a list of Gardiner's writings and general bibliography, *see* the article in the *Dict. Nat Biog. See* also J A. Muller, *Stephen Gardiner and the Tudor Reaction* (1926).

GARDNER, PERCY (1846–), English classical archaeologist, was born in London, and was educated at the City of London school and Christ's college, Cambridge (fellow, 1872) He was Disney professor of archaeology at Cambridge (1880–87), and professor of classical archaeology at Oxford (1887–1925) Gardner was a fellow of the British Academy and of other learned societies in many foreign countries Among his works are *Types of Greek Coins* (1883); *A Numismatic Commentary on Pausanias* (with F Imhoof-Blumer, 1887); *New Chapters in Greek History* (1892), an account of excavations in Greece and Asia Minor, *Manual of Greek Antiquities* (with F. B. Jevons, 2nd ed. 1898), *Grammar of Greek Art* (1905), *Principles of Greek Art* (1913); *New Chapters in Greek Art* (1926), and a number of works on theological and ecclesiastical subjects

His brother, ERNEST ARTHUR GARDNER (1862–), educated at the City of London school and Caius college, Cambridge (fellow, 1885), was director (1887–95) of the British. School at Athens, and later became professor of archaeology at University college, London, and dean of the university His publications include. *Introduction to Greek Epigraphy* (1887); *Catalogue of the Vases in the Fitzwilliam Museum, Cambridge* (1897), *Ancient Athens* (1902), *Handbook of Greek Sculpture* (1905); new and enlarged ed. (1915), *The Art of Greece* (1925), etc

GARDNER, a city among the hills of northern Worcester county, Massachusetts, U S A , 60m W by N of Boston, at an altitude of 1,200ft It is served by the Boston and Maine railroad. The population was 16,971 in 1920 (32 7% foreign-born white) and was estimated locally at 21,000 in 1928. The outstanding industry is the manufacture of chairs, dating from 1805 Other important products are baby-carriages, oil stoves, silverware, time-clocks, wood-working machinery and reed, fibre and upholstered furniture The aggregate factory output in 1926 was valued at $19,516,838. The city maintains a system of supervised playgrounds, a public bath-house and swimming pool, a toboggan slide and a ski jump. Gardner was formed in 1785 from parts of four other towns, and was named after Colonel Thomas Gardner (1724–75), who was mortally wounded at the battle of Bunker Hill It was chartered as a city in 1923

GAREFOWL, also known as Great Auk (*Alca impennis*), a large flightless sea-bird, now extinct. Slightly smaller than a tame goose, it resembled its relative the razorbill (*A torda*) in appearance, but a large patch of white occupied nearly all the space between the bill and the eye, while the bill itself bore eight or more transverse grooves wings, the bird was unable to fly



GREAT AUK (ALCA IMPENNIS) KNOWN ALSO IN THE HEBRIDES, WHICH IT FREQUENTED, AS THE GAREFOWL

Owing to the small size of the

It is a mistake to suppose that this bird had a high northern range It bred in Iceland and on islands off Newfoundland, where the French fishermen used both the bird and its eggs for food. Enormous numbers were killed, the birds being driven up a plank into the hold of the vessel (*see* Ritchie, *Animal Life in Scotland*). It became extinct about 1844 The egg resembled that of the razorbill in shape and colour, but was larger. (*See* AUK.)

GARFIELD, JAMES ABRAM (1831–1881), twentieth president of the United States, was born on Nov 19, 1831 in a log cabin in the little frontier town of Orange, Cuyahoga county, Ohio His early years were spent in the performance of such labour as fell to the lot of every farmer's son in the new states, and in the acquisition of such education as could be had in the district schools held for a few weeks each winter But life on a farm was not to his liking, and at 16 he left home and tramping across the country to Cleveland, Ohio, sought employment from the captain of a lake schooner But the captain drove him from the deck, and, wandering on in search of work, he fell in with a canal boatman who engaged him During some months young Garfield served as bowsman, deck-hand and driver of a canal boat An attack of the ague sent him home, and on recovery, having resolved to attend a high school and fit himself to become a teacher, he passed the next four years in a hard struggle with poverty and in an earnest effort to acquire an education; worked as a teacher, a carpenter and a farmer; studied for a time at the Western Reserve Eclectic Institute at Hiram, Ohio, and finally entered Williams College. On graduation, in 1856, Garfield became professor of ancient languages and literature in the Eclectic Institute at Hiram, and within a year rose to be its principal.

Soon afterwards he entered political life In the early days of the Republican party, when the shameful scenes of the Kansas struggle were exciting the whole country, and during the campaigns of 1857 and 1858, he became known as an effective speaker and ardent anti-slavery man His reward for his services was election in 1859 to the Ohio senate as the member from Portage and Summit counties When the "cotton States" seceded, Garfield appeared as a warm supporter of vigorous measures, and when the call came for 75,000 troops, at once offered his services to the governor, and became lieutenant-colonel and then colonel of the 42nd Ohio Volunteers, recruited largely from among his former students He served in Kentucky, was promoted to the rank of brigadier-general of volunteers early in 1862, took part in the second day's fighting at the battle of Shiloh, served as chief of staff under Rosecrans in the Army of the Cumberland in 1863, fought at Chickamauga, and was made a major-general of volunteers for gallantry in that battle. In 1862 he was elected a member of Congress from the Ashtabula district of Ohio, and, resigning his military commission, took his seat in the House of Representatives in Dec 1863 In Congress he joined the radical wing of the Republican party, advocated the confiscation of Confederate property, approved and defended the Wade-Davis manifesto, and was soon recognized as a hard worker and ready speaker. Capacity for work brought him places on important committees and his ability as a speaker enabled him to achieve distinction on the floor of the House and to rise to leadership The year 1874 was one of disaster to the Republican party The greenback issue, the troubles growing out of reconstruction in the South, the Crédit Mobilier and the "Salary Grab," disgusted thousands of independent voters and sent a wave of democracy over the country. Garfield himself was accused of corruption in connection with the Crédit Mobilier scandal, but the charge was never proved. A Republican convention in his district demanded his resignation, and re-election seemed impossible; but he defended himself in two pamphlets, "Increase of Salaries" and "Review of the Transactions of the Crédit Mobilier Company," made a village-to-village canvass, and was victorious In 1876 Garfield for the eighth time was chosen to represent his district; and afterwards as one of the two representatives of the Republicans in the House, he was a member of the Electoral Commission which decided the dispute regarding the presidential election of 1876 When, in 1877, James G. Blaine was made a senator from Maine, the leadership of the House of Representatives passed to Garfield, and he became the Republican candidate for speaker. But the Democrats had a majority in the House, and he was defeated Hayes, the new president, having chosen John Sherman to be his secretary of the treasury, an effort was made to send Garfield to the United States Senate in Sherman's place But the President needed his services in the House, and he was not elected to the Senate until 1880.

The time had now come (1880) when the Republican party must nominate a candidate for the presidency. General Grant had served two terms (1869–77), and the unwritten law of custom condemned his being given another. But the "bosses" of the Republican party in three great states—New York, Pennsylvania and Illinois—were determined that he should be renominated. These men and their followers were known as the "stalwarts." Opposed to them were two other factions, one supporting James G. Blaine, of Maine, and the other John Sherman, of Ohio. When the convention met and the balloting began, the contest along these factional lines started in earnest For 28 ballots no change of any consequence was noticeable. Though votes were often cast for ten names, there were but two real candidates before the convention, Grant and Blaine. That the partisans of neither would yield in favour of the other was certain That the choice therefore rested with the supporters of the minor candidates was manifest, and with the cry "Anything to beat Grant!" an effort was made to find some man on whom the opposition could unite. Such a man was Garfield His long term of service in the House, his leadership of his party on its floor, his candidacy for the speakership, and his recent election to the United States Senate, marked him out as the available man Between the casting of the first and the 33rd ballot, Garfield, who was the leader of Sherman's adherents in the convention, had sometimes received one or two votes and at other times none On the 34th he received 17, on the next 50, and on the next almost the entire vote hitherto cast for Blaine and Sherman, and was declared nominated. During the campaign Garfield was subject to violent personal abuse; the fact that he was alleged to have received $329 from the Crédit Mobilier as a dividend on stock led his opponents to raise the campaign cry of "329," and this number was placarded in the streets of the cities and printed in flaring type in partisan newspapers. The forged "Morey letter," in which he was made to appear as opposed to the exclusion of the Chinese, was widely circulated and injured his candidacy in the West That the charges against Garfield were not generally credited, however, is shown by the fact that he received 214 electoral votes to his opponent's 155. He was inaugurated on March 4, 1881

On July 2, while on his way to attend the commencement exercises at Williams College, the new president was shot in a Washington railway station by a disappointed office-seeker named Charles J Guiteau, and on Sept. 19, 1881, he died at Elberon, New Jersey, whither he had been removed on the 6th. He was buried in Cleveland, Ohio, where in 1890 a monument was erected by popular subscription to his memory.

In 1858 Garfield had married Miss Lucretia Rudolph, by whom he had seven children.

BIBLIOGRAPHY.—President Garfield's writings, edited by Burke A Hinsdale, were published at Boston, in 1882, *The Life and Letters of James A. Garfield,* by Theodore Clarke Smith in 1925

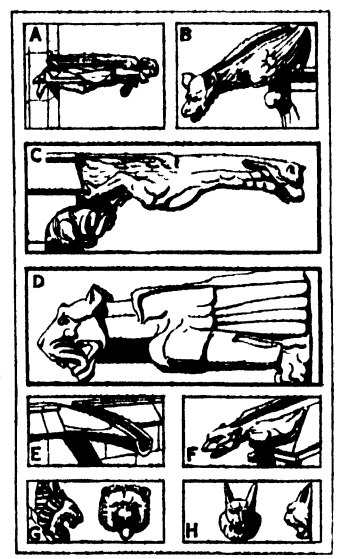
GARFIELD, a rapidly growing industrial city of Bergen county, New Jersey, U.S A , on the Passaic river, 12m N W. of New York city It is served by the Erie railroad (and for freight also by the Lackawanna) and by motor-coach lines The population was 19,381 in 1920 (44% foreign-born white, largely from Italy, Hungary and Poland) and was estimated locally at 26,000 in 1928. It has extensive woollen and worsted mills, and various other manufacturing industries, with an aggregate output in 1925 valued at $33,271,578. The city was founded in 1881; incorporated as a borough in 1898, and as a city in 1920. Between 1900 and 1920 the population increased over 450%.

GAR-FISH, a genus of fishes (*Belone*) found in most temperate and tropical seas, and recognized by their long, slender, compressed and silvery body, and by their jaws being produced into a long, pointed, bony and sharply-toothed beak. About 50 species are known, some attaining a length of 4 or 5ft. One species is common on the British coasts, and is well known by the name of "long-nose " The green bones deter many people from eating this wholesome food. The skipper (*Scomberesox*) and half-beak (*Hemirhamphus*), in which the lower jaw only is prolonged, are fishes akin to the gar-pikes

GARGANEY, or SUMMER-TEAL, *Anas querquedula,* is one of the smallest of the ducks and is a summer visitant to England, where it breeds in the east Norfolk Broads. Slightly larger than the common teal (*A. crecca*), the male has a nutmeg-brown beard and a white line behind the eyes The female resembles the hen teal, but possesses no wing spot In Ireland and Scotland the garganey is rare. It has not a high northern range, and its appearance in Norway and Sweden is casual. It is nowhere common in Europe, but ranges far to the eastward in Asia, and yearly visits India in winter in enormous numbers. They nest very frequently in reed-beds

GARGANO, MONTE (anc. *Garganus Mons*), a massive mountainous peninsula projecting eastward from the north coast of Apulia, Italy, and belonging geologically to the opposite Dalmatian coast, it was indeed separated from the rest of Italy by an arm of the sea as late as the Tertiary period. It is of the same character as the Carso, being composed of fractured calcareous rock, and has numerous superficial and subterranean cavities The highest point (Monte Calvo) is 3,465 ft above sea-level The oak forests for which it was renowned in Roman times have entirely disappeared except in three sections, and have left the soil dry and stony Monte Sant' Angelo (*q v*) is the principal town.

See Beltramelei, *Il Gangano* (Bergamo, 1907) well illustrated.



A, B, C, E, F, FROM VIOLLET-LE DUC; D, "THE AMERICAN ARCHITECT", G, FROM FLETCHER, "HISTORY OF ARCHITECTURE ON THE COMPARATIVE METHOD" (BOTSFORD)

GARGOYLES

Ancient: G, Greek; H, Roman; Gothic: E, French undecorated; C and F, Notre Dame, Paris (*c.* 1225); B, the Ste Chapelle Paris (*c.* 1250); A, St Urbain, Troyes (*c.* 1290); Modern: D, Farmers Loan and Trust Building, New York City (Starrett and Van Vleck, architects)

GARGOYLE, in architecture, a decorated water spout. Although technically speaking the term applies to the carved lions of classic cornices, or to the terra-cotta spout, such as those found frequently in Pompeii, in general usage the word has become restricted to the grotesque, carved spouts of the middle ages, and is even, incorrectly, applied to other grotesque beasts, such as the *chimères* that decorate the parapets of Notre Dame at Paris. The gargoyle of the developed Gothic period is usually a grotesque bird or beast sitting on its haunches on the back of a cornice moulding and, in order to throw the water far from the building, projecting for several feet

GARHWAL, a district of British India, in the Kumaon division of the United Provinces. Pop. (1921) 485,186, area 5,612 sq m It consists almost entirely of rugged mountain ranges running in all directions, and separated by narrow valleys which in some cases become deep gorges or ravines The only level portion of the district is a narrow strip of waterless forest between the southern slopes of the hills and the fertile plains of Rohilkhand. The highest mountains are in the north, and embrace some of the most stupendous of the snow-clad giants, the principal peaks being Nanda Devi (25,661 ft), Kamet (25,413), Trisul (23,382), Badrinath (23,210), Dunagiri (23,181) and Kedarnath (22,853). The Alaknanda, one of the main sources of the Ganges, receives with its affluents the whole drainage of the district At Devaprayag the Alaknanda joins the Bhagirathi, and thenceforward the united streams bear the name of the Ganges. Cultivation is principally confined to the immediate vicinity of the rivers, which are employed for purposes of irrigation. Tradition has it that Garhwal originally consisted of 52 petty chieftainships, each chief with his own independent fortress (*garh*), that 500 years ago, one of these chiefs, Ajai Pal, reduced all the minor principalities under his own sway, and founded the Garhwal king-

dom He and his ancestors ruled over Garhwal and the adjacent state of Tehri, in an uninterrupted line till 1803, when the Gurkhas invaded Kumaon and Garhwal, driving the Garhwal chief into the plains. They in turn were defeated by the British in the war with Nepal in 1814, when Garhwal and Kumaon were converted into British districts, and the Tehri principality was restored to a son of the former chief Since annexation, Garhwal has rapidly advanced in material prosperity Two battalions of the Indian army (the 39th Garhwal Rifles) are recruited in the district, which also contains the military cantonment of Lansdowne. Grain and coarse cloth are exported, and salt, borax, live stock and wool are imported, the trade with Tibet being considerable The administrative headquarters are at the village of Pauri, but Srinagar and Kotdwara are the chief marts Transport is laborious, and the people are simple and attractive

GARIBALDI, GIUSEPPE (1807–1882), Italian patriot, was born at Nice on July 4, 1807 He entered the Sardinian navy, and, with a number of companions on board the frigate "Euridice," plotted to seize the vessel and occupy the arsenal of Genoa at the moment when Mazzini's Savoy expedition should enter Piedmont The plot being discovered, Garibaldi fled, but was condemned to death by default on June 3, 1834 Escaping to South America in 1836, he was given letters of marque by the state of Rio Grande do Sul, which had revolted against Brazil, and after a series of victorious engagements, passed into the service of Uruguay. In Montevideo, he formed the Italian Legion, with which he won the battles of Cerro and Sant' Antonio in 1846, and assured the freedom of Uruguay He returned to Italy upon receiving news of the incipient revolutionary movement, and landing at Nice on June 24, 1848, placed his sword at the disposal of Charles Albert. He formed a volunteer army 3,000 strong, but shortly after the defeat of Custozza had to flee to Switzerland Proceeding thence to Rome, he was entrusted by the Roman republic with the defence of San Pancrazio against the French, where he gained the victory of April 30, 1849 During May he dispersed the Bourbon troops at Palestrina, Velletri and elsewhere, and after the fall of Rome started on his wonderful retreat through central Italy pursued by the armies of France, Austria, Spain and Naples. He escaped to Ravenna, then to Piedmont, and ultimately to America from whence he returned to Italy in 1854, and purchased the island of Caprera on which he built his home On the outbreak of war in 1859 he was in command of the Alpine infantry, defeating the Austrians at Casale on the 8th of May, crossing the Ticino on the 23rd of May, and, after a series of victorious fights, liberating Alpine territory as far as the frontier of Tirol.

Returning to Como to wed the countess Raimondi, by whom he had been aided during the campaign, he was apprised, immediately after the wedding, of certain circumstances which caused him to abandon that lady and to start for central Italy Forbidden to invade the Romagna, he returned to Caprera, where with Crispi and Bertani he planned the invasion of Sicily. Assured by Sir James Hudson of the sympathy of England, he began active preparations for the process which ended in the making of Italy He reached Marsala on May 11, 1860, landed under the protection of the British vessels "Intrepid" and "Argus," and on the following day his dictatorship was proclaimed at Salemi On the 15th the Neapolitan troops were routed at Calatafimi, on the 25th Palermo was taken, on the 6th of June 20,000 Neapolitan regulars were compelled to capitulate, on July 20, Messina fell and on Aug 21, the battle of Reggio was won On Sept 7, Garibaldi entered Naples, and a month later, routed the remnant of the Bourbon army 40,000 strong on the Volturno On Nov 7, Garibaldi accompanied Victor Emmanuel during his solemn entry into Naples, and on the morrow returned to Caprera

Indignant at the cession of Nice to France and at the neglect of his followers by the Italian government, he returned to political life. Elected deputy in 1861, his anger against Cavour found violent expression, until Cavour's successor, Ricasoli, enrolled the Garibaldians in the regular army. While marching on Rome in the following year, he was taken prisoner at Aspromonte on the 27th of August. Liberated by an amnesty, Garibaldi returned once more to Caprera amidst general sympathy, and in 1864 was enthusiastically received in London On the outbreak of war in 1866 he assumed command of a volunteer army and on the 3rd of July he defeated the Austrians at Monte Saello, on the 7th at Lodrone, on the 10th at Darso, on the 16th at Condino, on the 19th at Ampola, on the 21st at Bezzecca, but, when on the point of attacking Trent, he was ordered by General Lamarmora to retire. His famous reply "Obbedisco" ("I obey") has often been cited as a classical example of military obedience to a command destructive of a successful leader's hopes, but documents now published (cf. *Corriere della sera,* Aug 9, 1906) prove that Garibaldi had for some days known that the order to evacuate the Trentino would shortly reach him. As early as the 16th of July Crispi had been sent to warn Garibaldi that, owing to Prussian opposition, Austria would not cede the Trentino to Italy, and that the evacuation was inevitable. Hence Garibaldi's laconic reply He returned to Caprera to mature his designs against Rome, which had been evacuated by the French in pursuance of the Franco-Italian convention of September 1864 In 1867, he prepared to enter papal territory, but was arrested at Sinalunga by the government and conducted to Caprera He escaped to Florence, and, with the complicity of the second Rattazzi cabinet, entered Roman territory at Passo Corese on the 23rd of October Two days later he took Monterotondo, but on Nov 2nd, his forces were dispersed at Mentana by French and papal troops Recrossing the Italian frontier, he was arrested at Figline and taken back to Caprera In 1870 he formed a fresh volunteer corps and went to the aid of France, defeating the German troops at Chatillon, Autun and Dijon. Elected a member of the Versailles assembly, he resigned his mandate in anger at French insults, and withdrew to Caprera until, in 1874, he was elected deputy for Rome Popular enthusiasm induced the Conservative Minghetti cabinet to propose that £40,000 with an annual pension of £2,000 be conferred upon him but the proposal was refused by Garibaldi Upon the advent of the Left to power, however, he accepted both gift and pension He died at Caprera on June 2, 1882, one of the greatest masters of revolutionary war

See Garibaldi, *Epistolario,* ed E E Ximenes (2 vols, Milan, 1885), *Memorie autografiche* (11th ed, Florence, 1902, Eng translation by A Werner, 1889), *Scritti politici e militari* (1908) and *Lettere e proclami* (1917), G Guerzoni, *Garibaldi* (2 vols, Florence, 1882); J W Mario, *Garibaldi e i suoi tempi* (Milan, 1884), G M Trevelyan, *Garibaldi's Defence of the Roman Republic* (1907), *Garibaldi and the Thousand* (1909) and *Garibaldi and the Making of Italy* (1911), C de Saint-Cyr, *Garibaldi* (1907), A V Vecchi, *La Vita e La Geste di Garibaldi* (Bologna, 1910) and A Luzio, *Garibaldi, Cavour, Verdi* (Turin, 1924)

GARIBALDI, GIUSEPPE (1879–), Italian general, eldest son of Gen Ricciotti Garibaldi and grandson of the Liberator, was born at Melbourne, July 29, 1879 He fought under his father in the Greco-Turkish War in 1897, and served in the South African War, subsequently leading an adventurous life in South and Central America and in the Balkans On the outbreak of the World War he raised an Italian Legion of 14,000 men, which fought on the side of France in the Argonne In 1915 Garibaldi returned to Italy, and on Italy's entry into the War he enlisted as a volunteer He was soon afterwards commissioned, being given command of a battalion, and served with distinction in the IV Army He returned to the French front in March 1918 in command of the famous Brigata Alpi, and in June was promoted brigadier-general He resigned his command in June 1919 and gave up his commission in Feb. 1920 He became opposed to the Fascist Government and in the autumn of 1924 was involved in an anti-Fascist agitation organised by the *Italia libera* Association. Deciding, however, that the movement had no chance of success, he departed for New York to devote himself to business

GARIN LE LOHERAIN, French epic hero The 12th century *chanson de geste* of Garin le Loherain is one of the fiercest and most sanguinary narratives left by the *trouvères* This local cycle of Lorraine, which is completed by Hervis de Metz, Girbers de Metz, Anséis, fils de Girbert and Yon, is obviously based on history, and affords a picture of the savage feudal wars of the 11th and 12th centuries. The cycle relates three wars against hosts of heathen invaders. In the first of these Charles Martel and his faithful vassal Hervis of Metz fight by an extraordinary anachron-

ism against the Vandals, who have destroyed Reims but are defeated in a great battle near Troyes. In the second Hervis is besieged in Metz by the "Hongres." In the third Thierry, king of Moriane, sends to Pippin for help against four Saracen kings. He is delivered by a Frankish host, but falls in the battle. Hervis of Metz was the son of a citizen to whom the duke of Lorraine had married his daughter Aelis, and his sons Garin and Begue are the heroes of the *chanson* which gives its name to the cycle. The dying king Thierry had desired that his daughter Blanchefleur should marry Garin, but when Garin prefers his suit at the court of Pippin, Fromont of Bordeaux puts himself forward as his rival and Hardré, Fromont's father, is slain by Garin. The rest of the poem is taken up with the war that ensues between the Lorrainers and the men of Bordeaux. Blanchefleur becomes the wife of Pippin, while Garin remains her faithful servant. He is slain after avenging the murder of his brother The remaining songs continue the feud between the two families. According to Paulin Paris, the family of Bordeaux represents the early dukes of Aquitaine, the last of whom, Waifar (745–768) was dispossessed and slain by Pippin the Short, king of the Franks; but the *trouvères* had in mind no doubt the wars which marked the end of the Carolingian dynasty.

See *Li Romans de Garin le Loherain*, ed P. Paris (1833); *Hist litt de la France*, vol xxii. (1852); J. M. Ludlow, *Popular Epics of the Middle Ages* (1865), F Lot, *Etudes d'histoire du moyen âge* (1896), F. Settegast, *Quellenstudien zur gallo-romanischen Epik* (Leipzig, 1904). A complete edition of the cycle was undertaken by E Stengel, the first volume of which, *Hervis de Mes* (Gesellschaft fur roman. Lit., Dresden), appeared in 1903.

GARLAND, HAMLIN (1860–), American writer, was born at West Salem (Wis), Sept 16, 1860. His early celebrity was due in large part to his rebellion against the idyllic interpretations of rural life then current, and his *Main-Travelled Roads* (1891), *Other Main-Travelled Roads* (1910), and *Prairie Folks* (1893), written in a mood of intense resentment, remain among the most bitter indictments of the farm in American fiction Yet his fondness for the unbroken prairie makes his *Son of the Middle Border* (1917) and *Trail-Makers of the Middle Border* (1926) fascinating revelations of the lure of free land, of the epic movement of peoples that in a few decades swept the border line of civilization from the Alleghenies to the Pacific The former book is an admirable record of his boyhood in Wisconsin, Minnesota, and Iowa, his brief homesteading in Dakota, and his early literary struggles in Boston *A Daughter of the Middle Border* (1921) records his and his family's later experiences, chiefly in and near Chicago, a city which in *Crumbling Idols* (1894) he heralded as a literary capital but which he has since deserted for New York. His other work is most easily accessible in the "Sunset" edition.

GARLAND, JOHN, JOHANNES DE GARLANDIA (*c* 1195–*c* 1272), Latin grammarian and poet, was born in England of noble family. He studied at Oxford under a certain John of London, and about 1202 went to Paris where he had Allan of Lille as a teacher. He himself taught at Paris until 1229 when he went to the new university of Toulouse In 1232 or 1233, Garland had to fly from Toulouse on account of religious troubles with the Albigensians The rest of his life was spent at Paris in writing and teaching Knowing Greek, and well read in the classics and the Fathers, Garland desired to stimulate a profound interest in Latin literature and language; hence his writings throw much light on the actual teaching of these subjects at Paris during his time His *Compendium Grammatice* and his *Liber de Constructionibus*, both important for a knowledge of mediaeval Latin, are still unedited, but his *Dictionarius*, a Latin vocabulary, was edited in 1857 by T Wright, who also published fragments of the *Poetria* (1841), since edited in full by G Mari (Milan 1892 and Erlangen 1902). The best known of Garland's poems are *De triumphis ecclesiae* (ed. T Wright 1856), books iv.–vi. giving a detailed account of the Albigensian crusade in the south, and *Epithalamium beatae Mariae Virginum*, still in ms The *De Mysteriis ecclesie* was ed. by F. G. Otto (Giessen 1842) and the *Morale scolarium*, which covers such topics as general behaviour, table manners, virtue, and the defence of the pope against simony, by L J. Pactow (Berkeley, California 1927) who in his introduction gives an excellent account of the life and works of Garland

See also J. A. Fabricius, *Bibliotheca Latina mediae* (1754); *Histoire litt de la France*, vols. xxi, xxiii and xxx.; the prefaces to the editions by T Wright mentioned above, Haureau, *Notices et extraits des MSS*, vol. 27, pt 2 (1879), P Meyer, *La Chanson de la croisade contre les Albigeois* (Paris 1875); A Scheler, *Lexicographie latine du XIIe et du XIIIe siècles* (Leipzig 1867), E Habel, "Johannes de Garlandia" in *Mitteilungen der Gesellschaft f deutsche Erziehungs und Schulgesch* xix. (1909); J. E. Sandys, *Hist of Class. Schol* (3rd ed 1921); Haskins, *Studies in Hist. of Medieval Science* (Harvard, 1924).

GARLIC, *Allium sativum*, a bulbous perennial plant of the family Liliaceae, indigenous apparently to south-west Siberia It has long, narrow, flat, obscurely keeled leaves, a deciduous spathe, and a globose umbel of whitish flowers, among which are small bulbils The bulb, which is the only part eaten, has membranous scales, in the axils of which are 10 or 12 cloves, or smaller bulbs From these new bulbs can be procured by planting out in February or March The bulbs are best preserved hung in a dry place

Garlic is cultivated in the same manner as the shallot (*q v*). It is stated to have been grown in England before the year 1548 The bulb has a strong and characteristic odour and an acrid taste, and yields an offensively smelling oil, essence of garlic, identical with allyl sulphide $(C_3H_5)_2S$ This, when garlic has been eaten, is evolved by the excretory organs, the activity of which it promotes From the earliest times garlic has been used as an article of diet

GARLIC-MUSTARD (*Alliaria officinalis*), a plant of hedge-banks, low woods and waste grounds, called also hedge-garlic, Jack-by-the-hedge and sauce-alone It is an erect, somewhat branching biennial or perennial herb, 2 ft. to 3 ft high, of the mustard family (Cruciferae), native to Europe and temperate Asia and naturalized in North America from Quebec and Ontario to Virginia The long-stalked, coarsely-toothed leaves emit, when crushed, a garlic-like odour. The plant bears white flowers, about ¼ in across, followed by long, stout, four-sided pods

GARNEAU, FRANÇOIS-XAVIER (1809–1866), Canadian historian, the son of a working man, was born in Quebec. He had very little education, and entered a notary's office when he was about 15, himself becoming a notary in 1830 In 1831 he visited England, where he spent two years studying English institutions Returning to Canada in 1833, he was appointed translator to the chamber of Lower Canada, and from 1844–64 was secretary to the city of Quebec His *Histoire du Canada* (1845–48) treats of the history of all the French colonies in North America By this work, strongly anti-British in tone, Garneau may be said to have founded a school of patriotic Canadian historians and poets. He also published *Voyage en Angleterre et en France* (1855).

GARNET or **GARNETT, HENRY** (1555–1606), English Jesuit, was born at Heanor, Derbyshire, educated at Winchester and afterwards studied law in London. Having become a Roman Catholic, in 1575 he joined the Jesuits in Italy, and in 1587 was made superior of the English province Fearless and indefatigable in carrying on his propaganda and in ministering to the scattered Catholics, even in their prisons, Garnet is remembered for his connection with the Gunpowder Plot for which he suffered death On June 9, 1605 Garnet was asked by Catesby whether any undertaking which should involve the destruction of the innocent together with the guilty was lawful Garnet answered in the affirmative, giving as an illustration the fate of persons besieged in time of war Afterwards, however, he admonished Catesby against intending the death of "not only innocents but friends and necessary persons for a commonwealth," and showed him a letter from the pope forbidding rebellion According to Sir Everard Digby, Garnet, when asked the meaning of the brief, replied "that they (meaning the priests) were not to undertake or procure stirs, but yet they would not hinder any, neither was it the pope's mind they should, that should be undertaken for Catholic good . This answer, with Mr Catesby's proceedings with him and me, gave me absolute belief that the matter in general was approved, though every particular was not known " A few days later, according to Garnet, the Jesuit, Oswald Tesemond, known as Greenway, informed him of the whole plot "by way of confession," but he urged

was keeper of the printed books. In 1895 he was made a C.B. In the history of the British Museum library his place is second only to that of Panizzi. Besides introducing the "sliding press" in 1887 he was responsible for reviving the publication of the general catalogue, the printing of which, interrupted in 1841, was resumed under him in 1880, and gradually completed He married (1863) an Irish wife, Olivia Narney Singleton (d. 1903); his son Edward (b. 1868), a well-known author, married Constance Black, known under her married name as the translator of the works of Turgeniev, Tolstoy and other Russian authors.

Dr. Garnett's chief publications in book-form were. in verse, *Primula* (1858), *Io in Egypt* (1859), *Idylls and Epigrams* (1869, republished in 1892 as *A Chaplet from the Greek Anthology*), *The Queen and other Poems* (1902), *Collected Poems* (1893); in prose, biographies of Carlyle (1887), Emerson (1887), Milton (1890), Edward Gibbon Wakefield (1898); a volume of remarkably original and fanciful tales, *The Twilight of the Gods* (1888), a tragedy, *Iphigenia in Delphi* (1890); *A Short History of Italian Literature* (1898), *Essays in Librarianship and Bibliophily* (1899); *Essays of an Ex-librarian* (1901) He was an extensive contributor to the *Encyclopædia Britannica* and the *Dictionary of National Biography*, editor of the *International Library of Famous Literature*, and co-editor, with E Gosse, of the elaborate *English Literature: an illustrated Record*. This list represents only a small part of his published work

GARNIER, CLEMENT JOSEPH (1813–1881), French economist, was born at Beuil (Alpes Maritimes) on Oct 3, 1813. He studied at the Ecole de Commerce, Paris, of which he became secretary and finally a professor In 1842 he founded with Gilbert-Urbain Guillaumin (1801–64) the Société d'Economie Politique; and in 1846 he organized the Association pour la Liberté des Echanges. He also helped to establish and edited for many years the *Journal des économistes* and the *Annuaire de l'économie politique* Of the school of *laissez faire*, he was engaged during his whole life in the advancement of the science of political economy, and in the improvement of French commercial education. In 1873 he became a member of the Institute, and in 1876 a senator for the department in which he was born He died in Paris on Sept 25, 1881 Of his writings, the following are the more important *Traité d'économie politique* (1845), *Richard Cobden et la Ligue* (1846), *Traité des finances* (1862), and *Principes du population* (1857)

GARNIER, GERMAIN, Marquis (1754–1821), French politician and economist, was born at Auxerre on Nov 8, 1754. He was educated for the law, and obtained the office of *procureur* to the Châtelet in Paris On the calling of the states-general he was elected as one of the *députés suppléants* of the city of Paris, and in 1791 administrator of the department of Paris. After Aug. 10, 1792, he withdrew to the Pays de Vaud, returning to France in 1795 Two years later he was among the candidates for the Directory, in 1800 he was prefect of Seine-et-Oise. At the Restoration, he received a peerage, became minister of State and member of privy council, and in 1817 was created a marquis. He died at Paris on Oct 4, 1821. His literary reputation depends chiefly on his later works on political economy, especially his admirable translation, with notes and introduction, of Smith's *Wealth of Nations* (1805) and his *Histoire de la monnaie* (2 vols, 1819), which contains much sound and well-arranged material.

GARNIER, JEAN LOUIS CHARLES (1825–1898), French architect, was born in Paris on Nov 6, 1825, and died on Aug. 3, 1898 He was the son of a wheelwright and studied drawing and mathematics at the Petite Ecole de Dessin He then entered the atelier of Lebas Passing the entrance examination of the Ecole des Beaux Arts in 1842, he studied there in the evening, supporting himself by working by day in the offices of Viollet-le-Duc and other architects In 1848 he won the *Grand Prix de Rome* and went to the Villa de Medicis His principal works were the measured drawings of the Forum of Trajan and the temple of Vesta in Rome and the temple of Serapis at Pozzuoli. Garnier's other works include the imperial academy of music, the casino at Monte Carlo, the Bischoffsheim villa at Bordighera, the Hotel du Cercle de la Librairie in Paris and his tombs for the musicians Bizet, Offenbach, Massé and Duprato. In 1874 he was elected a member of the Institute of France.

See L. G. B. P. Larroumet, "La vie de Charles Garnier," in *L'Ami des Monuments Français*, xviii., 65, 224; xix., 18 (1904–05).

GARNIER, MARIE JOSEPH FRANÇOIS [Francis] (1839–1873), French officer and explorer, was born at St. Étienne on July 25, 1839. He entered the navy, and after voyaging in Brazilian waters and the Pacific he obtained a post on the staff of Admiral Charner, who from 1860 to 1862 was campaigning in Cochin-China. After some time spent in France he returned to the East, and in 1862 he was appointed inspector of the natives in Cochin-China, and entrusted with the administration of Cho-lon, a suburb of Saigon At his suggestion the marquis de Chasseloup-Laubat sent a mission to explore the valley of the Mekong. Garnier accompanied Captain Doudart de Lagrée on this expedition From Kratie in Cambodia to Shanghai 5,392 m were traversed, and of these 3,625 m, chiefly of country unknown to European geography The area was surveyed with care, and the positions fixed by astronomical methods, most of the observations being taken by Garnier himself Volunteering to lead a detachment to Talifu, the capital of Sultan Suleiman, the sovereign of the Mohammedan rebels in Yunnan, he successfully carried out the dangerous enterprise When shortly afterwards Lagrée died, Garnier conducted the expedition in safety to the Yang-tsze-Kiang, and thus to the Chinese coast The preparation of his narrative, after his return to France, was interrupted by the Franco-German War, and during the siege of Paris he served as principal staff officer to the admiral in command of the eighth "sector" Returning to Cochin-China he found the political circumstances of the country unfavourable to further exploration, turned to China, and in 1873 followed the upper course of the Yang-tsze-Kiang to the waterfalls He was next commissioned by Admiral Dupré, governor of Cochin-China, to found a French protectorate or a new colony in Tongking On Nov 20, 1873 he took Hanoi, the capital of Tongking, and on the 21st of December he was slain in fight with the Black Flags His chief fame rests on the fact that he originated the idea of exploring the Mekong, and carried out the larger portion of the work.

The narrative of the principal expedition appeared in 1873, as *Voyage d'exploration en Indo-Chine effectué pendant les années 1866, 1867 et 1868, publié sous la direction de M Francis Garnier, avec le concours de M Delaporte et de M M Joubert et Thorel* (2 vols). An account of the Yang-tsze-Kiang from Garnier's pen is given in the *Bulletin de la Soc de Géog* (1877) His *Chronique royale du Cambodje*, was reprinted from the *Journal Asiatique* in 1872 See *Ocean Highways* (1874) for a memoir by Colonel Yule, Petit, *Francis Garnier* (1885) and Hugh Clifford, *Further India*, in the Story of Exploration series (1904).

GARNIER, ROBERT (*c* 1545–*c* 1600), French tragic poet, was born at Ferté Bernard (Le Maine) He published his first work while still a law-student at Toulouse, where he won a prize (1565) in the *jeux floraux* It was a collection of lyrical pieces, now lost, entitled *Plaintes amoureuses de Robert Garnier* (1565). After some practice at the Parisian bar, he became *conseiller du roi* in his native district, and later *lieutenant-général criminel*

In his early plays Garnier was a close follower of the Senecan school. His pieces in this rhetorical manner are *Porcie* (published 1568, acted at the hôtel de Bourgogne in 1573), *Cornélie* and *Hippolyte* (both acted in 1573 and printed in 1574) His next group of tragedies—*Marc-Antoine* (1578), *La Troade* (1579), *Antigone* (acted and printed 1580)—shows an advance on the theatre of Etienne Jodelle and Jacques Grévin, and on his own early plays, since the rhetoric is accompanied by some action

In 1582 and 1583 he produced his two masterpieces *Bradamante* and *Les Juives* In *Bradamante*, which alone of his plays has no chorus, he cut himself adrift from Senecan models, and sought his subject in Ariosto, the result being what came to be known later as a tragi-comedy. The dramatic and romantic story becomes a real drama in Garnier's hands, though even there the lovers, Bradamante and Roger, never meet on the stage. The contest in the mind of Roger supplies a genuine dramatic interest. *Les Juives* has for its theme the story of the barbarous vengeance of Nebuchadrezzar on the Jewish king Zedekiah and his children. This tragedy, although almost entirely elegiac in conception, gains

unity by the personality of the prophet. Faguet says that of all French tragedies of the 16th and 17th centuries it is, with *Athalie*, the best constructed with regard to the requirements of the stage. Actual representation is continually in the mind of the author; his drama is, in fact, visually conceived

The best edition of his works is by Wendelin Foerster (Heilbronn, 4 vols., 1882–83). A detailed criticism of his works is to be found in Emile Faguet, *La Tragédie française au XVIe siècle* (1883, pp 183–307)

GARNIER-PAGÉS, LOUIS ANTOINE (1803–1878), French politician, was born at Marseilles on Feb. 16, 1803 His brother ETIENNE (1801–1841) was secretary of the society *Aidetoi, le ciel t'aidera,* under the Restoration, supported the revolution of July and sat in the Chamber of Deputies from 1831 until his death Louis Antoine fought on the barricades in 1830, and after his brother's death was elected to the Chamber He was a leading spirit in the affair of the reform banquet fixed for Feb 22, 1848 He was a member of the provisional government of 1848, and was named mayor of Paris On March 5, he was made minister of finance, and incurred great unpopularity by the imposition of additional taxes He was a member of the Constituent Assembly and of the Executive Commission Under the Empire he was conspicuous in the republican opposition and opposed the war with Prussia, and after the fall of Napoleon III became a member of the Government of National Defence Unsuccessful at the elections for the National Assembly in 1871, he retired into private life, and died in Paris on Oct 31, 1878 He wrote *Histoire de la révolution de 1848* (8 vols , 1860–1862), *Histoire de la commission exécutive* (1869–1872), and *L'Opposition et l'empire* (1872)

GARNISH: *see* ATTACHMENT, EXECUTION, BANKRUPTCY

GARO HILLS, a district of British India, in the Assam valley division of Assam Area 3,140 sq m Pop (1921) 179,140 It takes its name from the Garos, a tribe of Tibeto-Burma origin, by whom it is almost entirely inhabited The Garos are probably a section of the great Bodo tribe, which at one time occupied a large part of Assam In the 18th century they were a terror to the inhabitants of the plains below their hills The early period of British rule is a record mainly of raids by the Garos, followed by blockades of the hills At last in 1866 a British officer was posted among the hills with a small police force This step was effective in putting a stop to raids till 1871–72, when further outrages were committed by some independent Garos It was decided to annex their territory A police force marched through the hills, the heads taken in the raids were surrendered and there were no further disturbances

The district consists of the last spurs of the Assam hills, which here run down almost to the bank of the Brahmaputra where that river debouches upon the plain of Bengal and takes its great sweep to the south The administrative headquarters are at Tura, where the American Baptist mission maintains a branch Coal in large quantities and petroleum are known to exist in the hills Nomadic cultivation is practised, *i e* , patches of forest are burnt and cleared with the axe and crops are grown among the ashes These patches are cultivated for a few years and then left, fresh areas being cleared in the same way Nearly half of the cotton grown in Assam is raised by the Garos it is remarkable for a short staple and woolly fibre, which has led to its being mixed with wool for carpet making

The Garos are an Assam tribe of the Bodo group which seems to have migrated from the direction of Bhutan, but probably absorbed some pre-existing local stock (wavy and even curly hair is frequent); the existing culture suggests Indonesian affinities A Tibeto-Burmese language is spoken, the tribe is related to the Rabhas, Kacharis and Tipperas

Villages are built on river banks, the houses raised on piles; land is communal and cultivation shifting, rice and cotton being grown Garos are good fishermen but indifferent hunters Distension of the ear is practised There are a dozen sub-tribes with varying customs and dialects, but all are divided into matrilineal clans Marriage is exogamous and polygamous and the proposal comes from the woman, who, if accepted, lives for a time in the bridegroom's house on probation, but this system is subject to compulsory cross-cousin marriage coupled with a rule by which a man must marry his wife's father's widow, who is in such cases the husband's father's sister, actual or classificatory Such a wife takes precedence of her daughter married before her A man's sister's son, called his *nokrom,* stands therefore in intimate relationship to him, as the husband of one of the daughters and ultimately of his widow and the vehicle through which his family's interest in the property of his wife is secured for the next generation, for no male can inherit property.

The dead are buried, followed by various forms of secondary disposal including urn burial, burial by water and sometimes by special treatment of the frontal bone Head-hunting (*q v*) used to be practised, enemy skulls being kept in the latrines, and there are faint traces of cannibalism and human sacrifice in the past Religion is generally animistic, but provides a benevolent creator and a sort of vague ancestor worship with soul figures of wood or stone, probably phallic, and a fertility cult which involves the sacrifice of an imitation horse They believe in the reincarnation of the soul. (*See* also ASIA *Ethnology;* HEAD-HUNTING, LYCANTHROPY, METEMPSYCHOSIS)

See A. Playfair, *The Garos* (1909)

GARONNE (Lat *Garumna*), a river of south-western France, rising in the Maladetta group of the Pyrenees and flowing in a wide curve to the Atlantic ocean It is formed by two torrents, one of which has a subterranean course of 2½ m , disappearing in the sink known as the Trou du Taureau ("bull's hole") and reappearing at the Goueil de Jouéou After a course of 30 m in Spanish territory, during which it flows through the fine gorge, the Vallée d'Aran, the Garonne enters France in the department of Haute Garonne through the narrow defile of the Pont du Roi, and at once becomes navigable for rafts At Montréjeau it receives on the left the Neste, and encountering at this point the vast plateau of Lannemezan turns abruptly east, flowing in a wide curve to Toulouse At Saint Martory it gives off the irrigation canal of that name At this point the Garonne enters a fertile plain, and supplies the motive power to several mills It is joined on the right by various streams fed by the snows of the Pyrenees Such are the Salat, at whose confluence river navigation begins, and the Arize and the Ariège (both names signifying "river")

From Toulouse the Garonne flows to the north-west, now skirting the northern border of the plateau of Lannemezan which here drains into it by the Save, Gers and Baise On its right the Garonne receives its two chief tributaries, the Tarn, near Moissac, and the Lot, below Agen, afterwards it is joined by the Drot (or Dropt), and on the left by the Ciron Between Toulouse and Castets, 33½ m above Bordeaux, the river is accompanied at a distance of from ½ m to 3 m by the so-called "lateral canal" of the Garonne, constructed in 1838–56 This canal is about 120m long From Toulouse to Agen the main canal follows the right bank of the Garonne, crossing the Tarn on an aqueduct at Moissac, while another aqueduct carries it across the Garonne at Agen It has a fall of 420 ft and over 50 locks The carrying trade upon it is chiefly in agricultural produce and provisions, building materials, wood and industrial products At Toulouse the canal connects with the Canal du Midi, which runs to the Mediterranean

After passing Castets the Garonne begins to widen out considerably to about 650 yd at Bordeaux, its great commercial port From here it flows between two flat shores to the Bec d'Ambès (15½ m), where, after a course of 357 m , it unites with the Dordogne to form the vast estuary known as the Gironde The peninsula lying between these two great tidal rivers, the entre-deux-mers ("between two seas"), is famous for its wines The drainage area of the Garonne is nearly 33,000 square miles. Floods are of common occurrence, and descend very suddenly The most disastrous occurred in 1875, 1856 and in 1770, when the flood level at Castets attained the record height of 42½ ft above low-water mark

GAR-PIKE (*Lepidosteus*) a genus of fishes with four, or perhaps more, species in the rivers of North and Central America, with elongate body covered with hard rhombic scales, with the jaws produced, and with strong conical teeth Fishes with ganoid scales of the same structure were abundant in Mesozoic times.

but *Lepidosteus* is not known before the Eocene. In the bill-fish or long-nosed gar (*L. osseus*) the jaws are exceedingly long and slender, in other species shorter and broader. The alligator gar of Cuba, Mexico and the southern States, reaches a length of 10 ft. These are piscivorous fishes, of sluggish habits, but very voracious. The name gar or garfish is also given to the Belonidae, fishes of warm seas, slender and with long jaws, but with thin cycloid scales, and not related to the gar-pikes.

GARRET, properly a small look-out tower built on a wall, and hence the name given to a room on the top storey of a building, the sloping ceiling of which is formed by the roof

GARRETT, JOÃO BAPTISTA DA SILVA LEITÃO DE ALMEIDA, VISCONDE DE ALMEIDA-GARRETT (1799–1854), perhaps the greatest Portuguese poet since Camoens, was born in Oporto; but the French invasion of Portugal drove the family to the Azores, and Garrett made his first studies at Angra Going to the University of Coimbra in 1816 he soon earned notoriety by the precocity of his talents and his fervent Liberalism His tragedy *Lucrecia* was played there in Feb 1819, and he also wrote *Merope* and a great part of *Cato*, all these plays belonging to the so-called classical school Leaving Coimbra with a law degree, he proceeded to Lisbon, and on Nov 11, 1822, married D Luiza Midosi; but the alliance proved unhappy and a formal separation took place in 1839

The reactionary movement against the Radical revolution of 1820 reached its height in 1823, and Garrett had to leave Portugal by order of the Absolutist ministry then in power, and went to England. He became acquainted with the masterpieces of the English and German romantic movements during his stay abroad

Imbued with the spirit of nationality, he wrote in 1824 at Havre the poem *Camões*, which destroyed the influence of the worn-out classical and Arcadian rhymers, and in the following year composed the patriotic poem *D Branca* He was permitted to return to Portugal in 1826, and thereupon devoted himself to journalism His defence of Liberal principles brought him three months' imprisonment and when D. Miguel was proclaimed absolute king on May 3, 1828, Garrett had again to leave the country. He spent the next three years in and about Birmingham, Warwick and London Sailing in Feb 1832, he disembarked at Terceira, whence he passed to S Miguel, then the seat of the Liberal government Here he became a co-operator with the statesman Mousinho da Silveira, and assisted him in drafting those laws which were to revolutionize the whole framework of Portuguese society In his spare time he wrote some of the beautiful lyrics afterwards collected into *Flores sem Fructo* (1845) He took part in the expedition that landed at Mindello on July 8, 1832, and in the occupation of Oporto Early in the siege he sketched out, under the influence of Walter Scott, the historical romance *Arco de Sant' Anna* (1845–51)

In 1834–35 he served as consul-general and *chargé d'affaires* at Brussels, later the government employed him to draw up a proposal for the construction of a national theatre, and a school of dramatists and actors arose under his influence To give them models, he proceeded to write a series of prose dramas, choosing his subjects from Portuguese history He began in 1838 with the *Auto de Gil Vicente* and followed this up in 1842 by the *Alfageme de Santarem*, and in 1843 by *Frei Luiz de Sousa*, one of the few great tragedies of the 19th century, a work as intensely national as *The Lusiads* and written in a restrained and beautiful prose.

Entering parliament in 1837, Garrett soon made his mark as an orator He brought in a literary copyright bill, which, when it became law in 1851, served as a precedent for similar legislation in England and Prussia. He wrote about this time the drama *D. Filippa de Vilhena* (1840), founded on an event in the revolution of 1640 In July 1843 an excursion to Santarem resulted in a prose masterpiece *Viagens na minha terra*. He took no part in the civil war that followed the revolution of Maria da Fonte He spent much of the year 1850 in finishing his *Romanceiro*, a collection of folk-poetry of which he was the first to perceive the value; and in June 1851 he was created a viscount. In 1852 he became for a short time minister of foreign affairs In 1853 he brought out *Folhas Cahidas*, a collection of short poems exquisite in form. He died on Dec. 9, 1854, and on May 3, 1903, his remains were translated to the national pantheon, the Jeronymos at Belem, where they rest near to those of Herculano and Camoens As poet, novelist, journalist, orator and dramatist, he deserves the remark of Rebello da Silva. "Garrett was not a man of letters only but an entire literature in himself."

Besides his strong religious faith, Garrett was endowed with a deep sensibility, a creative imagination, rare taste and a singular capacity for sympathy. He was first and always an artist. His artistic temperament explains his many-sided activity, his expansive kindliness, his seductive charm, especially for women, his patriotism, his aristocratic pretensions, his huge vanity and dandyism and the ingenuousness that absolves him from many faults in an irregular life. From his rich artistic nature sprang his profound, sincere, sensual and melancholy lyrics, the variety and perfection of his scenic creations, the splendour of his eloquence, the truth of his comic vein, the elegance of his lighter compositions The complete collection of his works comprises 24 volumes

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GARRICK, DAVID (1717–1779), English actor and theatrical manager, was descended from a good French Protestant family named Garric or Garrique of Bordeaux, which had settled in England on the revocation of the Edict of Nantes His father, Captain Peter Garrick, who had married Arabella Clough, the daughter of a vicar choral of Lichfield cathedral, was on a recruiting expedition when his famous third son was born at Hereford on Feb 19, 1717 Captain Garrick, who had made his home at Lichfield, in 1731 rejoined his regiment at Gibraltar This kept him absent from home for many years, during which letters were written to him by "little Davy," acquainting him with the doings at Lichfield On his father's return from Gibraltar, David, who had previously been educated at the grammar school of Lichfield, was sent with his brother George to the "academy" at Edial just opened in June or July 1736 by Samuel Johnson, the senior by seven years of David, who was then 19 This seminary was, however, closed in about six months, and on March 2, 1737, both Johnson and Garrick left Lichfield for London—Johnson, as he afterwards said, "with twopence halfpenny in his pocket," and Garrick "with three-halfpence in his" Johnson, whose chief asset was the ms tragedy of *Irene*, was at first the host of his former pupil, who, however, before the end of the year went to live at Rochester with John Colson (afterwards Lucasian professor at Cambridge) Captain Garrick died about a month after David's arrival in London Soon afterwards, his uncle, a wine merchant at Lisbon, having left David a sum of £1,000, he and his brother entered into partnership as wine merchants in London and Lichfield, David taking up the London business The concern was not prosperous, and before the end of 1741 he had spent nearly half of his capital

His passion for the stage completely engrossed him; he tried his hand both at dramatic criticism and at dramatic authorship His first dramatic piece, *Lethe*, or *Aesop in the Shades* was played at Drury Lane on April 15, 1740, and he became a well-known frequenter of theatrical circles His first appearance on the stage was made in March 1741, *incognito*, as harlequin at Goodman's Fields, Yates, who was ill, having allowed him to take his place during a few scenes of the pantomime entitled *Harlequin Student*, or *The Fall of Pantomime with the Restoration of the Drama* Garrick subsequently accompanied a party of players from the same theatre to Ipswich, where he played his first part as an actor under the name of Lyddal, in the character of Aboan (in Southerne's *Oroonoko*) On Oct 19, 1741 he made his appearance at Goodman's Fields as Richard III and gained the most enthusiastic applause Among the audience was Macklin, whose performance of Shylock, early in the same year, had pointed the way along which

Garrick was so rapidly to pass in triumph On the morrow the latter wrote to his brother at Lichfield, proposing withdrawal from the partnership. Meanwhile, each night had added to his popularity on the stage The town, as Gray (who, like Horace Walpole, at first held out against the *furore*) declared, was "horn-mad" about him. Before his Richard had exhausted its original effect, he won new applause as Aboan, and soon afterwards as Lear and as Pierre in Otway's *Venice Preserved,* as well as in several comic characters (including that of Bayes) Glover ("Leonidas") attended every performance, the duke of Argyll, Lords Cobham and Lyttelton, Pitt and others praised the new actor Within the first six months of his theatrical career he acted in 18 characters of all kinds, and from Dec. 2, he appeared in his own name. Pope went to see him three times during his first performances, and pronounced that "that young man never had his equal as an actor, and he will never have a rival." Garrick's farce of *The Lying Valet,* in which he performed the part of Sharp, was at this time brought out with so much success that he ventured to send a copy to his brother.

His fortune was now made, and while the managers of Covent Garden and Drury Lane resorted to the law to make Giffard, the manager of Goodman's Fields, close his little theatre, Garrick was engaged by Fleetwood for Drury Lane for the season of 1742 In June of that year he went over to Dublin He was accompanied by Margaret (Peg) Woffington, of whom he had been for some time a fervent admirer From Sept 1742 to April 1745 he played at Drury Lane, after which he again went over to Dublin. Here he remained during the whole season, as joint-manager with Sheridan, in the direction and profits of the Theatre Royal in Smock Alley In 1746–47 he fulfilled a short engagement with Rich at Covent Garden, his last series of performances under a management not his own With the close of that season Fleetwood's patent for the management of Drury Lane expired, and Garrick, in conjunction with Lacy, purchased the property of the theatre, together with the renewal of the patent; contributing £8,000 as two-thirds of the purchase-money In Sept 1747 it was opened with a strong company of actors, Johnson's prologue being spoken by Garrick, while the epilogue, written by him, was spoken by Mrs. Woffington Garrick was surrounded by many eminent players, and he had the art, as he was told by Mrs Clive, "of contradicting the proverb that one cannot make bricks without straw, by doing what is infinitely more difficult, making actors and actresses without genius" The naturalness of his acting fascinated those who, like Partridge in *Tom Jones,* listened to nature's voice, and justified the preference of more conscious critics To be "pleased with nature" was, as Churchill wrote, in the *Rosciad* (1761), to be pleased with Garrick For the stately declamation, the sonorous, and beyond a doubt impressive, chant of Quin and his fellows, Garrick substituted rapid changes of passion and humour in both voice and gesture, which held his audiences spellbound Garrick's French descent and his education may have contributed to give him the vivacity and versatility which distinguished him as an actor; and nature had given him an eye, if not a stature, to command, and a mimic power of wonderful variety The list of his characters in tragedy, comedy and farce would be extraordinary for a modern actor of high rank, it includes not less than 17 Shakespearian parts. As a manager he did good service to the theatre and signally advanced the popularity of Shakespeare's plays, of which not less than 24 were produced at Drury Lane under his management Many of these were not pure Shakespeare, and he is credited with the addition of a dying speech to the text of *Macbeth.* On the other hand, Tate Wilkinson says that Garrick's production of *Hamlet* in 1773 was well received at Drury Lane even by the galleries, "though without their favourite acquaintances the gravediggers." Among his published adaptations are an opera, *The Fairies* (from *Midsummer Night's Dream*) (1755), an opera *The Tempest* (1756); *Catherine and Petruchio* (1758); *Florizel and Perdita* (1762) But not every generation has the same notions of the way in which Shakespeare is best honoured Few sins of omission can be charged against Garrick as a manager, but he refused Home's *Douglas,* and made the wrong choice between *False Delicacy* and *The Good Natur'd Man.* For the rest, he purified the stage of much of its grossness, and introduced a relative correctness of costume and decoration unknown before To the study of English dramatic literature he rendered an important service by bequeathing his then unrivalled collection of plays to the British Museum.

After escaping from the chains of his passion for the beautiful but reckless Mrs. Woffington, Garrick had in 1749 married Mademoiselle Violette (Eva Maria Veigel), a German lady who had attracted admiration at Florence or at Vienna as a dancer, and had come to England early in 1746, where her modest grace and the rumours which surrounded her created a *furore* Garrick, who called her "the best of women and wives," lived most happily with her in his villa at Hampton, acquired by him in 1754, whither he was glad to escape from his house in Southampton street To this period belongs Garrick's quarrel with Barry, the only actor who even temporarily rivalled him in the favour of the public In 1763 Garrick and his wife visited Paris, where they were cordially received and made the acquaintance of Diderot and others at the house of the baron d'Holbach. Grimm extolled Garrick as the first and only actor who came up to the demands of his imagination, and it was in a reply to a pamphlet occasioned by Garrick's visit that Diderot set forth the views expounded in his *Paradoxe sur le comédien* After some months spent in Italy, where Garrick fell seriously ill, they returned to Paris in the autumn of 1764 and made more friends, reaching London in April 1765 Their union was childless, and Mrs Garrick survived her husband until 1822. Her portrait by Hogarth is at Windsor castle.

Garrick practically ceased to act in 1766, but he continued the management of Drury Lane, and in 1769 organized the Shakespeare celebrations at Stratford-on-Avon Of his best supporters on the stage, Mrs Cibber, with whom he had been reconciled, died in 1766, and Mrs (Kitty) Clive retired in 1769 Garrick sold his share in the property in 1776 for £35,000, and took leave of the stage by playing a round of his favourite characters—Hamlet, Lear, Richard and Benedick, among Shakespearian parts; Lusignan in *Zara,* Aaron Hill's adaptation of Voltaire's *Zaire,* and Kitely in his own adaptation of Ben Jonson's *Every Man in his Humour,* Archer in Farquhar's *Beaux' Stratagem,* Abel Drugger in Ben Jonson's *Alchemist;* Sir John Brute in Vanbrugh's *Provoked Wife;* Leon in Fletcher's *Rule a Wife and have a Wife.* He ended the series, as Tate Wilkinson says, "in full glory" with "the youthful Don Felix" in Mrs. Centlivre's *Wonder* on June 10, 1776. He died in London on Jan 20, 1779 He was buried in Westminster Abbey at the foot of Shakespeare's statue

In person, Garrick was a little below middle height; in his later years he seems to have inclined to stoutness The extraordinary mobility of his whole person, and his power of as it were transforming himself at will, are attested by many anecdotes and descriptions, but the piercing power of his eye must have been his most irresistible feature The most discriminating character of Garrick, slightly tinged with satire, is that drawn by Goldsmith in his poem of *Retaliation* Garrick was often happy in his epigrams and occasional verse, including his numerous prologues and epilogues He had the good taste to recognize, and the spirit to make public his recognition of, the excellence of Gray's odes at a time when they were either ridiculed or neglected His dramatic pieces, *The Lying Valet,* adapted from Motteux's *Novelty Lethe* (1740), *The Guardian, Linco's Travels* (1767), *Miss in her Teens* (1747), *Irish Widow,* etc , and his alterations and adaptations of old plays, which together fill four volumes, evinced his knowledge of stage effect and his appreciation of lively dialogue and acting He was joint author with Colman of *The Clandestine Marriage* (1766), in which he is said to have written his famous part of Lord Ogleby

Garrick's *Private Correspondence* (published in 1831–32, with a short memoir by Boaden, in 2 vols 4to), which includes his extensive *Foreign Correspondence* with distinguished French men and women, and the notices of him in the memoirs of Cumberland, Hannah More and Madame D'Arblay, and above all in Boswell's *Life of Johnson,* bear testimony to his many attractive qualities as a companion and to his fidelity as a friend

BIBLIOGRAPHY.—A collection of unprinted Garrick letters is in the Forster library at South Kensington. A list of publications of all kinds for and against Garrick will be found in R. Lowe's *Bibliographical History of English Theatrical Literature* (1887) The earlier biographies of Garrick are by Arthur Murphy (2 vols, 1801) and by the bookseller Tom Davies (2 vols, 4th ed, 1805), the latter a work of some merit, but occasionally inaccurate and confused as to dates; and a searching if not altogether sympathetic survey of his verses is furnished by Joseph Knight's valuable *Life* (1894) Percy Fitzgerald's *Life* (2 vols, 1868, new edition, 1899) is full and spirited, and has been reprinted, with additions, among Sir Theodore Martin's *Monographs* (1906) *See* also C Gaehde, *David Garrick als Shakespeare-Darsteller*, etc. (1904); Mrs. Parsons' *Garrick, and his Circle* and *Some unpublished Correspondence of David Garrick* ed G P. Baker (Boston, Mass, 1907) and F A. Hedgcock, *A cosmopolitan actor, David Garrick and his French friends, etc* (1912)

As to the portraits of Garrick, *see* W T. Lawrence in *The Connoisseur* (April 1905). That by Gainsborough at Stratford-on-Avon was preferred by Mrs Garrick to all others. Several remain from the hand of Hogarth, including the famous picture of Garrick as Richard III The portraits by Reynolds include the celebrated "Garrick between Tragedy and Comedy" Zoffany's are portraits in character Roubiliac's statue of Shakespeare, for which Garrick sat, and for which he paid the sculptor 300 guineas, was originally placed in a small temple at Hampton, and is now in the British Museum

GARRISON, WILLIAM LLOYD (1805–1879), the American anti-slavery leader, was born in Newburyport (Mass.), on Dec 10, 1805 His parents were from the British province of New Brunswick The father, Abijah, a sea captain, drank heavily and deserted his home when William was a child, and it is not known whether he died at sea or on land The mother, whose maiden name was Lloyd, is said to have been a woman of high character, charming in person and eminent for piety She died in 1823 William had little education but made the most of his opportunities He was set to learn the trade of a shoemaker, first at Newburyport, and then, after 1815, at Baltimore (Md). Then he was apprenticed to a cabinet-maker (at Haverhill, Mass.), but ran away. In Oct. 1818, when he was 14, he was indentured to Ephraim W. Allen, proprietor of the Newburyport *Herald,* to learn the trade of a printer. He soon became an expert compositor, and after a time began to write anonymously for the *Herald.* His communications won the commendation of the editor, who had not at first the slightest suspicion that he was the author He also wrote for other papers with equal success His skill as a printer won for him the position of foreman, while his ability as a writer was so marked that the editor of the *Herald,* when temporarily called away from his post, left the paper in his charge.

The printing-office afforded him an opportunity to increase his meagre education. He was enthusiastic about liberty, the struggle of the Greeks to throw off the Turkish yoke enlisted his sympathy; and at one time he seriously thought of entering the West Point academy and fitting himself for a soldier's career His apprenticeship ended in 1826, when he began the publication of a new paper (actually the old one under a new name), the *Free Press,* in his native place The paper, whose motto was "Our Country, our Whole Country, and nothing but our Country," was an intellectual force, but was too radical for Newburyport, and the enterprise failed Garrison then went to Boston, where, after working for a time as a journeyman printer, he became the editor of the *National Philanthropist,* the first journal established in America to promote the cause of total abstinence from intoxicating liquors; but a change in the proprietorship led to his withdrawal before the end of the year. In 1828 he established the *Journal of the Times* at Bennington (Vt), to support the re-election of John Quincy Adams to the Presidency of the United States This paper also died within a year. In Boston he had met Benjamin Lundy (*q v*), who had for years been preaching the abolition of slavery Garrison had been deeply moved by Lundy's appeals, and after going to Vermont he showed the deepest interest in the slavery question Lundy was then publishing in Baltimore a small monthly paper, *The Genius of Universal Emancipation,* and he went to Bennington and invited Garrison to join him in the editorship His mission was successful.

Garrison first accepted Lundy's views of gradual emancipation, but soon changed to total and immediate freedom for slaves when he joined Lundy in Baltimore in 1829 Lundy believed that the negroes, on being emancipated, must be colonized somewhere beyond the limits of the United States; Garrison held that they should be emancipated on the soil of the country, with all the rights of freemen Garrison saw that it would be idle to expose and denounce the evils of slavery, while responsibility for the system was placed upon former generations, and the duty of abolishing it transferred to an indefinite future His demand for immediate emancipation fell like a tocsin upon the ears of slaveholders. The *Genius,* when it became a vehicle for this dangerous doctrine, was feared and hated Baltimore was then one of the centres of the domestic slave trade, and upon this traffic Garrison heaped the strongest denunciations He was prosecuted for libel by the owner of a slave-carrying vessel, was fined $50, and, in default of payment, committed to gaol.

John G. Whittier interceded with Henry Clay to pay Garrison's fine and thus release him from prison. Clay responded favourably, but before he could act Arthur Tappan, a philanthropic merchant of New York, contributed the necessary sum and set the prisoner free after an incarceration of seven weeks The partnership between Garrison and Lundy was then dissolved by mutual consent, and Garrison resolved to establish a paper of his own, in which he could advocate the doctrine of immediate emancipation and oppose the scheme of African colonization He first proposed to establish his paper at Washington, in the midst of slavery, but on returning to New England and observing the state of public opinion there, he came to the conclusion that little could be done in the South while the non-slaveholding North was lending her influence for the sustenance of slavery He determined, therefore, to publish his paper in Boston, and set himself to the task of awakening an interest in the subject by lectures in some of the principal cities and towns of the North In Boston, then a great cotton mart, he tried in vain to procure a church or vestry for the delivery of his lectures, until a body of infidels under the leadership of Abner Kneeland (1774–1844), proffered him the use of their small hall He accepted it gratefully, and delivered (in Oct 1830) three lectures, in which he unfolded his principles and plans

On Jan 1, 1831, without capital and without a subscriber, he and his partner, Isaac Knapp (1804–43), issued the first number of the *Liberator,* avowing their "determination to print it as long as they could subsist on bread and water, or their hands obtain employment" Its motto "Our country is the world—our countrymen are mankind," shows his changed viewpoint. The paper in addition to favouring abolition, attacked war, alcoholic liquors and tobacco, and assailed freemasonry, capital punishment, and imprisonment for debt The editor, in his address to the public, uttered the words which have become memorable as embodying the whole purpose and spirit of his life "I am in earnest—I will not equivocate—I will not excuse—I will not retreat a single inch —and I will be heard" For many months Garrison and his partner made their bed on the floor of the room in which they printed their paper, and where Mayor Harrison Gray Otis of Boston, in compliance with the request of Governor Robert Y. Hayne of South Carolina, "ferreted them out" Otis decided, however, that the paper could not be suspended In the same year (1831), $5,000 reward was offered for Garrison's arrest and conviction under the laws of Georgia. The *Liberator,* though in constant financial difficulties, exerted a mighty influence, and lived to record not only President Lincoln's proclamation of emancipation, but the adoption of an amendment to the Constitution of the United States for ever prohibiting slavery

Garrison was a pacifist, and sought the abolition of slavery by moral means alone He knew that the National Government had no power over the system in any State, though he thought it should bring its moral influence to bear in favour of abolition. His idea was to combine the moral influence of the North, and pour it through every open channel upon the South To this end he made his appeal to the Northern churches and pulpits, beseeching them to bring the power of Christianity to bear against the slave system, and to advocate the rights of the slaves to immediate and unconditional freedom When they did not respond, he denounced them, and by 1840 had become very unorthodox The first society organized under Garrison's auspices, and in accordance with his

principles, was the New England anti-slavery society in Jan. 1832. The same spring Garrison issued his *Thoughts on African Colonization,* in which he showed from official documents that the American colonization society was organized in the interest of slavery, and that in offering itself as a practical remedy for that system it was guilty of deception Garrison was deputed by the New England anti-slavery society to visit England for the purpose of counteracting the influence there of agents of the colonization society. He went in the spring of 1833, and was received with great cordiality by British abolitionists He took home with him a "protest" against the American colonization society signed by Wilberforce, Zachary Macaulay, Samuel Gurney, William Evans, S Lushington, T. Fowell Buxton, James Cropper, Daniel O'Connell and others

Garrison's visit to England enraged the pro-slavery people, and when he returned in September with the "protest" against the colonization society, and announced that he had engaged the services of George Thompson as a lecturer against American slavery, there were fresh outbursts The American anti-slavery society was organized in December of that year (1833), the declaration of its principles coming from Garrison's pen The activities of this society and Thompson's lectures aroused such fury that, in the autumn of 1835, Thompson was compelled to return secretly to England He had announced that he would address the women's anti-slavery society in Boston, and a mob gathered Not finding him, it seized Garrison and dragged him through the streets until he was rescued, and protected in the gaol until he could leave the city in safety

The abolitionists of the United States were a united body until 1839–40 when division occurred Garrison countenanced the activity of women in the cause, even appointing them as lecturing agents, moreover, he believed in the political equality of the sexes, to which a strong party was opposed upon social and religious grounds His attack on the churches caused dissent. Many believed that Garrison injured abolitionism by causing it to be associated in men's minds with these unpopular views on other subjects These differences led to the organization of a new national anti-slavery society in 1840, and to the formation of the "Liberty Party" (*q v*) in politics (*see* BIRNEY, JAMES G). The two societies sent their delegates to the world's anti-slavery convention in London in 1840, and Garrison refused to take his seat in that body, because the women delegates from the United States were excluded The discussions of the next few years served to make clearer than before that the Constitution of the United States supported slavery, and Garrison came to the conclusion that its pro-slavery clauses were immoral, and that it was therefore wrong to take an oath for its support Because of this, Garrison burned the Constitution, denouncing it as "a covenant with death and an agreement with hell" He chose as his motto, "No union with slaveholders," and thereafter worked for peaceful disunion When in 1861 the Southern States seceded from the Union and took up arms against it, he saw clearly that slavery would perish in the struggle and that the Constitution would be purged of its pro-slavery clauses He therefore ceased to advocate disunion, and devoted himself to hastening the inevitable event His services at this period were recognized and honoured by President Lincoln and others in authority, and the whole country knew that the agitation which resulted in the abolition of slavery was largely due to his uncompromising spirit and indomitable courage

In 1865 at the close of the war, he declared that, slavery being abolished, his career as an abolitionist was ended He counselled a dissolution of the American anti-slavery society, insisting that it had become *functus officus,* and that whatever needed to be done for the protection of the freedmen could best be accomplished by new associations formed for that purpose. The *Liberator* was discontinued at the end of the same year, after an existence of 35 years. He visited England for the second time in 1846, and again in 1867, when he was received with distinguished honours, public as well as private In 1869 he became president of the Free Trade League, advocating the abolition of custom houses throughout the world. In 1877, he again visited England, and declined every form of public recognition He died in New York on May 24, 1879, in the 74th year of his age, and was buried in Boston, after a most impressive funeral service, four days later. In 1843 a small volume of his *Sonnets and other Poems* was published, and in 1852 appeared a volume of *Selections from his Writings and Speeches.*

Garrison's son, WILLIAM LLOYD GARRISON (1838–1909), was a prominent advocate of the single tax, free trade, woman's suffrage, and of the repeal of the Chinese Exclusion Act, and an opponent of imperialism. Another son, WENDELL PHILLIPS GARRISON (1840–1907), was literary editor of the New York *Nation* from 1865 to 1906.

BIBLIOGRAPHY —The great authority on the life of Garrison is the thorough and candid work of his sons, W P and F. J Garrison, *William Lloyd Garrison, 1805–1879; The Story of his Life told by his Children* (4 vols, 1885–89). See *Garrison an Outline of his Life* (1879), and *William Lloyd Garrison and his Times* (1880) by Oliver Johnson, a prominent abolitionist and intimate friend of Garrison. Goldwin Smith's *The Moral Crusader; a Biographical Essay on William Lloyd Garrison* (1892) is a brilliant sketch J J Chapman's *Garrison* (1913) is valuable for its picture of the abolition movement, Lindsay Swift, *William Lloyd Garrison* (1911), is a reliable biography though it is too eulogistic, Edward Channing, *A History of the United States* (vol. v. and vi, 1905–25), and Ellis Paxson Oberholtzer, *A History of the United States since the Civil War* (1917–26) give the relation of Garrison to the history of his time

GARROTTE, an appliance used in Spain and Portugal for the execution of criminals (*see* CAPITAL PUNISHMENT). "Garrotting" is the name given in England to a form of robbery with violence which became rather common in the winter of 1862–63 An act of 1863, imposing the penalty of flogging in addition to penal servitude for this offence, had the effect of stopping it almost entirely

GARSHIN, VSEVOLOD MIKHAILOVICH (1855–1888), Russian author, was born in the government of Ekaterinoslav in Feb 1855, the son of a retired army officer From his childhood he had a nervous temperament, and in 1872 he was put under restraint for a year In 1874 he entered the High School of Mines at St Petersburg (now Leningrad), but on the outbreak of the Russo-Turkish War (1877) he enlisted as a private in an infantry regiment Wounded in Aug 1878 he was invalided home; from that time he suffered from frequent attacks of melancholia, and in 1887 he tried to commit suicide by throwing himself down some stone steps, broke his leg, and died in a hospital on March 24, 1888. Many of his best known stories, *The Signal* (1912); *The Coward, Mad Love,* or *An Artist's Dream* (1889); *The Red Flower* (1883); *Attalea Princeps* and *That which was Not* have been translated into English His *Four Days,* written while he was lying wounded at Kharkov, created a great sensation

GARSTANG, JOHN (1876–), British archaeologist, born in Blackburn, was educated at Blackburn Grammar School and Jesus College, Oxford From 1897 onward he directed excavations on various Roman sites in Britain (Ribchester, Richborough, etc), in Egypt, and in Nubia. In 1902 he became honorary reader in Egyptian archaeology, at Liverpool University, and in 1907 professor of the methods and practice of archaeology In the same year he led an expedition to Asia Minor and North Syria. He also conducted excavations on the Hittite site of Sakje-Genzi (1908 and 1911), ancient Meroë (Sudan) (1909–14), and Askalon, (1920–21). During the World War (1915–19) he served voluntarily as liaison officer for the medical services From 1919–26 he held the post of honorary adviser in antiquities to the military administration of Palestine, and from 1920–26 that of director of the department of antiquities of the Government of Palestine.

He has published many books on the results of his researches, including *The Third Egyptian Dynasty* (1911), *Roman Ribchester* (1911,), *A Short History of Ancient Egypt* (with Prof Newberry, 1911); *The Land of the Hittites* (1911), *Notes to an Index of Hittite Geographical Names* (1923)

GARSTIN, SIR WILLIAM EDMUND (1849–1925), British engineer, was born in India on Jan 29, 1849 He was educated at Cheltenham and King's college, London, and in 1872 entered the Indian Public Works department. In 1885 he was transferred to Egypt, and in 1892 became inspector-general of

irrigation and under-secretary of State for Public Works. He proved himself an indefatigable worker, and by his efforts extensive areas were reclaimed in Egypt and the Sudan Among his greatest works were the Asyut barrage and the Aswan reservoir. In addition, it was due to him that the White Nile was cleared of sudd, thus rendering possible free navigation between Khartoum and Gondokoro. He was created K C M.G. in 1897 and G.C.M.G in 1902. In 1907 he was appointed British Government director of the Suez Canal company During the World War he devoted himself to Red Cross work in England, being created G B E in 1918. He died in London on Jan 8, 1925

GARSTON, seaport, Wavertree parliamentary division, Liverpool borough, Lancashire, England, on the Mersey, 6 m S E. of Liverpool Pop (1921) 28,729 The docks of the L M S railway company, with over a mile of quayage are specially equipped for shipping coal

GARTH, SIR SAMUEL (1661–1719), English physician and poet, entered Peterhouse, Cambridge, in 1676, graduating B.A. in 1679, and M A. in 1684 He took his M D. and became a member of the College of Physicians in 1691 In 1697 he delivered the Harveian oration, in which he advocated a scheme for providing dispensaries for the relief of the sick poor as a protection against the greed of the apothecaries In 1699 he published a mock-heroic poem, *The Dispensary,* in six cantos, ridiculing the apothecaries and their allies among the physicians

GARTOK, a trade-market of Tibet, situated on the bank of the Indus on the road between Shigatse and Leh, to the east of Simla In accordance with the Tibet treaty of 1904, Gartok, together with Yatung and Gyantse, was thrown open to British trade. In winter it consists of only a few dozen people whose houses stand in the midst of a bare plain In summer, however, all the trade between Tibet and Ladakh passes through this place

GARUT, a district in the residency of West Preanger, in Java, Dutch East Indies, the seat of an assistant resident, and a native regent. It is Sundanese territory, has a population of 22,141, and is the centre of a well-cultivated region, noted for its tea, rubber and chinchona plantations, but is better known as one of the principal and most beautiful health resorts of Java. Situated at a height of 2,300 ft. above sea-level, the town is very charmingly laid out. The district forms a plateau, around which are grouped magnificent mountains, some volcanoes, with mountain lakes, hot springs and other wonders of nature. Among the most interesting excursions are the crater of the Papandayan, a volcano still active, which blew out the greater part of one side of a mountain in 1772, killing thousands of people and destroying much of the surrounding countryside, and now erupts from the enormous crater hole which is left; the Kawah Kamodyan, a most interesting collection of pools of boiling mud, geysers and fumaroles; the Telega Bodas, or White Lake, situated amidst charming forest scenery; the Kawah Manut, or Bird's Crater; the lakes of Bagendit and Leles, and the hot springs of Chipanas; the lake of Pendjalu; and Mount Chikorai. (E E. L)

GARVIE, ALFRED ERNEST (1861–) English divine, was born on Aug 29, 1861 at Zyrardow, Russian Poland; he was educated privately in Poland and at George Watson's College, Edinburgh He studied for a year at Edinburgh University (1878–79), and after four years in business in Glasgow, spent eight years in study at Glasgow and at Oxford. He was appointed in 1903 a professor at Hackney and New Colleges, London, becoming in 1907 principal of New College. In 1922 he was appointed principal of Hackney College, and from 1924 onward held both posts.

His numerous publications include· *The Ritschlian Theology* (1899), *Handbook of Christian Apologetics* (1913), *The Christian Doctrine of the Godhead* (1925); and *The Preachers of the Church* (1926).

GARY, ELBERT HENRY (1846–1927), American jurist and business man, was born on Oct 8, 1846, and brought up on his father's farm, near Wheaton, Ill He attended public school and Wheaton college, and studied law in the office of his uncle, Col. Vallette He graduated in 1867 from the Union College of Law, which became the law department of the University of Chicago, and later of Northwestern university, Chicago. In 1869 he began his law practice in Chicago. In 1874 he organized the Gary-Wheaton bank, of which he was president. He was elected judge of Du Page county in 1882 and again in 1886. During this period he also frequently held court in Chicago, Cook county, and occasionally presided over important cases in other counties throughout the State of Illinois He was three times elected president of the town of Wheaton, and on its becoming a city in 1890 served as mayor for two terms.

Until 1898 he practised law in Chicago and became a leader and authority in corporation law and insurance matters. He was president of the Chicago Bar Association in 1893–94 In time he became general counsel and a director in a number of large railroads, banks and industrial corporations, including steel and wire companies He early saw the advantages of combination in business In 1891 he was one of the organizers of the Consolidated Steel and Wire Company. In 1898, upon the organization of the Federal Steel Company, with the financial backing of J P. Morgan and Company, he became its first president and retired from legal practice This company was merged in 1901 in the U.S. Steel Corporation, which was then organized with a capital stock exceeding $1,000,000,000, then by far the largest industrial corporation in the world He was elected chairman of the executive committee and later chairman of the board of directors and of the finance committee, and continued to be chief executive officer during 26 years of remarkable development of the steel industry and growth of the corporation

The steel mills and town of Gary, Ind, were laid out in 1906 by the U S Steel Corporation, and later named in his honour. The site was then a waste of sand dunes Twenty years later Gary had grown, following the plans and large investments of the Steel Corporation, under Judge Gary's direction, to be a beautiful city of 100,000 people, with a splendid school system and with enormous and varied mills for the manufacture of iron and steel products Equally important and beneficent developments were similarly carried out under E H Gary's leadership in other parts of the country, including those at Birmingham, Ala, Pittsburgh, Pa, and Duluth, Minn. As chairman of the Steel Corporation, he advocated and established many pioneer measures for the welfare of the employees of industrial corporations, including stock ownership by them and participation in profits, high wages and safe, sanitary and pleasing surroundings He was always a strong advocate and a firm upholder of the "open shop" During his chairmanship the seven-day week and the 12 hour day for labour in the steel mills were abolished. (J A Fa.)

GARY, a city of Lake county, Ind, U S A, at the southern end of Lake Michigan, 25m S E of Chicago It is on Federal highways 12 and 20 and is served by the Baltimore and Ohio, the Michigan Central, the New York Central, the Pennsylvania, and the Wabash railways, two industrial belt railroads, and six interurban trolley lines and by lake steamers The population in 1920 was 55,378, of whom 5,299 were negroes and 16,460 were foreign-born white; and was estimated locally at 110,000 in 1928

Gary is a creation of the United States Steel Corporation, which in 1905 bought a tract of 8,000ac here The site consisted of barren sand dunes and swampy meadows, crossed by the Grand Calumet and the Little Calumet rivers By 1928 the city had an assessed valuation of $152,382,970, 191m of improved streets, 15m. of boulevards, 135m of water mains, 90m of street-car track and a fleet of motor buses, 4m. of bathing beach, and 515ac. of public parks, golf courses and playgrounds A city-planning commission was appointed in 1919, and the city plan (adopted in 1924) includes a comprehensive zoning system, and an ambitious scheme for the "Gary Gateway," providing for a civic centre.

The industries (chiefly subsidiaries of the United States Steel Corporation) represent an investment of $150,000,000, and include the largest steel works, tin-plate mills, rail mills and cement works in the country The heat, light and water company, also a subsidiary of the Steel Corporation, buys the electric current and the gas it distributes from the Illinois Steel company

The schools of Gary provide academic instruction 48 weeks in the year; physical training 52 weeks, on six and a half days each

week. William A. Wirt, the first superintendent of schools, taking advantage of his unique opportunity for experimentation, worked out a system known among educators as the "Gary Plan" or "Platoon Plan," and it has been adopted, with more or less modification, in many cities.

Gary was chartered in 1906, and was named after Elbert H. Gary (1846–1927), chairman of the board of directors of the Steel Corporation At the first Federal census (1910) after the founding of the city, the population was 16,802, and in the following decade it increased more than threefold. The original area has grown to 39 96 sq m At the beginning of the nation-wide strike of steel workers in 1919 (Sept. 22) the walk-out in Gary was almost complete. The city was occupied on Oct. 7 by Federal troops, who were not withdrawn until the strike was called off, on Jan. 7, 1920

For an account of the public school system, *see* F. P. Bachman and R. Bowman, *The Gary Public Schools* (1918).

GAS, a general term for one of the three states of aggregation of matter; also more specifically applied to coal-gas, the gaseous product formed in the destructive distillation of coal or other carbonaceous matter (*see* below, section *Gas Manufacture;* for gas engines *see* the separate heading GAS ENGINE)

The Gaseous State.—Matter is studied under three physical phases—solids, liquids and gases, the latter two being sometimes grouped as "fluids" The gaseous fluid with which we have chiefly to do is our atmosphere Though practically invisible, it appeals in its properties to other of our senses, thus we feel it in its motion as wind, and observe the dynamical effects of this motion in the quiver of the leaf or the motion of a sailing ship

The practically obvious distinction between solids and fluids may be stated in dynamical language thus Solids can sustain a longitudinal pressure without being supported by a lateral pressure, fluids cannot Hence any region of space enclosed by a rigid boundary can be easily filled with a fluid, which then takes the form of the bounding surface at every point of it But here we distinguish between fluids according as they are gases or liquids The gas will always completely fill the region, however small the quantity put in Remove any portion and the remainder will expand so as to fill the whole space again On the other hand, it requires a definite quantity of liquid to fill the region To quote Sir Oliver Lodge: "A solid has volume and shape; a liquid has volume, but no shape; a gas has neither volume nor shape"

It is necessary to distinguish further between a gas and a "vapour" The latter possesses the physical property stated above which distinguishes a gas from a fluid, but it differs from a gas by being readily condensible to liquid, either by lowering the temperature or moderately increasing the pressure The study of the effects of pressure and temperature on many gases led to the introduction of the term "permanent gases," to denote gases which were apparently not liquefiable, but with improved methods these gases have been liquefied and even solidified, thus rendering the term meaningless (*See* LIQUEFACTION OF GASES) "Perfect gas" is applied to an imaginary substance in which there is no frictional retardation of molecular motion, *i.e.*, one which obeys Boyle's law (*See* PHYSICS.)

The study of gases may be divided into two main branches the physical and the chemical. The former investigates essentially general properties, such as the weight and density, the relation between pressure, volume and temperature (piezometric and thermometric properties), calorimetric properties, diffusion, viscosity, electrical and thermal conductivity, etc, and generally properties independent of composition These subjects are discussed in the articles DENSITY, THERMOMETRY; CALORIMETRY, DIFFUSION, CONDUCTION OF HEAT; and CONDENSATION OF GASES The latter has for its province the preparation, collection and identification of gases, and the volume relations in which they combine; in general it deals with specific properties. The historical development of the chemistry of gases—pneumatic chemistry—is treated in the article CHEMISTRY, the technical analysis of gaseous mixtures is treated under CHEMISTRY, *Gas Analysis* Connecting the experimental study of the physical and chemical properties is the immense theoretical edifice termed the kinetic theory of gases. This subject, which is discussed in the article MOLECULE, has for its purpose, (1) the derivation of a physical structure of a gas which will agree with the experimental observations of the diverse physical properties, and (2) a correlation of the physical properties and chemical composition

GAS COAL: *see* COAL AND COAL MINING.

GASCOIGNE, GEORGE (*c.* 1535–1577), English poet, eldest son of Sir John Gascoigne of Cardington, Beds, was born probably between 1530 and 1535 He was educated at Trinity college, Cambridge, and became a member of Gray's Inn in 1555 His escapades were notorious, he was imprisoned for debt, and was obliged to sell his patrimony to pay the debts contracted at court. He was M P for Bedford in 1557–58 and 1558–59, but when he presented himself in 1572 for election at Midhurst he was refused on account of his bad reputation He married the wealthy widow of William Breton, thus becoming step-father to the poet, Nicholas Breton Fighting in the Low Countries in 1572 he was driven by stress of weather to Brill, which had just fallen into the hands of the Dutch. He obtained a captain's commission, and fought in the campaigns of the next two years Taken prisoner after the evacuation of Valkenburg by the English troops, he was sent to England in the autumn of 1574 He dedicated to Lord Grey of Wilton the story of his adventures, *The Fruites of Warres* (printed in the edition of 1575) and *Gascoigne's Voyage into Hollande* In 1575 he had a share in devising the entertainments provided for Queen Elizabeth at Kenilworth and Woodstock Most of his works were actually published during the last years of his life, after his return from the wars He died at Bernack, near Stamford, where he was the guest of George Whetstone, on Oct. 7, 1577

Gascoigne acknowledged Chaucer as his master, and differed from the earlier poets of the school of Surrey and Wyatt chiefly in the added smoothness and sweetness of his verse. His poems were published in 1572 during his absence in Holland with the title *A hundreth Sundrie Floures bound up in one small Posie* followed in 1575 by an authorized edition, *The Posies of G. G Esquire* (not dated). This edition contains as preface a treatise on prosody, apparently the earliest in English, "Certayne Notes of Instruction concerning the making of verse or ryme in English"

Gascoigne was a pioneer in many directions In 1576 he published *The Steele Glas,* sometimes called the earliest regular English satire Although this poem is Elizabethan in form and manner, it is written in the spirit of *Piers Plowman* Gascoigne begins with a comparison between the sister arts of Satire and Poetry, and under a comparison between the old-fashioned "glas of trustie steele," and the new-fangled crystal mirrors which he takes as a symbol of the "Italianate" corruption of the time, he attacks the amusements of the governing classes, the evils of absentee landlordism, the corruption of the clergy, and pleads for the restoration of the feudal ideal

> Againe I see, within my glasse of Steele
> But foure estates, to serve each country soyle,
> The King, the Knight, the Pesant, and the Priest
> The King should care for al the subjects still,
> The Knight should fight, for to defend the same,
> The Pesant, he shoulde labor for their ease,
> And Priests shuld pray, for them and for themselves —
> (Arber's ed p. 57)

His dramatic work belongs to the period of his residence at Gray's Inn, both *Jocasta* (of which Acts I and IV were contributed by Francis Kinwelmersh) and *Supposes* being played there in 1566 *Jocasta* is a literal version of Lodovico Dolce's *Giocasta,* which was derived probably from the *Phoenissae* in the Latin translation of R. Winter *Supposes,* a version of Ariosto's *I Suppositi,* is an early and excellent adaptation of Italian comedy, and "the earliest play in English prose acted in public or private." Udal's *Ralph Roister Doister* had been inspired directly by Latin comedy; *Gammer Gurton's Needle* was a purely native product, but *Supposes* is the first example of the acclimatization of the Italian models that were to exercise so prolonged an influence on the English stage A third play of Gascoigne's, *The Glasse of Government* (published in 1575), is a school drama of the "Prodi-

gal Son" type, familiar on the Continent at the time, but rare in England.

Gascoigne's works not already mentioned include "G G in commendation of the noble Arte of Venerie," prefixed to *The Noble Art of Venerie or Hunting* (1575); *The Complaynte of Phylomene*, bound up with *The Steele Glas* (1576); *The Droomme of Doomes-day* (1576), a prose compilation from various authors, especially from the *De contemptu mundi* of Pope Innocent III, printed with varying titles, earliest ed. (1470?), *A Delicate Diet for daintie mouthde Droonkardes* . . . (1576), a free version of St. Augustine's *De ebrietate The Posies* (1572) included *Supposes, Jocasta, A Discourse of the Adventures of Master F[erdinando] J[eronimi]*, in imitation of an Italian novella, a partly autobiographical *Don Bartholomew of Bath*, and miscellaneous poems *The Whole Workes of G G* . . . appeared in 1587. In 1868–70 *The Complete Poems of G G* . . . were edited for the Roxburghe Library by W C Hazlitt In his *English Reprints* Prof E Arber included *Certayne Notes of Instruction, The Steele Glas* and the *Complaynt of Philomene The Steele Glas* was also edited for the *Library of English Literature*, by Henry Morley, vol i p 184 (1889) A new edition, *The Works of George Gascoigne* (The Cambridge English Classics, 1907, etc) is edited by Dr. J W. Cunliffe *See* also F E Schelling, *The Life and Writings of George Gascoigne* (Publications of the Univ of Pennsylvania series in Philology, vol ii No 4, 1894); C H Herford, *Studies in the Literary Relations of England and Germany in the Sixteenth Century*, pp. 149–164 (1886), and "Gascoigne's Glasse of Government," in *Englische Studien*, vol. ix (Halle, 1877, etc)

GASCOIGNE, SIR WILLIAM (*c.* 1350–1419), chief justice of England in the reign of Henry IV Gascoigne practised as an advocate in the reigns of Edward III and Richard II On the banishment of Henry of Lancaster Gascoigne was appointed one of his attorneys, and soon after Henry's accession to the throne was made chief justice of the court of king's bench After the suppression of the rising in the north in 1405, Henry eagerly pressed the chief justice to pronounce sentence upon Scrope, the archbishop of York, and the earl marshal Thomas Mowbray, who had been implicated in the revolt This he absolutely refused to do, asserting the right of the prisoners to be tried by their peers. Although both were afterwards executed, the chief justice had no part in the transaction The oft-told tale of his committing the prince of Wales to prison is unauthentic, though it is characteristic of Gascoigne's independence Gascoigne appears to have been removed from his post or resigned soon after the accession of Henry V. He died in 1419, and was buried in the parish church of Harewood in Yorkshire

GASCONY (Wasconia), an old province in the south-west of France. It takes its name from the Vascones, a Spanish tribe, which in 580 and 587 crossed the Pyrenees and invaded the district known to the Romans as Novempopulana or Aquitania tertia. Basque, the national language of the Vascones, took root only in a few of the high valleys of the Pyrenees, such as Soule and Labourd; in the plains Latin dialects prevailed, Gascon being a Romance language. In the 7th century the name of Vasconia was substituted for that of Novempopulana. The Vascones readily recognized the sovereignty of the Merovingian kings, but in reality they remained independent They even appointed national dukes, against whom Charlemagne had to fight at the beginning of his reign. Finally Duke Lupus II. made his submission in 819, and the Carolingians were able to establish Frankish dukes in the country. After the death of Duke Arnaud in 864 the history of Gascony falls into the profoundest obscurity In the feudal period Gascony comprised a great number of countships (including Armagnac, Bigorre, Fézensac, Gaure and Pardiac), viscountships (including Béarn, Lomagne, Dax, Juliac, Soule, Marsan, Tartas, Labourd and Maremne) and seigneuries (*e g*, Albret, etc)

During the Hundred Years War Gascony was a battle-field for the forces of England and of France The French seized the duchy, but, aided by the rivalry between the powerful houses of Foix and Armagnac, Edward III was able to recover it, and by the treaty of Bretigny in 1360 John II. recognized the absolute sovereignty of England therein. Handed over as a principality by Edward to his son, the Black Prince, it was used by its new ruler as a base during his expedition into Spain, in which he received substantial help from the Gascon nobles The renewal of the war between England and France, which took place in 1369, was due in part to a dispute over the sovereignty of Gascony, and during its course the whole of the duchy save a few towns and fortresses was lost, but the victories of Henry V. in northern France postponed for a time the total expulsion of the foreigner. This was reserved for the final stage of the war and was one result of the efforts of Joan of Arc, the year 1451 witnessing the capture of Bayonne and the final retreat of the English troops from the duchy

The French kings, especially Louis XI, managed to restore the royal authority in the duchy, although this was not really accomplished until the close of the 15th century when the house of Armagnac was overthrown It was by means of administrative measures that these kings attained their object Gascony was governed on the same lines as other parts of France and from the time of Henry IV, who was prince of Béarn, and who united his hereditary lands with the crown, its history differs very slightly from that of the rest of the country The Renaissance inspired the foundation of educational institutions and the Reformation was largely accepted in Béarn, but not in other parts of Gascony The wars of religion swept over the land, which was the scene of some of the military exploits of Henry IV, and Louis XIV made some slight changes in its government. As may be surmised the boundaries of Gascony varied from time to time, but just before the outbreak of the Revolution they were the Atlantic Ocean, Guienne, Languedoc and the Pyrenees, and from east to west the duchy at its greatest extent measured 170 miles

At the end of the *ancien régime* Gascony was united with Guienne to form a great military government After the division of France into departments, Gascony, together with Béarn, French Navarre and the Basque country, formed the departments of Basses-Pyrénées, Landes, Hautes-Pyrénées and Gers Parts of Gascony also now form arrondissements and cantons of the departments of Lot-et-Garonne, Haute-Garonne, Ariège and Tarn-et-Garonne

See Barrau-Dihigo, "La Gascogne," a bibliography of manuscript sources and of printed works published in the *Revue de synthèse historique* (1903), A Larroquette, *Les landes de Gascogne & la forêt landaise Mort-de-Marsan* (1924), Eleanor C Lodge, *Gascony under English Rule* (1926)

GAS ENGINE: *see* Internal Combustion Engine

GAS-FILLED LAMP: *see* Electric Lamps and Valves, Manufacture of; Lighting

GASHOLDERS. As the manufacture of gas must be maintained at an approximately even rate throughout the 24 hours, while the rate of consumption varies considerably at the different hours of the day, it is necessary to provide storage for the gas produced during the periods of minimum demand, and also to provide against any temporary breakdown in the manufacturing plant In the early days of the gas industry the vessel in which the gas was stored was known as a "gasometer," as this vessel had to serve the dual purpose of storing and measuring the amount of gas made With the advent of the station meter in the year 1820 for measuring the volume of gas, the name of "gasholder" was adopted, but even now in Great Britain journalists and others invariably use the technically obsolete word "gasometer"

The capacity of the gasholder should be equal to at least 75% of the maximum daily output. There are now four distinctive types of gasholders: (1) frame guided, (2) spirally guided, (3) dry or tankless, (4) spherical The frame guided and spirally guided holders may have one or more lifts, the one lift type being known as a single lift holder, and the other as a telescopic gasholder, the latter type being generally adopted for economic reasons The movable vessel in which the gas is stored is known as the floating gasholder The steel structure which guides the floating holder as it ascends or descends is termed the guide framing, and is erected round the circumference of the steel or brick tank which contains the water for sealing the sides of the floating gasholder, thus preventing the escape of gas Gas is admitted into the holder by means of an inlet pipe which passes through the bottom of the tank, and extends to a height of about 6 in above the water level; another similar pipe is provided as an outlet for the gas to the district mains; both pipes being con-

trolled by slide valves.

The telescopic form of holder (fig 1) consists of two or more lifts, which work or slide inside one another, much in the same way as an ordinary telescope The inner or first lift is constructed to a certain diameter, according to the capacity required, and the diameter of each succeeding lift is increased by about 2 ft , whilst the depth of each lift would be constant, and equal to about one-fifth the diameter In order to secure a gas-tight joint between

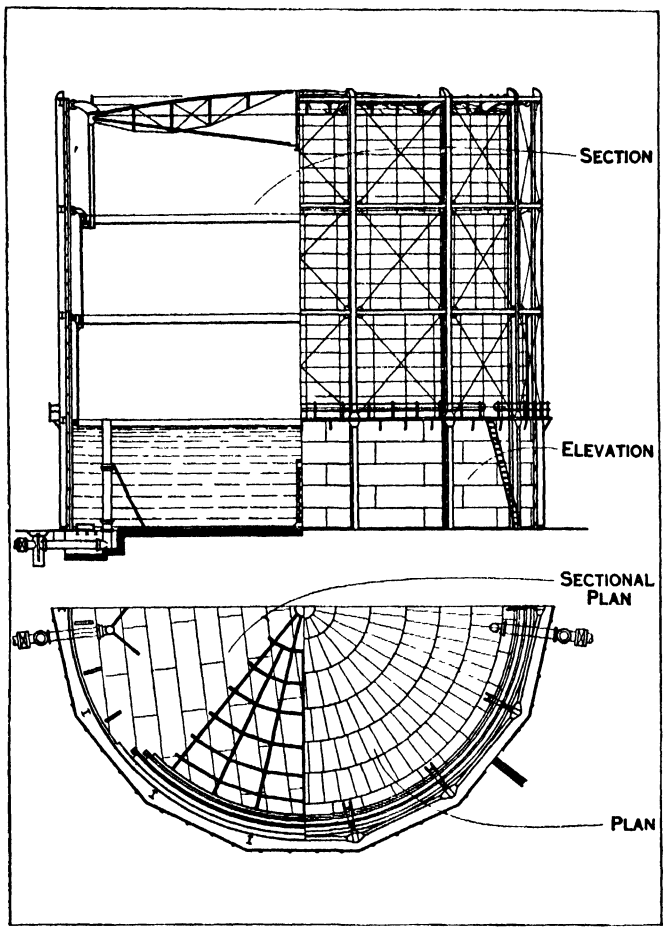


FIG 1 —ELEVATION AND SECTIONAL PLAN OF TELESCOPIC GASHOLDERS
This type consists of two or more lifts working into each other on the telescopic principle The diameters of the lifts decrease by 2 ft , the depths remaining constant

the lifts as they leave the tank, the bottom row of sheeting of the inner lift is prepared with a channel cup about 18 in deep, whilst the top row of sheeting of the adjoining lift is fitted with an inverted channel cup, usually termed the "dip" (fig 2) As the inner lift rises out of the water in the tank, the channel cup engages with the dip, thus making a gas-tight water-sealed joint between the lifts Each succeeding lift is fitted with a dip at the top, and a cup at the bottom, with the exception of the final or outer lift, which is provided with a dip at the top only, and a strong angle steel curb at the bottom The crown of the holder is dome-shaped, and when at rest in the tank, is either supported by a trussed steel roof forming part of the inner lift, or upon a permanent steel or timber framing erected in the tank The sheeting of the sides and crown of the holder is about $\frac{1}{8}$ in thick, with the exception of the rows of sheets adjoining the cup and dip, and also the junction between the crown and sides of the inner lift, which are much thicker, in order to allow for extra wear and strain at these points The tank may be constructed in brick, concrete or steel Brick and concrete tanks are usually constructed by excavating the ground and building up the sides of the tank, so that the top of same finishes about 6 in above the ordinary ground level • Water-tightness is obtained by encasing the bottom and side walls of the tank in a layer of clay puddle, or by coating the inside surface of the tank walls with cement Steel tanks are usually erected on a flat bed of concrete, laid at a foot or so below the normal ground level, the sides being formed of a number of tiers of steel plates varying in thickness to suit the pressure due to the depth of water in the tank Steel tanks are much less costly than either brick or concrete tanks, and can be much more quickly erected

Frame Guided Gasholders.—These consist of a series of columns or standards fixed at equal distances round the circumference of the tank, which are connected together by one or more tiers of horizontal girders or struts, and a series of diagonal bracing rods, thus forming a continuous tie all round The guide framing may be carried up to the full height of the holder when fully inflated, or to the top of the second lift only, thus allowing the inner lift to run clear of the guide framing, which is then known as a "flying lift " Channel guide runs are fixed to the inner face of the standards, to form a pathway for the guide rollers—which are attached to the crown and the dip of each lift—to work up and down for the purpose of guiding the gasholder and enabling it to withstand the overturning force of the wind The underside of each cup is fitted with a corresponding number of radial rollers, which run in channel guides fixed to the inside of the next adjoining lift; the bottom curb of the outer lift is also fitted with similar rollers working in channel guides fixed to the sides of the tank

Spirally Guided Gasholders.—The floating lifts of a spirally guided gasholder (fig 3) are practically the same in construction

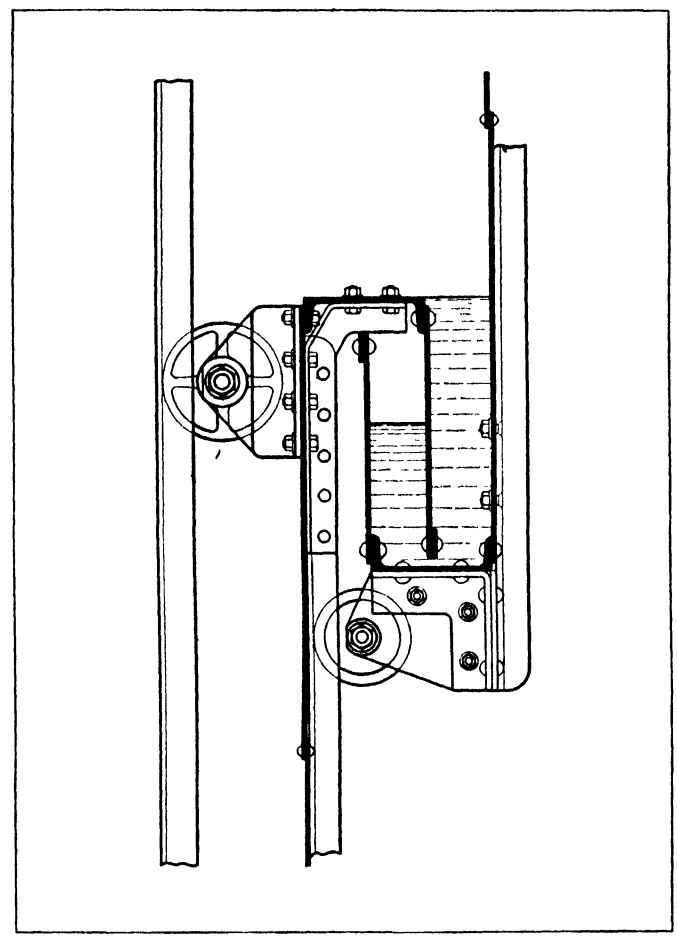


FIG 2 —CROSS-SECTION OF THE "CUP AND DIP," WHICH MAKES THE CONNECTION BETWEEN THE TWO LIFTS AND FORMS THE HYDRAULIC SEAL

as the frame guided holder, with the exception that a number of double flanged rails, inclined at an angle of 45° are secured to the side sheeting of each lift at equal distances round the circumference The spiral guides run between a corresponding number of sets of rollers (fig 4) mounted in adjustable carriages, secured to the dips of the holder and top curb of the tank The action of

the holder in rising or falling is comparable with the action of a coarse threaded screw, and the spiral motion thereby imparted to the floating vessel is sufficient to maintain the holder in a level condition, and enables it to resist the overturning force produced by the wind This form of holder costs from 10 to 15% less than the frame guided holder.

Dry Gasholders.—In this type of holder (fig. 5) the tank with its water content is dispensed with, thereby greatly reducing the cost of foundations The tankless gasholder consists of a cylindrical steel plate tower, within which a horizontal disc or piston moves up or down, receiving or expelling the gas. The piston is guided in its vertical movement by a system of rollers, travelling up or down the inner sides of the steel cylinder The periphery or outer edge of the piston is lubricated and maintained gas-tight by means of several layers of moulded rubber packing rings, which

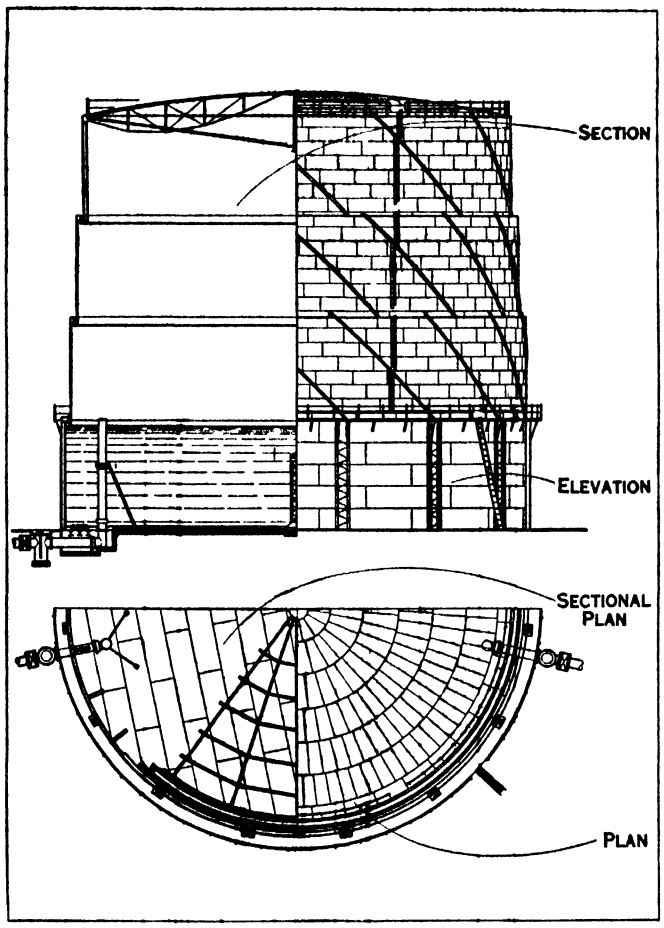


FIG 3 —THE ELEVATION AND PLAN OF SPIRALLY GUIDED GASHOLDER
The construction differs from the telescopic type in having a number of double-flanged rails, inclined at 45°, secured to the side sheeting of each lift

effectively confine the gas to the underside of the piston The interior of the tower above the piston is freely accessible, well ventilated, and lighted by openings provided in the sides of the tower above the highest gas level The packing seal, guide rollers and lubricators can, therefore, be readily inspected at any time, without interfering with the normal working of the gasholder The roof of the dry gasholder does not enclose the gas—this being the function of the moving piston—and is only required to perform the duty of sheltering the moving piston from rain, snow and dust.

Another type of dry gasholder consists of a polygonal steel tower, with movable piston, similar in construction to that previously described, but in this design the periphery of the piston is maintained gas-tight by means of a light gas-tar of moderate viscosity, contained in an annulus formed on the outer edge of the piston As this seal is not absolutely tar-tight, a small quantity of tar escapes and flows to the bottom of the cylinder, where it is collected in a series of chambers, and is pumped up again by a number of automatically controlled electric pumps, to the top of the tower.

Spherical Gasholders.—This type (fig. 6) is principally used for storing gas under pressure. It is a plain sphere of simple construction, usually about 50 ft. in diameter, formed of steel plates about $\frac{9}{16}$ of an inch thick The gas to be stored is forced by a

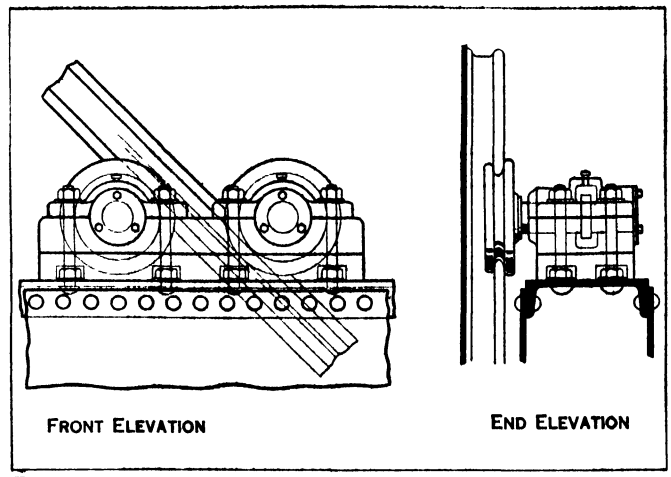


FIG 4 —FRONT AND END ELEVATIONS OF SPIRAL GUIDE RUN BETWEEN SET OF ROLLERS

compressing plant into the sphere at a pressure of about 50 lb per sq in When the gas leaves the outlet of the sphere, it is passed through suitable controlling governors, which reduces the pressure to such an extent as will meet the needs of the consumers A sphere filled at a pressure of 50 lb per sq in will store and de-

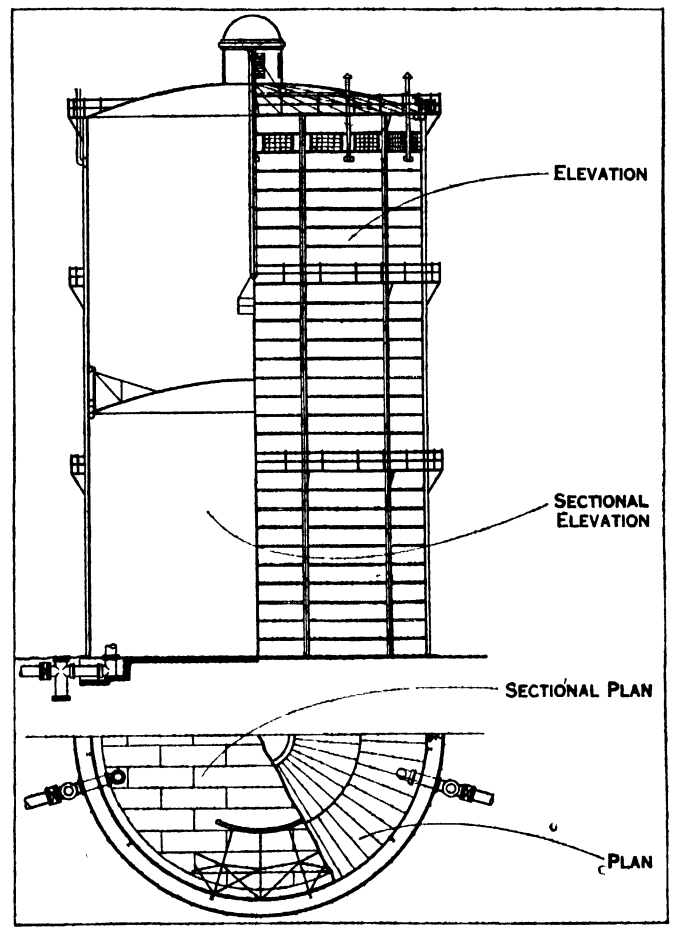


FIG 5.—DRY GASHOLDER IN WHICH WATER TANK IS ELIMINATED
In this type of holder a great reduction in foundation costs is effected. The holder consists of a cylindrical steel tower in which a horizontal piston moves up and down, receiving or expelling the gas

liver about 3½ times its cubical content at the lower pressure required in the distributing mains

See R. J. Milbourne, *Gasholder Design and Construction*

(R. J. Mi)

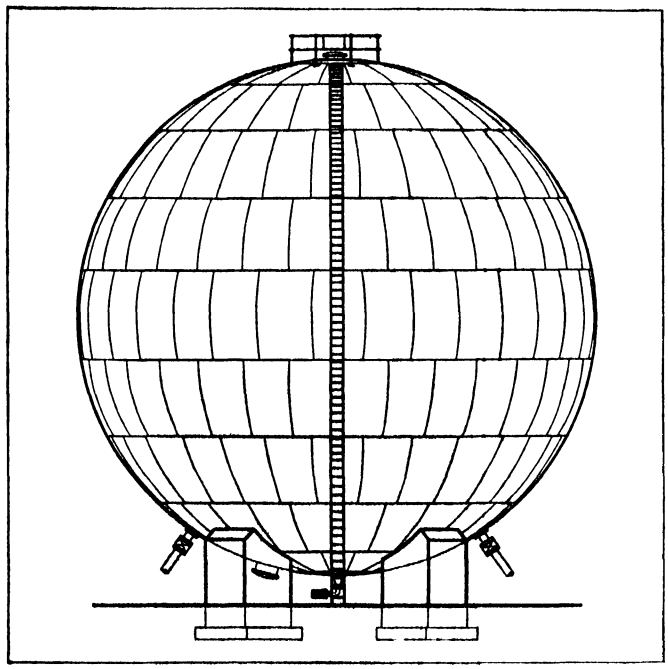


FIG 6 —SPHERICAL GASHOLDER USED FOR STORING GAS UNDER PRESSURE

This type consists of a plain steel sphere, the contained gas being forced in at a pressure of 50 lb. per square inch

GAS IN WARFARE: *see* CHEMICAL WARFARE

GASKELL, ELIZABETH CLEGHORN (1810–1865), English novelist and biographer, was born on Sept 29, 1810, in a house in Lindsay row, Chelsea, London, now 93 Cheyne walk Her father, William Stevenson (1772–1829), had been successively Unitarian minister, farmer, boarding-house keeper for students at Edinburgh, editor of the *Scots Magazine,* and contributor to the *Edinburgh Review* before he received the post of keeper of the records to the Treasury, which he held until his death His first wife, Elizabeth Holland, died a month after her daughter, Elizabeth, was born, and the babe was taken to Knutsford, Cheshire, to be adopted by her maternal aunt, Mrs Lumb Thus her childhood was spent in the environment idealized in *Cranford.* From 1824 to 1826 Elizabeth went to school at Stratford-on-Avon, from 1827 to 1829 she lived in London with her father and his second wife; and after two winters at Newcastle-on-Tyne in the family of William Turner, a Unitarian minister, and a third in Edinburgh, she married, on Aug 30, 1832, William Gaskell, minister of the Unitarian chapel in Cross street, Manchester, and from 1846 to 1853 professor of English history and literature in Manchester New college. They lived first in Dover street, then in Rumford street, and finally, in 1850, at 84 Plymouth grove

Mrs. Gaskell and her husband thought to emulate George Crabbe and write the annals of the Manchester poor, but only one poetic "sketch" appeared (*Blackwood's Magazine,* 1837) In 1844, while they were visiting North Wales, their infant son died, and to distract Mrs. Gaskell from her sorrow her husband suggested a long work of fiction Hence *Mary Barton, a Tale of Manchester Life* was begun It was published in 2 vols , 1848, its appeal for neighbourly love, its dramatic power and humour winning for the author the friendship of Carlyle, Landor and Dickens. Dickens asked her, in 1850, to contribute to his new magazine, *Household Words,* and here the whole of *Cranford* appeared at intervals from Dec. 1851 to May 1853, exclusive of one sketch, reprinted in the "World's Classics" edition (1907), that was published in *All the Year Round* for Nov. 1863 *Cranford* is an English classic It is a picture of Knutsford indeed, but a work of imagination that has a place in literature beside the much earlier work of Jane Austen. In *Ruth* (1853) Mrs Gaskell again presents Knutsford, thinly disguised, and the little Unitarian chapel in that town *North and South,* a powerful tale of the industrial revolution, first published serially in *Household Words,* was separately published in 1855

Then came—in 1857—the *Life of Charlotte Bronte,* in two volumes Two years earlier Miss Brontë had begged her publishers to postpone the issue of her own novel, *Villette,* in order that her friend's *Ruth* should not suffer This biography, by its vivid presentation of the tragic story of the three Brontë sisters, gave its author a place among English biographers

In 1863 Mrs. Gaskell published her last long novel, *Sylvia's Lovers,* a romantic tale of Whitby smugglers and the press-gang riots. In the same year a one-volume story, *A Dark Night's Work,* and *Cousin Phyllis and other Tales,* appeared

Mrs Gaskell died on Nov 12, 1865, at Holyburn, Alton, Hants, and was buried in the graveyard of the Knutsford Unitarian church Her unfinished novel, *Wives and Daughters,* was published in 2 vols. in 1866.

See J A Payne, *Mrs. Gaskell and Knutsford* (2nd ed , 1905), E K Chadwick, *Mrs Gaskell* (2nd ed , 1913, with bibliography), and J J van Dullcman, *Mrs Gaskell, Novelist and Biographer.*

GAS LIGHT AND COKE COMPANY. This London public utility company, working under Act of Parliament, had in 1928 an issued capital of over £35,000,000, and employed 20,000 men, whose interest in the company under its co-partnership scheme was £738,000 It was granted a royal charter in 1812, but for many years had to face serious competition

In 1870 the City of London and Great Central companies were amalgamated with the old chartered company, and in the next six years the company's position was consolidated by a further series of amalgamations to be followed later by those with the London Gas Light company (1883), with the West Ham company (1910), with the Barking & Chigwell and Loughton & Woodford companies (1912), with the Ilford company (1922) and with the Brentford company (1926) About the same time began the more detailed regulation of the company by parliament, under which, *inter alia,* the dividends now decrease as the price of gas increases, and vice versa, while the quality of the gas supplied is continually tested by a staff of public officers

In the early years gas was used almost wholly for lighting, but the invention of the incandescent mantle (1895) not only increased the efficiency of gas lighting, but gave a fresh stimulus to the company generally Gas began to be more and more used for heating purposes and in 1914 the official gas tests for heat value began to be made During the World War the company also supplied benzene, toluene and other raw materials for explosives After the war, many new technical developments led to a very rapid growth of the company Since 1920 gas has been sold only on the basis of heat content (Gas Regulation Act) and measured on this basis the increase in the output of gas has been about 25% in the five years 1922–1927

In 1927 2,642,000 tons of coal were carbonized and 46,300,000,000cu ft of gas sold to 1,207,520 consumers and distributed through 3,885m of main The coke made was 1,672,000 tons and the output of coal tar 27,000,000gal , other items were 23,000 tons of sulphate of ammonia and 7,250,000gal of creosote.

(L C M)

GAS MANUFACTURE. When coal is heated out of contact with air it is resolved into a stable solid residue, known as coke, and volatile matter, the principal constituent of which is gas, known as coal gas The coke residue may be gasified in steam to make water gas Coal gas, either alone or mixed with water gas, is distributed in pipes for public supply

Coal gas has an average heating value of about 500 British Thermal Units per cubic foot and water gas, unless enriched by carburetting (as *see* below), has a heating value of some 300 B T U per cubic foot.

Another kind of gas can be made if air is blown either alone or mixed with steam through a deep hot bed of coal. From half to two-thirds of this gas by volume is made up of the nitrogen contained in the air used for gasification, and the heating value

of such gas is of a much lower order than that of coal gas or water gas on that account, running about 120–160 B T U per cubic foot This is the form of gaseous fuel mainly used for large industrial furnaces and is known as producer gas

GAS FOR PUBLIC SUPPLY

The first use made of coal gas was as an illuminant, burning without any previous admixture of air with a yellowish luminous flame The earliest observation and demonstration of this property has been ascribed to John Clayton and to Jean Pierre Minckelers, but the first practical application on any considerable scale seems to have been made by William Murdoch who ran a small experimental plant in 1795, lighted a Soho factory by gas a few years later and in Feb 1808 was awarded the Rumford Medal of the Royal Society of London for his invention as described in a paper read before the Society The Gas Light and Coke Company (*q v*) was incorporated in London in 1812

Low Temperature Carbonization in Iron Retorts—Murdoch's gas making apparatus was an iron retort placed in an inclined position, and heated by a fire burning on a grate below For a long time, the retorts commonly employed in gas works were made of cast iron, which being charged with the coal to be carbonized, were heated by small coal to a temperature which probably ran from 600–700° C, a much lower temperature than now obtains, as is indicated by the yield of gas, which ran from 6,000–7,000 cu ft per ton of coal Further description will be facilitated by a consideration of the principles involved in the carbonization process, that is the heating of coal out of contact with air

The essential elementary constituents of a coal are carbon, hydrogen and oxygen, with small quantities of nitrogen and sulphur and some incombustible matter On heating out of contact with air, the coal fuses more or less and partially decomposes Gaseous products of decomposition force their way through the plastic mass and give it a honeycombed structure By the process of decomposition, however, the coal becomes less fusible, until it becomes a porous solid known as coke Further heating drives off more gas and results in a shrinkage and hardening of the coke The volatile matter coming away in the early stages is rich in easily condensible tarry matter and gaseous hydrocarbons At a temperature above 800° C, the volatile matter is principally hydrogen gas

The following analyses are given to exemplify the composition of coal-gas, tar and liquor

Gases	High temperature			Low temperature
	Horizontal retorts	Vertical retorts		
		Without steam	With steam	
Carbon dioxide	2 0	2 2	3 4	4 5
Unsaturated hydrocarbon	3 1	2 3	1 8	3 8
Oxygen	0 5	0 4	0 7	0 2
Carbon monoxide	8 0	10 3	15 1	8 3
Hydrogen	50 6	49 5	49 3	29 1
Methane	28 1	28 5	21 2	49 1
Nitrogen	7 7	6 8	8 5	5 0
	100 0	100 0	100 0	100 0

Tar	Per cent	Liquor	Grms per 100 cc
Water	1 6	Ammonia	1 58
Crude naphtha	2 6	Sulphate as thiocyanate	0 12
Light oils	9 4	Sulphate as sulphide	0 24
Carbolic oil	12 1	Hydrocyanic acid as thiocyanate	0 21
Creosote oil	13 0	Carbon dioxide as carbonate	1 78
Pitch	61 3	Chlorine as chloride	0 36
		Phenol	0 45
	100 0	Pyridine	0 02

Now considering the volatile matter, this is driven off in gaseous form owing to the high temperature, but on cooling down there is a gradual process of condensation In gas manufacture, the cooling is hastened by washing with water, which also removes ammonia formed from the nitrogen compounds in the coal The consequence is that the volatile matter is divided into three portions two of them liquid but not mixing because one

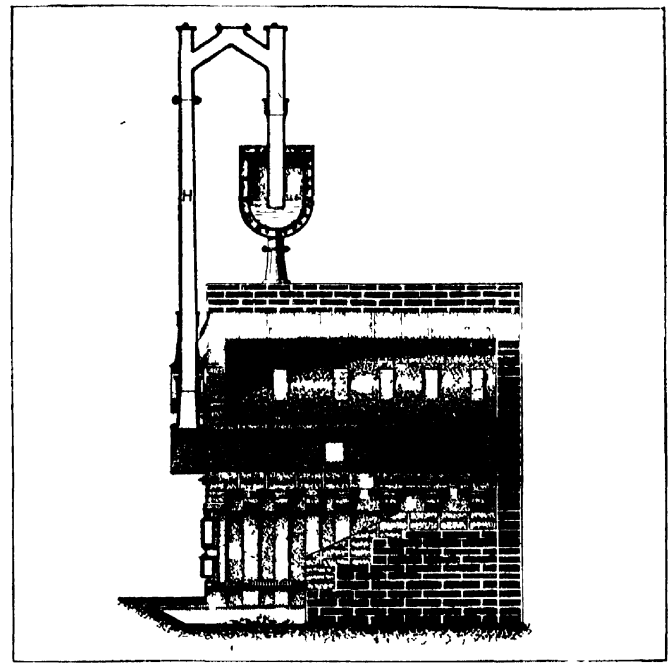


FIG 1 —SIMPLE SETTING OF A SINGLE RETORT DIRECT FIRED FROM A GRATE BELOW

is oily, the tar, while the other is the so-called ammonia liquor The third portion is the gas which, after purification from sulphuretted hydrogen, is ready for distribution

It will be readily understood that both the quantities and the compositions of the tar, liquor and gas vary according to the nature of the original coal and the conditions of manufacture, particularly the temperature The low temperature products are those resulting from the first processes of break-down in the coal The high temperature products contain many of the substances formed by the secondary decomposition of the primary products, brought about by subjecting them to a higher temperature The difference shows itself very plainly in the gas yield, which is much higher for high temperature working, and in the nature of the gas which contains much more hydrogen and less of the easily decomposable compounds of carbon and hydrogen The tar is usually smaller in amount for high temperature working and it is characterized by the presence of the so-called aromatic hydrocarbons of the benzene type, which are products of secondary decomposition and are absent from low temperature tars The increased yield of gas in high temperature working is partly due to the secondary decomposition of some of the more decomposable tar constituents, although it is mainly accounted for by an extensive formation of hydrogen peculiar to high temperature working

Fire-clay Retorts—The volume of gas obtainable by working in iron retorts was limited by the properties of this material

An important advance was made when fire-clay was substituted for iron in the construction of the retorts, because a higher temperature was permissible and further improvement of a radical character followed when, in the heating of these retorts, gas firing and the recuperative principle could be employed

Recuperative Retorts—This will be understood from fig 2, which shows a setting of ⌒-shaped horizontal fire-clay retorts in a setting They are heated by a gas made by passing air through a deep layer of red hot coke This gas, meeting hot air immediately under the retorts, burns around them and carbonizes

the coal contained therein The waste gases, after heating the retorts, do not, however, pass away directly to a chimney, as in the old "direct" firing (fig. 1), but are turned downwards into the recuperator, where they pass along channels in which they are only separated by a thin fire-clay partition from air travelling upwards to meet the gas By this plan, some of the heat is abstracted from the waste gases and restored to the setting in the air used for combustion. Consequently, less heat leaves the setting, and a higher temperature can be attained accompanied by a fuel economy. This system of carbonization in horizontal recuperative fire-clay retorts rapidly became standard practice, and remains so to a considerable extent. It enabled an average gas yield of 10,000 cu ft of gas per ton of coal to be obtained, and lowered the expenditure of fuel required for heating the setting from 25–30% of the weight of coal carbonized to 15–20%

Although excellent in many ways, the horizontal retort setting as so far described had the disadvantage of requiring heavy labour for hand charging This drawback has been to some extent neutralized by the use of mechanical charging machines Other methods were, however, coming forward by which the aid of gravity could be invoked for the moving of the coal and coke during carbonization, and some other advantages secured

Vertical Retorts.—The simplest form of the vertical retort was one in which the retorts were all set vertically instead of horizontally, as in the past, and, being filled with coal, were heated until the whole of the charge had been carbonized, after which it was withdrawn. This so-called Intermittent Vertical System was patented in England by Bueb in 1904, after previous trial at the Dessau Gas Works It had the advantage, as compared with the hand-charged horizontal retort setting, of lessening labour and requiring less ground space for a given output It had also the new characteristic, that the retort could be fully charged, thereby lessening that contact of the volatile matter with red hot coke and the walls of the retort, which make for secondary decomposition A further advance was made almost at once by the introduction of continuous working into the vertical retort system by which, instead of completing the carbonization of the whole charge before withdrawing any portion of the coke residue, a continuous feed of coal was made to the top of the retort and coke was continuously withdrawn from the bottom by an extracting mechanism

The principal names associated with this system are Woodall-Duckham, Glover-West and Robert Dempster and Sons, and it has been widely adopted The idea had been applied with limited success previously by Settle and Padfield Fig 3 illustrates a setting of Glover-West retorts which can be taken as typical The heating gas from the producer passes through apertures,

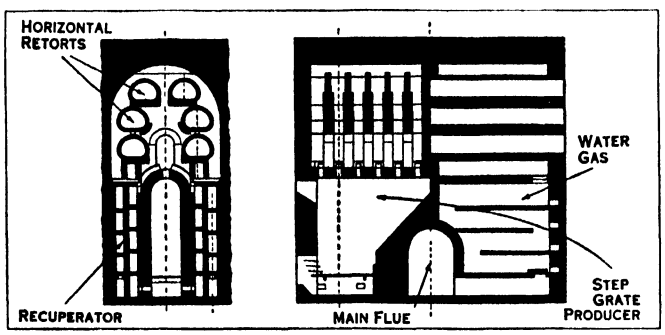
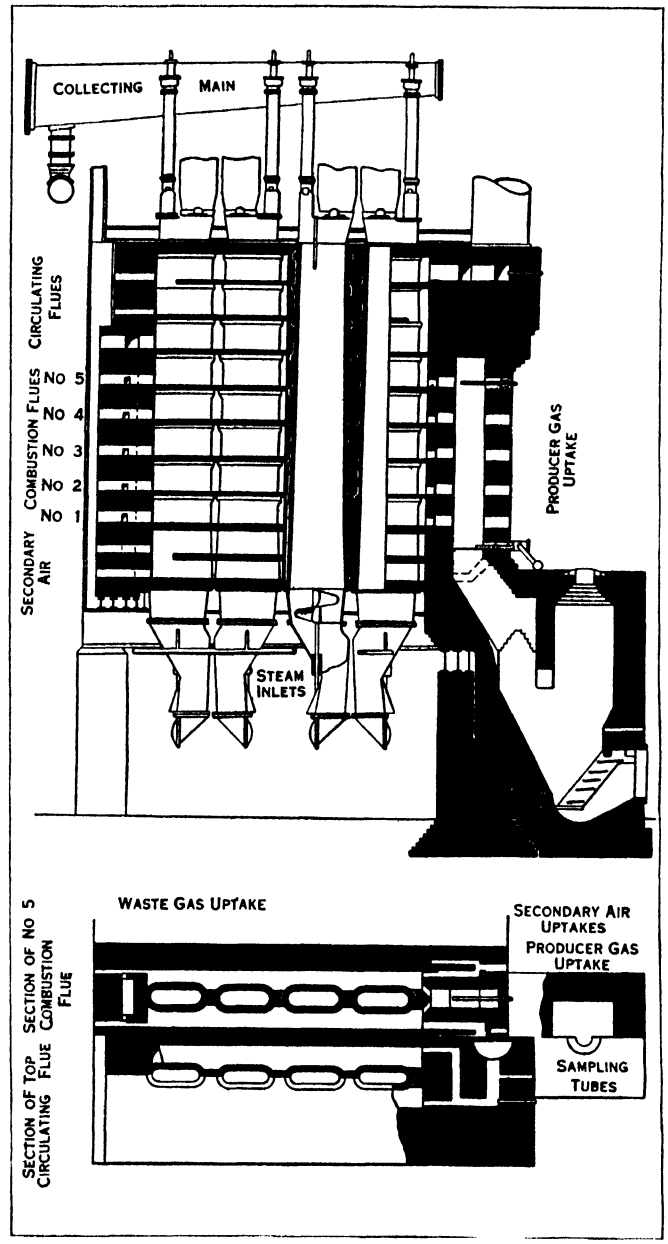


FIG 2.—CROSS SECTION AND LONGITUDINAL SECTIONS OF A SETTING OF 6 HORIZONTAL RETORTS

which can be regulated, into heating channels surrounding the retorts The upper sections are heated by waste gases alone

The heating quality of the gas is now of paramount importance. As a consequence, the heating value of a gas per cubic foot has become recognized as of more consequence than its illuminating power in "standard candles" and has become the statutory method of defining its quality. The British Gas Regulation Act of 1920 introduced the sale of gas by the therm, a therm being 100,000 B T U., and allowed gas companies and authorities to specify the standard quality in B T U 's per cubic foot of the gas they would supply, insistence, however, being rightly made upon the maintenance of that standard as all-important These alterations in the conditions of manufacture and use, and in legislation, have permitted and encouraged such developments in gas manufacture



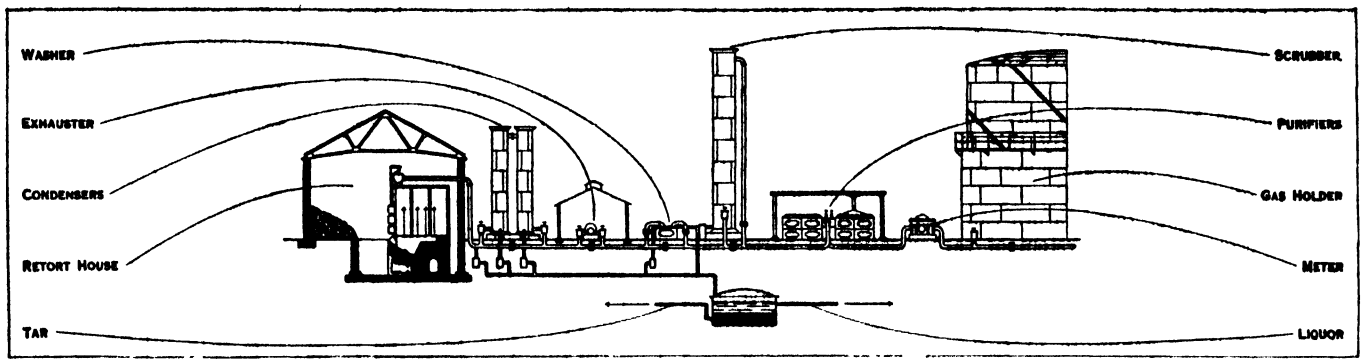
BY COURTESY OF THE COUNCIL OF THE INSTITUTION OF GAS ENGINEERS

FIG 3.—A SETTING OF 8 VERTICAL GAS RETORTS IN ELEVATION ABOVE, AND IN PLAN BELOW

as make for more complete gasification of coal, *i e*, obtaining a larger proportion of its potential heat in the gas made

Steaming.—One mode of obtaining this result, to which reference has already been made, has been working at a higher temperature. That has demanded special attention to the quality of the refractory materials used in the construction of the retorts and their settings and has led to an increase in the use of silica instead of fire-clay in vital parts subject to the higher temperatures By such means, higher yields of gas per ton (13,000 ft per ton) have become common. The gas so made is rich in hydrogen and poorer in illuminating constituents than was commonly supplied previously for lighting purposes and is lower in calorific value, say 500 as against 600 B T U. per cubic foot

Another method of increasing the yield in volume and thermal units has come into use, known as the "steaming" of vertical gas retorts, which is carried out by introducing steam at the base of



BY COURTESY OF J. E. CHRISTOPHER

FIG 4.—TYPICAL LAY-OUT OF A GAS WORKS, SHOWING, FROM LEFT TO RIGHT, CONSECUTIVE STEPS IN THE PROCESS OF MANUFACTURING

the continuous vertical gas retort where it can react with the red hot coke By this means an addition is made to the volume of gas by the interaction of carbon and steam which generates water gas (*see* below)

An investigation by the Joint Research Committee of the University of Leeds and the Institution of Gas Engineers, carried out on a Glover-West setting of continuous vertical retorts, showed that a lean coal which, without steam, gave 10,400 cu ft. of gas per ton of a calorific value of 544 B T U per cu ft (gross), or 56·5 therms in gas per ton, gave when steaming was applied to the extent of 26·4% of steam on the weight of coal used, a yield increased to 16,900 cu ft of gas with a calorific value of 447 B.T U. per cu.ft., or 75 7 therms in the gas made per ton of coal

Thermal Efficiency.—The development of gas practice, as traced above, has resulted not only in a greater yield of gas but in an increased thermal efficiency for the whole process of carbonization, that is the total number of heat units obtainable by the combustion of the products, gas, coke and tar, has come gradually to form a higher proportion of the heat units contained in the coal carbonized This has been effected by improved design of the setting and the use of the recuperative principle, resulting in a lowered consumption of coke for the heating of the retorts. Moreover, by the use of higher temperatures and steaming, the proportion of the heating value of the coal obtained in the gas has been increased, as compared with that left in the coke. This is of primary importance, because in the consideration of a carbonization process it is necessary to bear in mind that, owing to the efficiency of gas in use as compared with that of a solid fuel, the thermal value of a heat unit carried by gas is much greater than that of a heat unit in coal or coke, usually two to four times as great and the comparative monetary value is correspondingly increased In normal horizontal retort practice it may be taken that for every 100 heat units contained in the coal carbonized, 24 will appear in the gas, 42 in the coke available for sale after the heating of the retorts has been provided for and 5 6 in tar, which means that 71 6 of the original heat units have been obtained in the available useful products of carbonization Otherwise expressed the *thermal efficiency* of the carbonization process so conducted is 71 6%, 28 4% having been used and lost in the manufacture In a more modern installation a higher value would be attained, for example, in the investigation of steaming reported above, the efficiencies of carbonization varied from 80–83%

Purification of Gas.—As indicated above, the volatile matter driven off from the coal and leaving the retort contains permanent gas and constituents more or less easily condensed or washed from it Treatment for this purpose is made in a train of apparatus which varies widely in detail but not much in principle. The succession of parts is indicated diagrammatically in fig 4.

In fig. 1 a so-called "ascension" pipe (H) is shown leading upwards from a horizontal retort, then bending over and dipping below the liquid seal in the so-called hydraulic main, the seal being used to prevent access of air to the main when the retort is opened for charging and discharging Some cooling occurs in the ascension pipe and condensing of tarry matter Collecting together of the gas from a number of retorts into a hydraulic main is common practice Easily condensible constituents come down there and in the following foul main which leads to the condensers These are vertical pipes of considerable area and the cooling effect of air upon them causes such a lowering of temperature in the gas as to bring down both tar and water, which are gathered from the bases of the condenser pipes The pipes themselves may be circular or may be made annular, so as to make a sort of chimney up which air will pass the more rapidly because it is warmed by the enclosing gas in the annular space Water is sometimes used with success instead of air as a condensing medium

The next stage is the washing or scrubbing of the gas in which more complete cooling of the gas can be secured, and at the same time the dissolving out of soluble constituents carried by the gas The construction of washers and scrubbers has called for many designs but intimacy of contact between gas and liquid in the scrubber is sought in every case In the Livesey Washer for example, the gas stream is repeatedly broken up and forced through water by an ingenious device In the scrubber, as shown in fig 4, the gas passes up a tower packed with boards, coke, rings or other filling, so arranged as to give a large surface of contact, with the descending current of water or weak liquor which is relied upon to complete the removal of ammonia from the gas

Another type of scrubber contains slowly revolving disc brushes, the fibres of which are alternately moistened by liquid in the bottom of the scrubber and exposed to the gas current which they are called upon to purify (Holmes, "Standard") Some use is made in the gas industry of centrifugal washers consisting of a number of superposed chambers in each of which the gas passes through a spray of liquid thrown out centrifugally from a revolving cone or cage (K H C Feld). The condensing and washing described will remove excess of moisture from the gas, ammonia and the more easily condensable tarry constituents If, however, it is required to remove such volatile tar constituents as benzene and toluene with any degree of completeness, a further scrubbing with creosote oil or gas oil is found to be necessary

As shown in fig 4, the tar and liquor condensed at different points of the system are led away to a common well, but there is room for much discretion and modification in this respect One constituent of coal gas which by law has to be completely eliminated if the gas is to be used for public supply, is sulphuretted hydrogen, and the final process of purification in ordinary practice is to pass the gas through iron oxide purifiers, and thence to gas-holders (*see* GAS HOLDERS). The purifiers contain hydrated oxide of iron, or similar material spread on grids. The oxide absorbs sulphuretted hydrogen rapidly, becoming converted into sulphide If, owing to this conversion, the sulphide material no longer operative in absorbing sulphuretted hydrogen, is removed and exposed to air, it is re-oxidized with the formation of free sulphur If a small amount of air is admitted along with the gas to the purifiers, this re-oxidation will take place in situ, and this is usually done When the sulphur content of the fouled

oxide has reached some 50%, the material is sold for the making of sulphuric acid. Most of the sulphur in the gas is contained as sulphuretted hydrogen and is removed by this process. There remains, however, a small quantity occurring as carbon bisulphide and not removed by oxide of iron. It has been shown by Carpenter and Evans that by thermal treatment in the presence of a nickel catalyst the carbon bisulphide can be converted into sulphuretted hydrogen, subsequently removed.

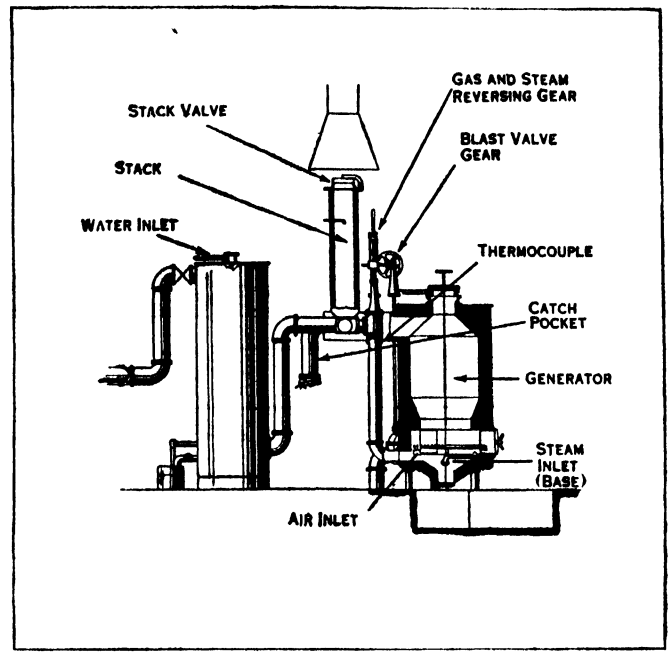
The sulphuretted hydrogen to be removed from the gas is dependent upon the composition of the coal and other factors, but is of the order of 1% and the carbon bisulphide about one-twentieth of this amount or less Of the same small order of magnitude are cyanogen and naphthalene

Ammonia.—Liquor containing the ammonia washed out of the gas is either sold as such or used at gas works for the production of ammonium sulphate When distilled with lime, ammonia is driven off from it and being absorbed in sulphuric acid, forms the sulphate which constitutes a valuable manure The quantity obtained at gas works usually lies between 20 and 30 lb of ammonium sulphate per ton The ammonia yield can be increased by steaming the retorts, but the liquor obtained is usually weaker because of the passage of undecomposed steam from the top of the gas retort into the gas A weaker liquor has a lower commercial value if it has to be sent away for treatment and has the further disadvantage that after distillation for ammonia the residual liquor is greater in amount

The direct method of ammonia recovery in which the gas is passed through sulphuric acid for the absorption of ammonia, instead of effecting a separation of the ammonia liquor and distilling it has found little application in gas works

Tar.—The tar made at gasworks is subjected to a complicated process of distillation, resolving it into fractions which boil over in different temperature ranges, the fractions being afterwards refined These operations are usually carried out at separate tar distilleries The average yield of tar by the ordinary gasworks process can be taken as 5% of the weight of coal carbonized At lower temperatures, more tar is produced and the light oil fraction coming over on distillation is usually greater in volume

Water Gas.—A limited gasification of coke in steam can be effected in the continuous vertical retort as described above, but the complete gasification of the carbon in coke is carried out in an entirely different type of apparatus, known as a water gas plant At high temperatures, carbon decomposes steam into hydrogen and carbon monoxide, but with an absorption of heat according to the equation $C+H_2O \rightarrow CO+H_2-29{,}000$ calories When the temperature of the carbon has been brought down by this absorption of heat, the reaction is altered with the production of carbon dioxide An equilibrium tends to be established by the catalytic action of the solid carbon (and inorganic ash constituents) so that a ratio $\frac{CO \times H_2O}{CO_2 \times H_2}$ may be established among the gas constituents, the ratio being constant for any one temperature but lowering with the temperature The reversible reaction occurring $CO+H_2O \rightleftarrows CO_2+H_2$ makes for a higher carbon dioxide content of the gas as the temperature is lowered, and moreover, since the velocity of gasification is rapidly lowered with falling temperature, the gas made with the same rate of steam supply comes to contain more undecomposed steam Carbon dioxide lowers the calorific value of the gas and the steam requires condensation. The high temperature of the carbon can, however, be restored by stopping the steam and blowing with air which raises the temperature of the fuel bed, generating a producer gas The industrial process based upon this principle of alternately blowing a bed of coke with steam and air was made by Gillard (1849), Tessie du Motay and Lowe (1873) and called the water-gas process. The plant as illustrated in fig. 5, is that of Messrs. Humphreys and Glasgow. The coke bed is enclosed in a steel casing, lined with fire-brick, and may be blown through the grate below by either air or steam. An arrangement of valves also enables the steam to be introduced above the coke for a "down-run." The exact arrangement and time in the up-run with steam, down-run with steam and blowing with air is varied to suit the fuel and other conditions and constitutes a cycle of operations which is carried out systematically The coke is blown with steam until, by lowering temperature, the carbon dioxide produced in the water gas is lowering its quality too far During the steam blow, the water gas made is carried forward to a scrubber, down which water is running and then goes forward to joint the main gas stream of the works for purification from sulphuretted hydrogen This water gas should have a calorific value



BY COURTESY OF THE INSTITUTE OF GAS ENGINEERS

FIG 5.—BLUE WATER-GAS PLANT, SHOWING PARTS

of 300 B.T U. per cu ft When the steam blast is replaced by air, in order to restore the high temperature in the fuel bed, the producer gas generated being heavily charged with nitrogen is not allowed to go forward to the scrubber, but is turned to waste up the stack That continues until a satisfactory high temperature has been re-established in the fuel bed, when steam is again employed The heaviest thermal loss in the process is that of the potential and thermal heat in the producer gas, but this is being considerably lessened in the most modern plants by the installation of a waste heat boiler Another means of lessening the same loss is adopted in the Dellwik Fleischer plant, in which, by the use of a thin bed of fuel and a powerful blast of air, regeneration of heat in the fuel bed can be carried out more quickly, more of the carbon being burned to carbon dioxide instead of carbon monoxide, so that more heat is generated in the fuel bed and less leaves the generator as potential heat of combustion in the blow gas (The steam using stage is known as the "run" and the air using stage as the "blow")

Carburetted Water Gas.—It has been noted that the water gas made by the process as described above has a calorific value approximating to 300 B T U per foot It is known as "blue" water-gas and is definitely lower in grade than the coal gas made from retorts There is a means, however, ready to hand, of increasing the calorific value by utilizing some of the heat in the gases leaving the generator for the purpose of cracking oil, that is converting it into permanent gas, rich in hydrocarbons, and so obtaining a "carburetted" water-gas of enhanced calorific value Fig 6 illustrates a Humphreys and Glasgow plant used for this process. The gas from the generator passes through two chambers, a carburettor and a superheater packed with brickwork, which are raised to redness, some air being admitted for the combustion of the "blow" gas therein The oil is run in from the top of the carburettor and should be such as can be efficiently cracked under the conditions of the process (In early stages of the development of the plant the oil was run directly upon the coke in the generator, but this was unsatisfactory for various reasons) In this plant, blue water-gas leaves the generator with a calorific value of 300 B T.U. per cu ft, but leaves the superheater enriched by the car-

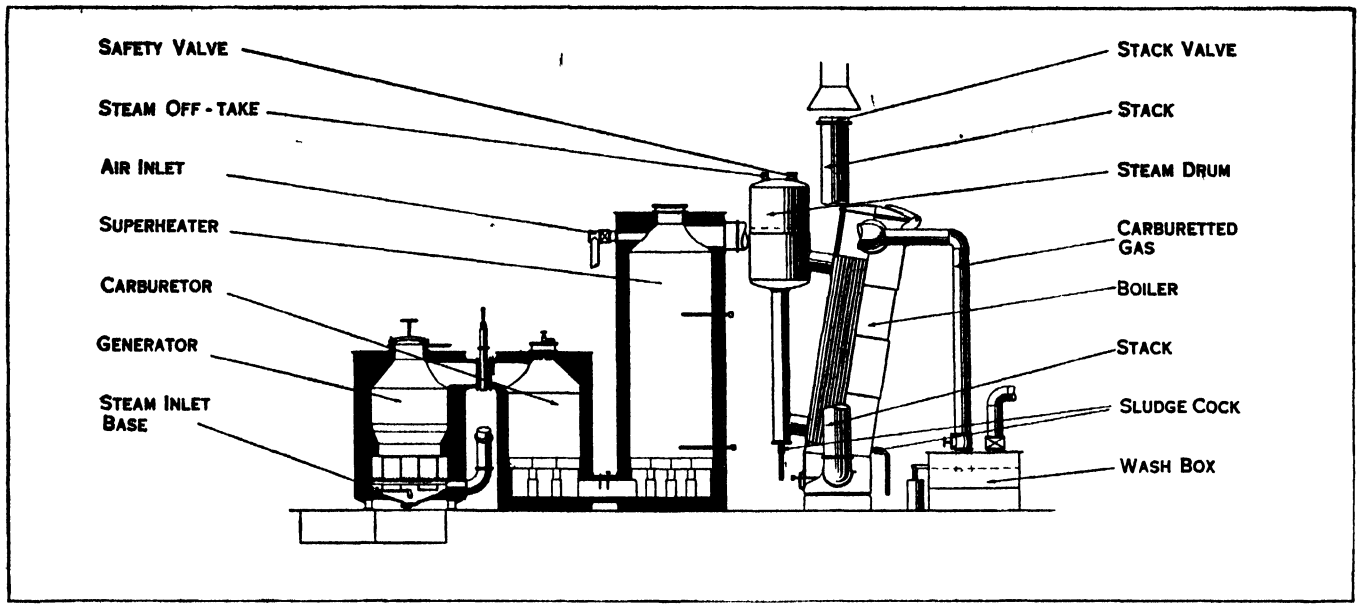


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FIG. 6.—CARBURETTED WATER-GAS PLANT AND WASTE HEAT BOILER

buretting to an extent determined by the amount of oil used The thermal efficiency of the oil cracking in the plant is high, amounting to something like 90% and consequently the thermal efficiency of the carburetted water-gas process is higher than that of the blue water-gas process and increases with the amount of oil used. The extent of carburetting employed is influenced by this factor, by the price of oil and the quality of gas desired In England, carburetting is usually carried out so far as to bring the carburetted water-gas up to something like the same calorific value as the coal-gas made at the same works, say 500 B T U , but in America it has in the past been usually carried much further It is plain too that blue water-gas, enriched by carburetting to the extent desired, can be used as a means of modifying the calorific value of the mixture of coal-gas and water-gas supplied from a works. The extent to which the coke made in a gas works may be economically gasified and water-gas supplied depends on relative capital and operating costs and the prices of coal, coke and oil A water-gas plant has the advantage, however, of being able to be put rapidly into full operation and the yield of gas per ton of fuel is high In tests under working conditions, a blue water-gas plant gave the following results:

Gas in cu ft per ton coke to generator		51,000
Calorific value of gas	B.T.U	305 gross
Composition of gas	Carbon dioxide	3 80
	Unsaturated hydrocarbons	0 05
	Oxygen	0 05
	Carbon monoxide	42 35
	Hydrogen	49·60
	Methane	0·65
	Nitrogen	3·50

A Carburetted Water-Gas Plant gave.—

Carburetted gas in cu.ft. per ton of coke		63,400
Calorific value	B.T U	485 gross
Composition of gas	Carbon dioxide	5·2
	Unsaturated hydrocarbons	6 0
	Oxygen	0·4
	Carbon monoxide	34 9
	Hydrogen	38 6
	Methane	10 0
	Nitrogen	4 9

The thermal efficiency of gas production in the carburetted water-gas plant with waste heat boiler, *i.e.*, heat of combustion of gas divided by heat of combustion+heat lost and utilized in carrying out the process, was 67·1 in this test, using 1 85 gals. of oil and 35·32 lb. of coke (dry) for each 1,000 cu.ft carburetted water-gas made.

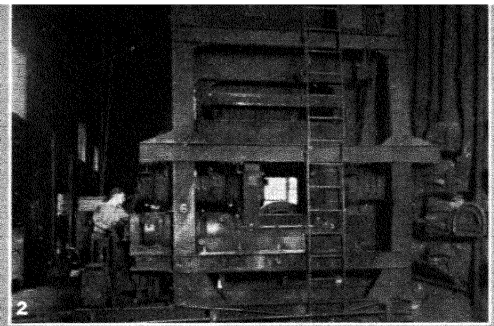
In the latest designs of carburetted water-gas plant, the blast steam and hot gas valves are operated automatically. There is a mechanical coke feed, an annular boiler round the generator and a mechanical grate A so-called back run has been introduced into the working during which steam is passed for a time down the superheater, up the carburettor and finally down the generator

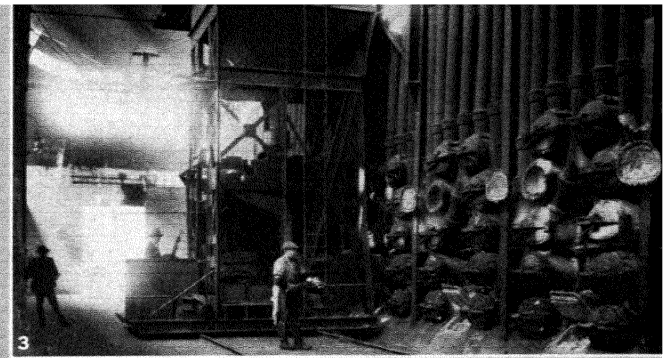
Complete Gasification and Other Processes.—The processes so far described are those which have come into general use. Attempts are being made to make gas for public supply by completing the gasification of coal in one process instead of carbonizing it first in retorts and gasifying the coke residue, so far as may be desired, in steam in a separate generator and process The water-gas process and generator is in some form embodied in all these plants. In the United Gas Improvement Company's plant some constructional modifications of the water-gas generator allow of the use of some coals in it in place of coke In other plants, a retort is in effect superposed upon a water-gas generator (Tully). In another (Robinson) the working of horizontal gas retorts and water-gas generator is combined so as to discharge coke from the retorts into the generator and to utilize heat from the latter for carbonization In plant by M W Travers, gas is recirculated to the generator after passing through a recuperator (heated by blow-gas) with the object of restoring sufficient heat to complete the carbonization process, both that and the gasification being carried out in the generator. Use is being made in gas works of coke ovens (*q v*) heated by producer gas; they are tending to be made narrow with reduced carbonization times Vertical chambers too are meeting with some success (Otto Pintsch) There is a large amount of gas of approximately the same composition as that made in horizontal retorts available from by-product coke-oven plants, even when the heating of the ovens has been carried out by coke-oven gas. Such gas is being brought into use for public supply where economically advantageous, transmission over long distances being made by pumping

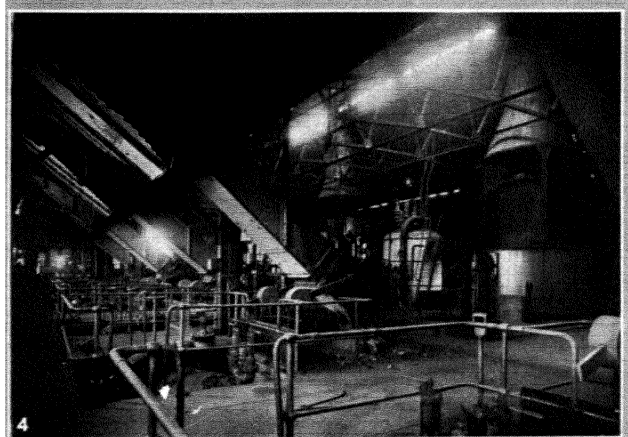
The newer systems of low temperature carbonization (*q.v.*) are still in the experimental stage and cannot be said to contribute to public supply.

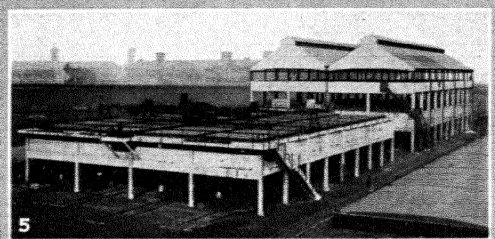
The development of gas manufacture is proceeding largely from a systematic study of the quality of different coals for carbonization and gasification at different temperatures and rates. The influence of the composition and physical properties of coal, such as fusibility and size of particle, the possibilities arising from blending different coals or pre-treating them by washing or preliminary gentle heating are receiving attention, while systematic studies of thermal efficiencies are stimulating the design of apparatus for carbonization and gasification so as to secure higher thermal and chemical yields.

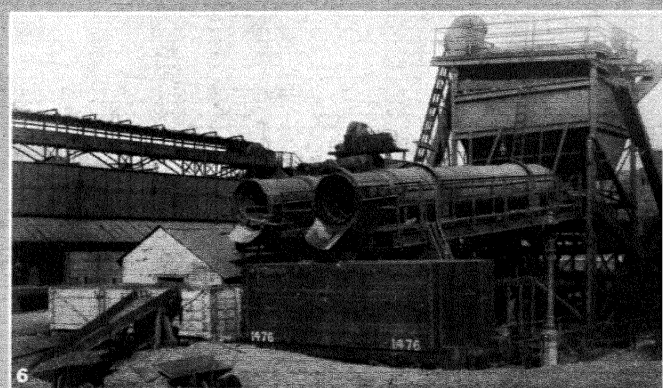


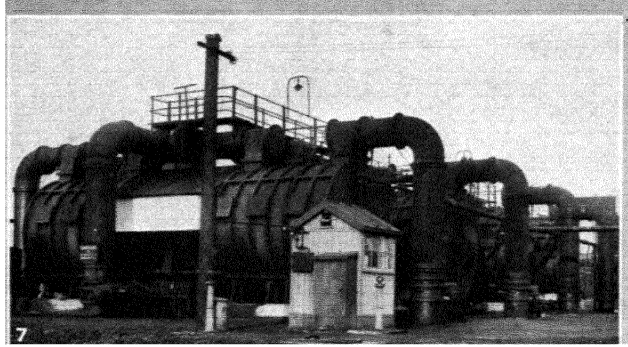


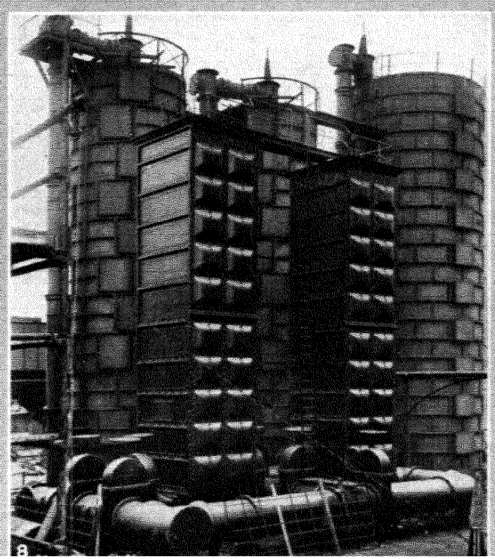


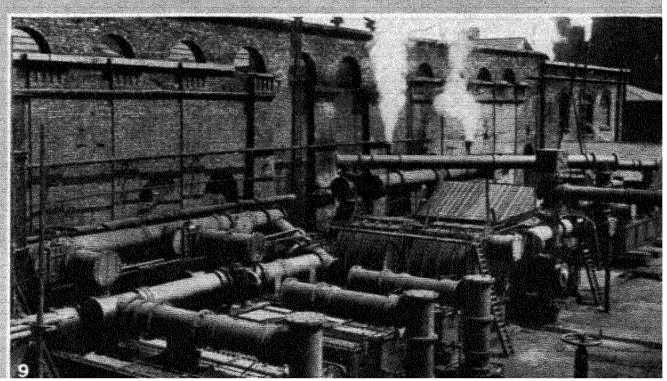












BY COURTESY OF (1, 2) THE CONSOLIDATED GAS COMPANY, (3-9) THE GAS LIGHT AND COKE CO.

PLANT AND MACHINERY FOR THE MANUFACTURE OF COAL GAS AND COKE

1. Large gas plant on Long Island, New York, from which two 72 in. mains carry gas supply under the East River to Manhattan Island. 2. Discharging horizontal retort. Coal is heated in retort until carbonized, releasing gas, and solid and liquid by-products. 3. Retort charging machine. Electrically driven rig moves along track in front of retorts, charging coal into them and removing coke. 4. Operating floor in a large carbureted water gas plant. 5. Purifiers for removal of sulphuretted hydrogen. Centre, reinforced concrete pumpers (dry lutes); background, dry lutes with upper floor for oxide revivification. 6. Coke washing plant for the removal of ash-forming materials. Coke is carried from bins by conveyor to the hopper in background. Passing through the two cylinders (centre) it is discharged, clean, into the car. 7. Washers where naphthalene is removed by oil or other solvents. 8. Water tube condensers (foreground) and tower scrubbers (background) for cooling the gas and extracting ammonia. 9. Washer and scrubber yard, showing plant for removing tar and ammonia from gas. Large manifolds in foreground convey gas and by-products to and from the building

GAS FOR INDUSTRIAL USE

The gas manufactured for public supply finds extensive and increasing applications for industrial heating Being thoroughly cooled and cleansed it can be controlled with nicety through taps and valves, which makes for convenience, cleanliness and efficiency in use It is a smokeless fuel, and by its use ground space and expenditure on the cost of gas-making apparatus is saved Since, too, such gas is of high calorific value and does not carry into its flame any large proportion of nitrogen or other inert constituents it can be used for high temperature processes in simple apparatus without the necessity of providing for that pre-heating of the air or gas or both which is a necessity for such high temperature work when the leaner producer gas is employed The simplest process of gas making is that used in making producer gas, and the great bulk of gasification effected for such purposes as the heating of steel-melting and other large industrial furnaces is conducted on this plan

Producer Gas—When air is passed through a deep bed of carbon maintained at a high temperature, above 1,000° C, such that complete contact with the carbon is ensured and equilibrium obtained, practically the whole of the carbon is obtained as carbon monoxide, according to the equation

$$C+\tfrac{1}{2}\{O_2+4N_2\}\rightarrow CO+2N_2+29{,}000 \text{ calories}$$

If the temperature is lower, even although the contact is complete and equilibrium is still attained, some carbon will be burned to CO_2 according to the equation

$$C+O_2+4N_2\rightarrow CO_2+4N_2+97{,}000 \text{ calories}$$

If, however, the high temperature has been maintained and the carbon entirely converted to CO, it is plain that the gas will consist of one-third carbon monoxide and two-thirds nitrogen, and the equation representing its formation may be called the ideal producer gas equation If this producer gas is collected and burned with air, it will generate heat according to the equation

$$CO+2N_2+\tfrac{1}{2}O_2+4N_2\} \rightarrow CO_2+4N_2+68{,}000 \text{ calories}$$

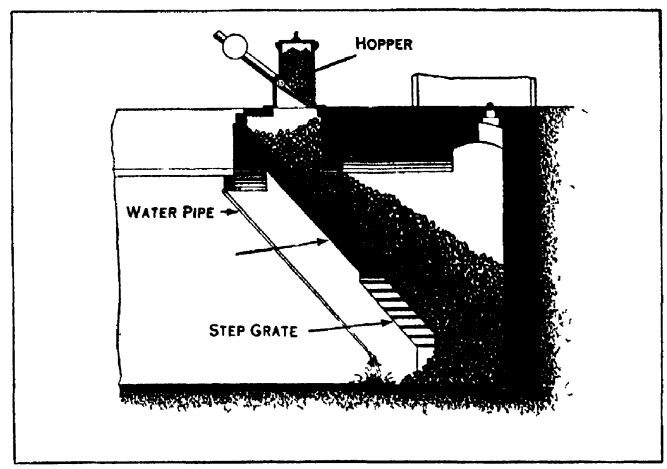
It will be seen that even if the whole of the heat generated in making the producer gas by converting the carbon to CO were lost, sixty-eight ninety-sevenths of the total heat of combustion of carbon to CO_2 would still remain available for use by its combustion of the gas This large proportion of heat available for the second stage of the combustion of the carbon in burning carbon monoxide to carbon dioxide is the basis of producer gas practice There are various factors which cause divergence in the composition of producer gas from that of the ideal producer gas equation In the first place, when coal is used as a fuel and is fed down on the fuel bed, it is at once subjected to a process of distillation or carbonization in the current of producer gas ascending from below, made by the action of the blast upon the carbonized fuel Producer gas is so enriched to some extent with hydrogen and hydrocarbons, particularly methane, and the percentage of nitrogen correspondingly diminished More important, however, is the modification in composition brought about by the steam consequent upon a lowering of the temperature of the fuel bed and the formation of water-gas by interaction with carbon The more steam is used, the lower the temperature and the more carbon dioxide and hydrogen at the expense of carbon monoxide is formed The percentage of nitrogen is further lowered by the admixture with water-gas Moreover, as the quantity of steam is increased and the temperature decreases, the rate of steam decomposition by the carbon lessens and steam passes through the fuel bed undecomposed The quantity of steam supplied is best controlled by the temperature of the mixed blast at a point well beyond the introduction of the steam, so as to allow a thorough mixing The temperature of the blast rises with the proportion of steam It will be understood that undecomposed steam, which begins to occur in quantity as soon as the saturation temperature of 60° has been exceeded, is an objectionable constituent in the producer gas, since it is thermally useless and would tend to prevent the attainment of high temperatures on combustion on account of its high specific heat Bone and Wheeler followed changes brought about in the composition and yield of producer gas, by gradually increasing the proportion of steam with results tabulated below The coal used was washed nut screened over a 1 in mesh

Steam saturation, temperature of blast	60°	70°	80°
Percentage composition of gas			
Carbon dioxide	5 25	9 15	13 25
Carbon monoxide	27 30	21 70	16 05
Hydrogen	16 60	19 65	22 65
Methane	3 35	3 40	3 50
Nitrogen	47 50	46 10	44 55
Total combustibles	47 25	44 75	42 20
Cal value of gas, B T Us per cu ft at 0° and 760 mm — Gross	185 6	177 5	169 5
Cal value of gas, B T Us per cu ft at 0° and 760 mm — net	173 0	163 3	154 3
Yield of gas cu ft at 0°C and 760 mm per ton of coal	138,250	141,450	147,500
Steam added to blast, lb per lb of coal	0 45	0 80	1 55
Percentage steam decomposed	87 0	61 0	40 0
Therms in gas per ton of coal (gross)	256 6	251 1	250 0
Weight of steam undecomposed per lb of coal	0 06	0 31	0 93
$\frac{\text{Therms in gas}}{\text{Therms in coal}} \times 100$	82 4	80 6	80 3

The two columns "Weight of steam undecomposed per lb of coal" and "Therms in gas per ton of coal" have been added by the writer

As the saturation temperature was raised by more steam, the gas composition shows a rise in carbon dioxide from 5 to 13% and a change over from a carbon monoxide producer gas, in which that constituent is dominant to a hydrogen producer gas is explained The nitrogen has fallen and the percentage of total combustibles has also fallen on account of the increase of carbon dioxide, resulting from the lower temperature of the fuel bed The calorific value of the gas has slightly diminished, but the volumetric yield increased, so that the yield in therms contained in the gas per ton of coal gasified shows little change The weight of steam undecomposed per lb of coal has run up from 0 05 to 0 9 lb per ton of coal

Producer Construction—The development of the apparatus in which the manufacture of producer gas is carried out can now

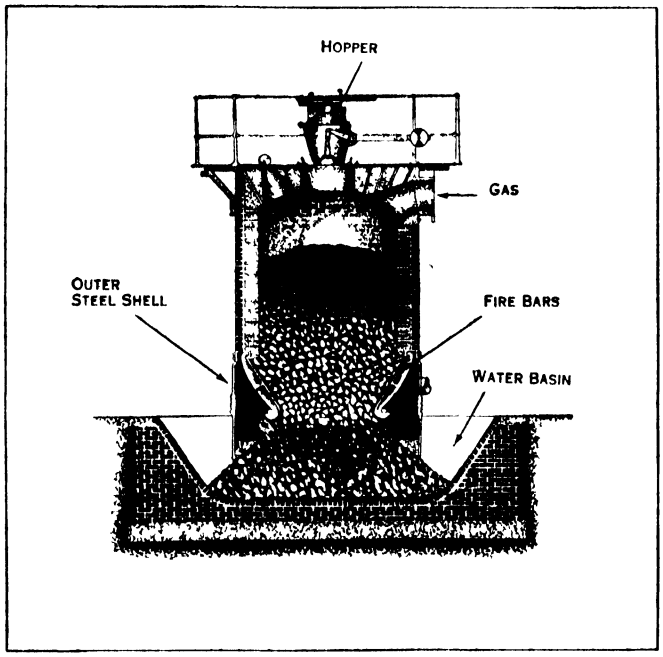


FROM RAMBUSH'S "MODERN GAS PRODUCERS" (BENN BROS.)
FIG 7.—OLD TYPE PRODUCER WORKING WITH MATERIAL DRAUGHT AND NO BLAST UNDER PRESSURE

be traced It would appear that the earliest gas producers were deep shafts of brick-work, but the name most closely identified with the successful establishment of the gas producer is that of Siemens, and a diagram of his Producer (1861) is given in fig 7 It illustrates how the coal falls from the hopper and lies in the producer above the step grate The producer was connected to a furnace, and the air for gasification was drawn through the fuel bed by natural chimney draft, operative on the furnace, supplemented at times by a syphon effect, induced by the dis-

position of the main between producer and furnace

Pressure Producers.—More modern conditions have, however, demanded an increased output per unit of space and grate area, and this has been met by putting the producer under positive blast Such a high rate of working involves a greater tendency to clinker formation, which has been counteracted by the use of steam Fig 8 is an example of one of the many gas



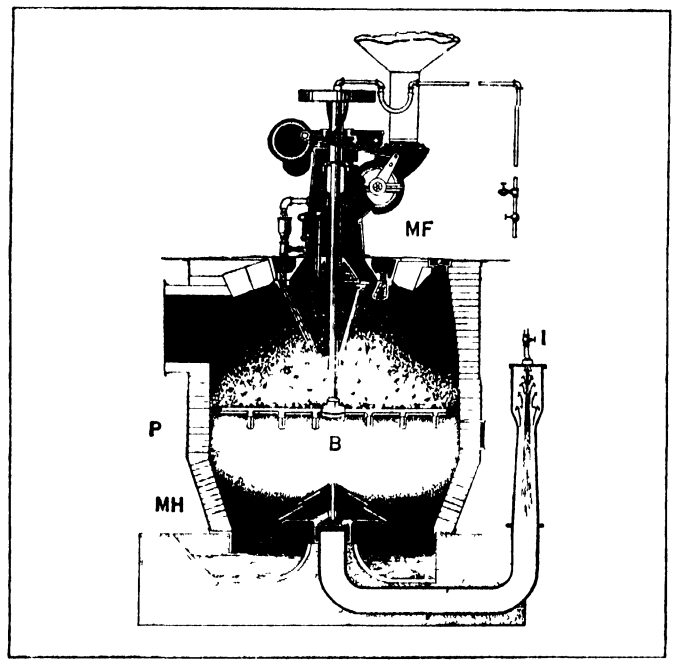
BY COURTESY OF THE POWER GAS CORP

FIG 8.—PRODUCER FOR BLOWING WITH AN AIR-STEAM BLAST

producers devised to work under these conditions. It is shown as a steel cylindrical shell, firebrick lined, and dipping into a water lute, which enables a pressure of blast to be maintained without escape, and ashes to be withdrawn through the water as required The grate bars are shown arranged in a truncated cone, and the air-steam blast is admitted to the space between them and the casing An alternative to this "side-blowing" is to deliver the blast up the centre line of the producer from the bottom, the blast escaping from under a mushroom head This arrangement is shown in fig 10 The mushroom head in such a "centre-blown" producer must be kept in ashes below the hot gasifying coke to prevent its destruction The side blown and centre blown arrangements are occasionally combined for very wide producers, in order to give a penetration of the blast to all parts of the wide bed, but such combination is not at all common and is somewhat difficult to control The simplest way of blowing a pressure producer is to use an injector supplied with steam under pressure, which can be easily arranged so as to be adequate in amount for injecting the air and at the same time saturating the blast (fig 10)

It will be readily understood that one of the principal objects to be attained in the design of a producer is that there shall be no accretion of semi-fused ash into large pieces of clinker, and maximum facility for removing the ash necessarily left when the gasification is complete, so keeping the producer in good working order and minimizing labour Fig 9 illustrates one mode of attaining these ends adopted in the Kerperly producer The central grate used for admission of the blast revolves mechanically in the ash bed, affording little hold for any pieces of clinker or bringing a shearing stress to bear upon them with a disintegrating effect The outside shell of the producer is lined with fire-brick in the ordinary way in its upper half, but in the lower half is constituted by what is in effect an annular boiler, with no brickwork lining. Clinker cannot form in the same way on the comparatively cold metal surface of such a water jacket as it can on a hot surface of fire-brick, which is itself practically as hot as the coke and ash in contact with it. The steam raised by the annular boiler can be used for the blast (This combination of mechanical grate and water-cooled sides is also coming into use for water-gas generators) The ash in the arrangement as shown in fig 11 is delivered into a water trough below, which provides a seal and a convenient channel from which the ash is automatically scooped Details differ and a dry revolving base without water seal is sometimes employed The well-being of a producer depends upon keeping the distribution of the blast and the ascending gas current as uniform as possible across the section of the producer, so as to give satisfactory contact in all parts with the descending fuel Imperfections in this respect, such as the existence of channels up the bed, have their effect in a deterioration in the quality of the producer gas made, indicated by a rise in temperature of the gas leaving the producer For this reason, the top of the producer is usually provided with a number of poke holes, through which pokers are periodically inserted by the producer man, for the purpose of keeping the fuel bed level, filling up hollows or channels, and breaking up incipient clinkers In some of the more modern designs this work has been minimized by the introduction of a mechanical revolving poker In the form introduced by Talbot, the poker was a central vertical shaft running the whole depth of the producer, with two arms, one revolving near the top of the fuel bed and the other just above the grate in the clinker-forming region This form of poker was difficult to maintain in action over long periods, and it has been simplified by Talbot and others, as indicated in the diagram of the Chapman mechanical producer in fig 9 There the horizontal arm of the poker is shown revolving near the top of the fuel bed It is not intended to prevent clinkering of ash, but to keep the top of the fuel bed in good working order

By-product Producer Plant.—For many purposes, producer gas can be used hot from the producer without further cleaning Indeed, that is so with the great majority of uses to which producer gas is put If however the gas is generated for use in the gas engine, which is thermally much more efficient than the steam engine, it must be cleaned and cooled The most complete system for providing washed clean producer gas, and at the

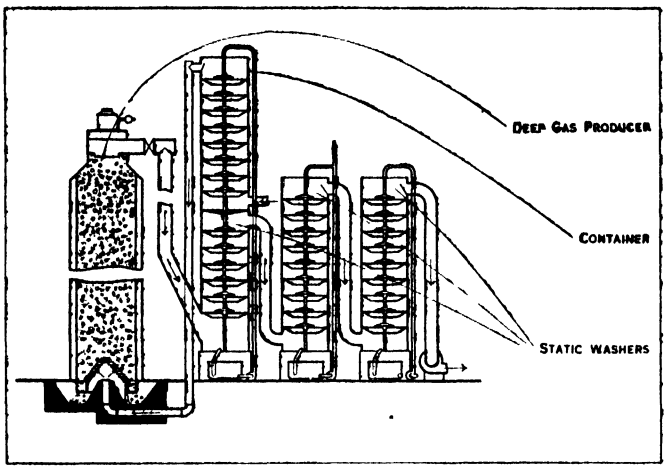


FROM RAMBUSH, 'MODERN GAS PRODUCERS' (BENN BROS)

FIG 9.—PRODUCER WITH MECHANICAL FEED AND DISTRIBUTOR FOR COAL, AND GRATE REVOLVING IN FUEL BED

same time recovering as ammonia the nitrogen in the coal gasified (to the extent of some 90 lb of sulphate of ammonia per ton) is due to the late Dr Ludwig Mond (1889) The plant he elaborated has been simplified by Lymn and Rambush and is shown in the simplified form in fig. 11 The producer carries a very much deeper fuel bed (say 10 ft against 5 ft) than is ordinarily employed, and more steam is employed in the blast, 1 lb per

ton of fuel gasified By this means, the temperature of the fuel bed is kept low, and the coal is given a long time of exposure to the ascending gas current, as it gradually descends towards the grate. These conditions favour the production and preservation of ammonia and of low temperature tars The gas is washed, freed from ammonia, and cooled, by passing in turn through the three Lymn static washers, the ammonia being absorbed



BY COURTESY OF THE POWER GAS CORP

FIG 10 —DEEP GAS PRODUCER FROM WHICH GAS PASSES THROUGH STATIC WASHERS FOR WASHING, AMMONIA ABSORPTION, AND COOLING

by a solution of ammonium sulphate, maintained slightly acid, and the after-cooling being effected by water. The Lymn washer, which replaced the towers of the original Mond plant, consists of a number of cones fixed to a central shaft, alternating with strips fixed to the outer case of the washer, so that the descending water or liquor is repeatedly forming a falling sheet or shower, through which the ascending gas has to pass The air blast going to the producer ascends a washer "F," superposed on "C" and is there warmed and moistened by hot water which has been pumped from "C" after abstracting heat from the gas Gas leaving such a plant is ready for use in furnaces, but centrifugal tar extractors and saw-dust scrubbers are employed in cleaning the gas more thoroughly for use in engines

The following results have been reported by Lymn (1924) as long-period averages using a Durham coal containing 8 0% of ash.

Gas analysis	Carbon dioxide	8 3%
	Carbon monoxide	21 0%
	Hydrogen	20 5%
	Methane	4·0%
	Nitrogen	45·3%
B T Us net to cu ft.		178
Gas efficiency	$\frac{\text{Cal val of gas (netto)}}{\text{Cal val. of coal (netto)}}$	80%
Average gas yield (cu ft) per ton of dry fuel gasified		122,000
Average ammonium sulphate yield per ton of dry fuel gasified		90 lb.
Average yield of dry tar per ton of dry fuel gasified		21 gal.
Steam into producer per lb of dry fuel		1 lb

When ammonia recovery is not attempted, the process of washing and cooling is simplified A washed producer gas has advantages for many uses in that its control can be made so much more precise and its subdivision for heating purposes so much more readily effected than with gas straight from the producer Distribution, moreover, is much simplified, so that for example in south Staffordshire a scheme is in operation for distributing producer gas in pipes over a considerable area Even in a works it is an advantage to be able to convey the gas in steel or cast-iron mains, which drain themselves of all impurities, rather than firebrick lined conduits, in which tarry and dusty deposits accumulate, necessitating periodical clearances, by burning out, or other methods.

Suction Producers.—Many producer-gas plants are made for power purposes (Dowson, National) and washed producer-gas finds one of its most characteristic applications in the provision of gaseous fuel for isolated gas engine units In the smallest plants for this purpose, the so-called "suction gas plants," it is the suction stroke of the gas engine which is relied upon to draw air through the fuel-bed of the producer.

The gas on its way to the scrubber passes through a vertical water vaporizer, which provides all the steam required Water is supplied to the scrubber and the gas passing up it is both cleaned and scrubbed.

Blast Furnace Gas.—The blast furnaces used for the production of pig-iron may be regarded as very deep air-blown gas producers, from which the quality of the gas is lowered to some 90 or 100 B T.U. per cu ft , by the oxidation which much of the carbon monoxide undergoes in reducing oxide of iron to the metallic state

There are some special types of gas producer which have not been described. In one, invented by Dowson, air is drawn in both at the top and bottom of the fuel bed and the gas is collected in nostrils, which open into the producer half way down, where the fuel is red hot. By this means, the amount of tar in the gas is lessened, but the gas of necessity leaves the producer very hot and there are difficulties in keeping the gas exits open for the free passage of gas. In another special type of producer, the ash is run off as a liquid slag. No steam is employed in that case, since a very high temperature is a working necessity, and it may even be necessary to add some flux along with the coal

BIBLIOGRAPHY.—Among books dealing with gas manufacture are, Alwyne Meade, *Modern Gasworks Practice;* and W B. Davidson, *Gas Manufacture*. Producer gas is treated of by N E. Rambush, *Modern Gas Producers*, and Dowson and Larter, *Producer Gas* More general are Bone, *Scientific Uses of Coal;* and Haslam and Russell, *Fuels and their Combustion*. The *Transactions of the Institution of Gas Engineers* and *Proceedings of the American Gas Association*, the *Gas Journal* and *Gas World*, are periodicals dealing specially with gas manufacture (J W C)

GAS SUPPLY IN THE UNITED STATES

In the little more than one hundred years since the first gas company was organized in the United States, the gas industry has developed into one of the key industries. It has not only expanded until to-day gas service is known in practically every town but it has also gone through a complete metamorphosis, and from a light-producing industry has emerged as a heat-producing one selling a service which is rapidly growing in popularity for every kind of domestic and industrial heating. This industry is represented by 957 manufactured gas companies and 577 natural gas companies Seventy-five million people are served Of the 1,534 plants, 1,472 are privately owned, and 62 are municipal plants owned and operated by cities While municipal ownership in the gas industry has never been popular in the United States, it is becoming even less of a factor every year.

The First Gas Plants.—Following the discovery of how to make gas from coal and the unparalleled success of gas lighting in one or two European cities, it was in Baltimore that gas lighting got its start in the United States Although there were a few isolated instances of gas being used by individuals in other cities previously, introduction of gas lights in Rembrandt Peale's museum in Baltimore in 1816 proved to be such a sensation and success that the city council passed an ordinance on June 17, 1816, permitting Peale and others to manufacture gas, lay pipes in the streets and contract with the city for street lighting The first recorded demonstration of gas in the United States was in Philadelphia in Aug 1796 The gas was manufactured by M Ambroise and Company, Italian fireworkers and artists A few years later, in 1812, David Melville of Newport, R I , lighted his home and the street in front with gas which he manufactured He also lighted a factory at Pawtucket and induced the Government to use gas at Beaver Tail lighthouse.

Baltimore, however, was the first city to use gas commercially, and other cities followed her lead. Introduction of gas lighting was not rapid Since it was a radical change from the common methods of lighting of those days, it was regarded with fear by many people As many objections were made against it in the United States as had been made in London when introduced there

Gas was used first for street lighting Later public buildings were lighted in this way, and a few wealthy citizens also used gas to light their homes It was not until between the years 1865 and 1875 that the use of gas for home lighting began to make any great progress

Domestic Gas.—The first authentic recorded use of gas for domestic purposes was about 1830 or 1832, when James Sharp, of Northampton, England, demonstrated the availability of gas for cooking in his own home It was about the year 1859 when gas started to be used to any extent for cooking in the United States, and this was done chiefly on stoves imported from England Much interest was manifested at an exhibit of different types of gas stoves shown at the Centennial Exhibition, held in 1876, in Philadelphia Many of the exhibitors used gas stoves in connection with their exhibits

The latter part of the 19th century saw the gas industry of the United States firmly entrenched as a utility furnishing light to homes and factories, with the domestic cooking business more or less in the nebulous stage It was at this time, however, that the industry was given a severe blow, probably the worst that has ever been dealt to an industry in the history of American business enterprise It was the advent of the electric light which caused consternation, and yet it was this same electric light which was responsible for placing the industry in its present place of importance In the face of the keen competition the electric light would offer, it was apparent that the gas companies would have to look for other fields to conquer To-day, some 50 years after the invention of the electric light, gas has established a record for itself as a fuel and both homes and industries use this smokeless fuel for thousands of purposes Just at the turn of the 20th century, the industry had the domestic-cooking business as a base load, and soon other fields of heat application were developed, until to-day there is hardly a heating process, in the home and in any industry, which cannot be and is not being done with gas

The sales of gas for the year 1927 revealed an increase of 15,000,000,000 cu ft over the record-breaking total registered for 1926. The sales figure was 471,000,000,000 cu ft, a new high record, proportioned as follows 324,000,000,000 cu ft for household purposes, 136,400,000,000 cu ft. for industrial and commercial uses, and 5,600,000,000 cu ft for miscellaneous purposes The use of manufactured gas for commercial and industrial heating applications continues to show phenomenal growth, the amount consumed in 1927 representing 29% of the total sales of manufactured gas for all purposes, or an increase of 9,995,000,000 cubic feet Manufactured gas companies now serve 11,450,000 customers Miles of main total 91,400, invested capital $2,700,000,000, and gross operating revenue $520,000,000 The manufactured gas industry has not reported a decrease in annual sales or annual gross revenue in the last 21 years Sales have increased 408% in 25 years while the population of the country has increased only 50%

Natural Gas.—This industry is a large and important business in the United States The total amount of natural gas produced in 1927 amounted to 1,445,428,000,000 cu ft In 1927 there were 3,984,000 domestic consumers of natural gas, who used a total of 296,036,000,000 cu ft of natural gas The estimated revenue from such domestic uses was $180,000,000 It is estimated that there is more than $1,500,000,000 invested in the natural gas industry in the United States The State of Ohio has the largest number of domestic customers of natural gas, followed by California and Pennsylvania

Household and industrial consumption of gas offer tremendous opportunities for further development, substantiated by figures gathered in surveys made during 1927 One survey, covering nearly 8,000,000 homes in 2,228 communities, showed that while 75% of all families living in places of from 5,000 to 100,000 population and over have gas service, the percentage for the communities under 5,000 is only 54 The gas appliances in actual use also show a comparable difference In towns of 100,000 and over, 79% of the families have gas ranges, while in towns between 5,000 and 10,000 population, the percentage falls to 47 9%

It is estimated that there are 7,250,000 gas cooking appliances, including gas ranges and cookers, 1,700,000 gas water heaters of all kinds, and 1,500,000 gas room heaters in use in the United States Although gas has been used for cooking to the largest extent, it is only one of the conveniences which are available to the modern American home through the use of gas Automatic hot water supply is growing in use, and many of the most up-to-date homes have adopted the incinerator as an aid to cleanliness and sanitation. House heating by gas is a development which promises to do more than any other recent achievement to relieve the American home from back-breaking labour exerted merely to provide heat in the house Gas house heating is completely automatic—it requires no attention Cities having natural gas service have used this splendid fuel for house heating and auxiliary heating to the exclusion of all other fuels, but in the manufactured gas territory the premium over coal operation has prevented the general adoption of gas up to this time This use is growing very rapidly To eliminate noise, ensure freedom from interference with radio reception, and to provide an ideal method for refrigeration, there has been developed the gas operated automatic refrigerator This unit is also available as a combination device with the cabinet type of kitchen range mounted directly over the refrigerator, an appliance which has especial interest for homes with small kitchens The completely gas-equipped laundry with its washer, dryer and ironer, reducing the work of washing and making the home independent of the weather, is also very popular

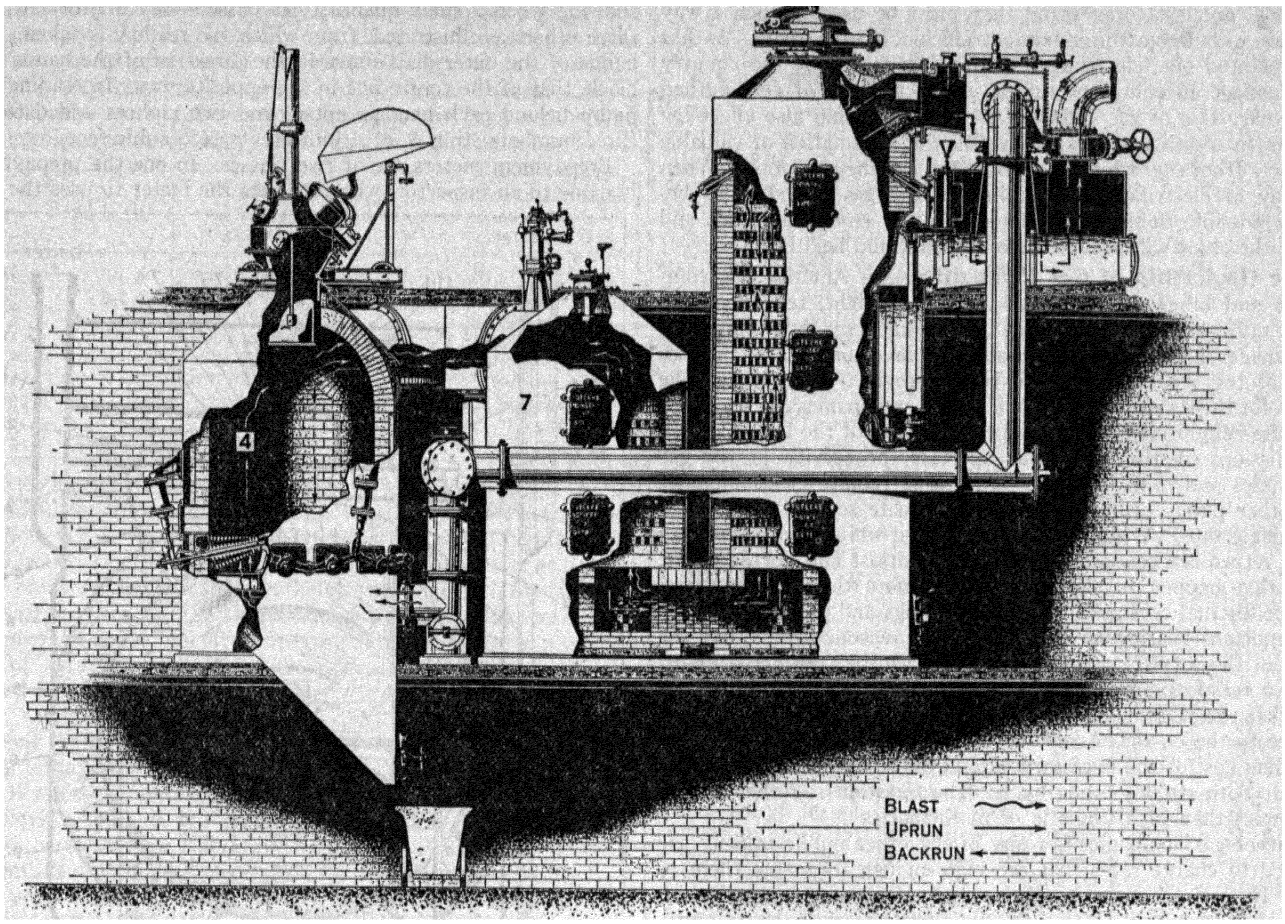
Fuel Gas.—No true concept of the gas business can be secured without referring to the growing use of this fuel in industry, and the important part it is playing in the manufacturing world A study of the stocks and bonds listed on the New York Stock Exchange and Curb Market fails to reveal any industry that cannot use gas profitably in some of its manufacturing processes Yet such a list could be extended by thousands, gas having more than 21,000 uses in industry

The chief advantages gas offers are as follows: Improvement in quality and economy in manufacture of the product, owing to perfect heat control, marked increased production; fuel storage space eliminated, elimination of capital tied up in fuel investment, elimination of smoke and end of the ash removal nuisance

The Ford Motor Company plant at River Rouge alone uses approximately 50,000,000 cu ft of gas a day This is enough to supply a city of 5,000,000 population A typical industrial gas installation will consume as much gas in one day as 500 average homes Gas is being used extensively for baking bread in large bakeries, making candy, roasting coffee, smoking meat, pasteurizing milk, pressing clothes, singeing cloth and yarn, melting glass and many different kinds of metal, vulcanizing automobile tyres, drying clothes and lumber, forging, heating rivets, galvanizing, welding, cutting metal, annealing, hardening and tempering alloy steel, tool dressing, bolt and rivet making, shrinking locomotive tyres, heating structural steel for fabrication, bending pipe, plate heating, soft metal melting, aluminium melting, lead refining, silver refining, in treating various metals in ovens and for many other purposes

While the use of gas for heating homes was started in America but a few years ago, there are to-day many scores of thousands of installations of central gas-fired units, exclusive of the millions of space heaters in use Baltimore has 1,600, Chicago has 2,000, and other cities boast of more than 1,000 homes that are heated entirely with manufactured gas, and in addition natural gas zones with all homes heated by natural gas Supplying a heating service that is in most localities not so expensive as to be prohibitive, the gas companies are preparing themselves to take on installations at a rate two and three times in excess of what they have in the past Using gas for house heating one obtains a service entirely automatic in character, free of labour, dirt, smoke, dust and ashes Recent years have seen the use of gas heating developed in the so-called skyscraper. A large building in Boston, 13 storeys high, 2,175,000 cu ft in size, is heated by manufactured gas

A most important step taken by the gas industry in behalf of its domestic customers was the establishment of a testing laboratory at Cleveland, O, for testing gas appliances In this manner



FROM THE AMERICAN GAS JOURNAL

FIG. 11.—SECTIONAL VIEW OF A STEERE WATER-GAS MACHINE WITH BACKRUN, CHARGING MACHINE FOR MECHANICAL FUELING, AUTOMATIC GRATES, THREE-WAY BACKRUN VALVE AND WATER SPRAYS IN THE SUPERHEATER FOR MAKING BACKRUN STEAM AND LOW GRAVITY GAS

The arrows indicate the course of the gas-making cycle. Wavy arrows show the blasting, which heats the fuel bed in the generator (4) to gas-making condition. In so doing a producer gas is made which in turn is consumed as secondary air is admitted in the top of the carburetor (7). This combustion heats the checkerbrick in the carburetor and superheater to proper temperatures for cracking or gasifying the oil which is sprayed into the machine at the top of the carburetor during the uprun. Straight arrows show the path of the uprun and the arrows formed with dashes, the course of the backrun. An ordinary gas-making cycle is: blasting, two minutes; uprun, 1¼ minutes; backrun, 1½ minutes, then a final uprun of ¼ minute

the American Gas Association has met the obligation of the industry to the American people for the safest, most efficient and most economical utilization of its product. The laboratory is financed by a large number of gas companies and manufacturers of appliances, and into it has been built the hopes and aims of the industry to serve the public to the best of its ability. In this laboratory are being tested for the information of manufacturers, gas companies, dealers and the general public, all manner of appliances in which gas is burned for domestic uses.

THE FUTURE OF GAS

The Passing of Coal as Fuel.—Leaders of American industry believe, and are constantly preaching, a coming era of effective conservation of all natural resources and efficient and economical use of the public services. They foresee the time not only when oil will be reserved for purposes of transportation by land and sea and air, but also when the burning of raw fuel of any kind, including coal, will be forbidden. They believe that the necessity for conservation, together with the growing sense of the economic waste and the loss of health and efficiency as a result of smoke, will result in coal being used exclusively as a raw material rather than as fuel. It is believed that perhaps 70% of the potential efficiency of coal is wasted in the average home and anywhere from 25 to 75% in industrial plants. A ton of coal used in the manufacture of gas will produce approximately 1,400 lb. of smokeless fuel (coke), 10,000 cu.ft. of gas, 25 lb. of ammonium sulphate, 1½ gal. of benzol, and 10 gal. of tar.

Air Pollution by Coal Smoke.—Smoke pollutes the atmosphere, injures the health and destroys property. It is claimed that more persons are devitalized, disabled and poisoned by the impurities contained in smoke-polluted air than by the noxious ingredients in food or water. Density of atmospheric smoke increases pneumonia and causes other illnesses. As smoke diminishes sunlight and increases the humidity during both cold and warm weather, it is certain it exerts an important influence upon the health of all persons who live in a smoky city. The Mellon Institute estimates the annual smoke loss and damage in Pittsburgh is $10,000,000, or almost as much as the city's yearly bill for domestic fuel. Since Chicago has nearly five times the population of Pittsburgh, it is probably a conservative estimate to put the annual cost of smoke damage in that city at $20,000,000, or nearly double that of Pittsburgh. The total volume of air-diluted gases discharged from smoke stacks in Chicago each day amounts to approximately 47,000,000,000 cu.ft., or 58 times as much as the average daily consumption of manufactured gas.

Smokeless Cities Possible.—Conservation of our natural resources, including coal, is one of the big problems of the age. Few people realize the enormous amounts of coal and oil burned every year. Back in the days of the Civil War, roughly 33,000,000 tons of coal were produced annually and the consumption of petroleum, which was then just coming into use, was about ¾ gal. per caput. To-day, we produce 700,000,000 tons of coal a year

research, but he added little to our knowledge of physical science. In philosophy he opposed the blind acceptance of Aristotle, revived atomism and advocated an empirical realism But he was not a consistent empiricist, for while he constantly maintains "that there is nothing in the intellect which has not been in the senses," and that the imaginative faculty is the counterpart of sense, he at the same time admits that the intellect, which he affirms to be immaterial and immortal, attains notions and truths of which sensation or imagination can give us not the slightest apprehension (*Op* ii 383.) He instances the capacity of forming "general notions" and universals, the notion of God and the power of reflection.

The first part of the *Syntagma philosophicum,* which exhibits Gassendi's critical ability, his wide reading, and also his deficiency in speculative power, contains at least one praiseworthy portion, a sketch of the history of the science It also contends that the true method of research is the analytic, rising from lower to higher notions, though it admits that inductive reasoning, as conceived by Bacon, rests on a general proposition not itself proved by induction In the second part of the *Syntagma,* the physics, he approves of the Epicurean physics, but rejects the Epicurean negation of God and particular providence, and of an immaterial rational soul, endowed with immortality, capable of free determination, and specially created The hypothesis of the *calor vitalis* (vital heat), a species of *anima mundi* (world-soul), which is introduced as physical explanation of physical phenomena, does not seem to throw much light on the special problems which it is invoked to solve Nor is his theory of the weight essential to atoms as being due to an inner force impelling them to motion in any way reconcilable with his general doctrine of mechanical causes In the third part, the ethics, there is little beyond a milder statement of the Epicurean moral code, and a mass of historical quotations The final end of life is happiness, and happiness is harmony of soul and body (*tranquillitas animi et indolentia corporis*)

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GASTEIN, in the province of Salzburg, Austria, a side valley of the Salzach, about 25 m long and 1¼ m. broad, renowned for its mineral springs The valley lies at an elevation of between 3,000 and 3,500 ft and is traversed by the river Gasteiner Ache and the railway which pierces the Hohe Tauern The principal settlements in the valley are Bad-Gastein and Hof-Gastein. Bad-Gastein is a very celebrated watering-place situated on a shelf between the upper and lower valleys of the Ache at a height of about 3,300 ft. Its thermal springs have a temperature of 113–120° F, are mineral-bearing and radioactive and used as baths for the treatment of nervous diseases, rheumatoid complaints and senile debility. Their medical value has been known since the 7th century but they were popularized by the visits of Wilhelm I of Prussia and the Austrian Imperial family. On several occasions, notably during the negotiation of the Austro-German treaty in 1879, the town has been the scene of historic political conferences It is also celebrated for its magnificent waterfalls, the upper, the Kesselfall (196 ft) and the lower, the Barenfall (296 ft) Pop (1923) 2,670. Hof-Gastein, the capital of the valley commune, lying at a lower level is also a spa, the waters being conveyed from Bad-Gastein by a conduit At one time it was, after Salzburg, the richest place in the province owing to its gold and silver mines, worked from the Roman period onwards until the 17th century, since when they have been disused. Pop (1923) 1,040

GASTER, MOSES (1856–), Rumanian Jewish scholar, was born at Bucharest, and educated at Bucharest university, where he became lecturer in Rumanian language and literature (1881–85). His championship of the cause of persecuted Jews led to his expulsion from Rumania, and he came to England, where he held a lectureship at Oxford in Byzantine and Slavonic languages (1886 and 1891), and was for six years (1890–96) principal of the late Montefiore college at Ramsgate The Rumanian order, *Bene merenti,* 1st class, was bestowed on him for literary achievements In 1887 he was appointed chief rabbi of the Sephardic communities of England

His numerous publications include *History of Rumanian Popular Literature* (1883), new edition of Sephardic Prayer-Book with revised English translation (5 vols, 1901–06), *The Hebrew version of Secretum Secretorum of Aristotle* (1908), *The Samaritan Book of Joshua* (1908), *Example of the Rabbis* (1924), many Rumanian translations, and contributions to learned journals

GASTONIA, a rapidly growing industrial city of North Carolina, U S A, in the midst of the beautiful Piedmont mountain region, at an altitude of 832 ft, 10om E S E of Asheville, the county seat of Gaston county It is on Federal highway 74, and is served by the Carolina and North-western, the Piedmont and Northern (electric), and the Southern railways The population was 12,871 in 1920 (18% negroes) and was estimated locally at 22,000 in 1928 The 43 cotton mills, with a total of 600,000 spindles in 1928, produce chiefly fine combed yarns Spindles and other textile machinery are also manufactured in large quantities, and there are various other factories The total factory output in 1927 was valued at $26,476,195 The State orthopaedic hospital is located here Gastonia was settled about 1872, incorporated as a town in 1876, and as a city in 1910 It has a council-manager form of government

GAS STOVES. Many kinds of gas-consuming appliances are commonly included under this heading The main types in general use are the gas-cooker and the gas-fire, and each of these is manufactured in many different forms Gas-fired water-heaters, radiators, boilers for central-heating purposes, furnaces and many other gas-consuming contrivances are also employed in houses, offices, factories, hospitals, etc

The Gas-Cooker.—As usually manufactured, the gas-cooker consists of a gas-heated oven, combined with a hot plate provided with boiling burners, and some form of griller Many years of experiment have brought the appliances to a high degree of efficiency, with the result that they are very freely used It is estimated that in Great Britain alone there are six to seven million domestic gas-cookers in use. It is claimed for the most modern appliances that with town gas at 9d per therm (*i.e.,* 100,000 British thermal units), the cooking of a varied menu for a family of six persons may be performed at a cost of less than ¾d per day per person

Gas-cookers are now frequently made with a very high-grade finish in polished metal and nickel-plated fittings A specially tough vitreous enamel is used to cover both the interiors and exteriors, including the hotplate, and a new process has been adopted by which the enamel is applied cold to castings and fired afterwards, instead of being sprayed on to hot metal Expansion and contraction do not affect these enamels, and stains can be removed easily without damage to their surfaces

Gas-cooker ovens are now often fixed at a higher level than in the past, in some cases on stands raised about 6 inches from the floor, and in others about 2 feet 4 inches above floor level When the oven is raised to eye level, the hotplate is fixed on the same stand at the side of the oven instead of above it.

Nearly all gas ovens are internally-heated, combustion taking place inside the chamber in which the food is cooked This practice was investigated on behalf of the *Lancet,* and the principle declared sound. Externally-heated ovens have, however, been made In internally-heated ovens one or two bar burners of bunsen type are fixed at the base. When two burner bars are used they are placed at the sides; when one only is provided it is fixed at the back The oven has adjustable shelves which make it possible for several articles of food to be cooked at one time

The metal walls and door are insulated with silicate wool, which is packed between the inner and outer casings The products of combustion and the vapours arising from the food pass away

through an opening, which in some cases is situated at the top of the oven and in others at the bottom.

The thermostat supplied with many gas cooker ovens is provided with a revolving knob and pointer, and a numbered dial By setting the pointer at the figure required for certain cooking processes the cooking is automatically carried out without the necessity of further attention on the part of the user

The Hotplate.—The bulk of the cooking for the average household is done on the hotplate, which consists of two or more boiling burners and a griller, with bars above to support cooking utensils The boiling burners are of two kinds—the "drilled ring" and the "spreading flame," each of which has merits In some cases, both types are used in the same hotplate The "drilled ring" burner is usually regarded as the better for slow work—especially when solid materials are contained in the saucepan—whereas for plain boiling work, such as heating water in a kettle, the "spreading flame" burner can be employed with advantage in thermal efficiency The flames can, in either case, be reduced or increased at will to give a large number of variations of heat between the maximum and the minimum

The common type of hotplate is of "open" form, the cooking vessels being supported above the burners by relatively slender bars or grids so constructed that, while having the necessary strength, they provide the smallest possible surface contact with the flames of the boiling burners This ensures the utmost economy in gas consumption, because very little heat is conducted away and wasted through the bars, and with gas at 9d. per therm, about 14 pints of water may be boiled for ½d.

In the "enclosed" type of hotplate, the burners are covered by a metal plate or plates upon which the vessels stand With this type of hotplate the amount of gas used for heating a single vessel is greater than when open bars are used, as some of the heat which is passed to the plate is conveyed to the adjoining metal, upon whose surface other and slower cooking operations may of course be carried on The closed hotplate also provides a smooth surface on which vessels can readily be manipulated For this reason this type is sometimes preferred for large-scale cooking operations. When cookers are made with closed tops, some detachable plates are provided for removal to permit a kettle or other vessel to be placed directly over the burner flame to hasten the process of boiling Alternatively, one or more solid plates are frequently supplied with the more popular open-top hotplates for use when specially slow cooking processes are required

In the kitchens of works' canteens, hotels, hospitals and institutions, separate appliances are usually provided for the carrying out of the various functions of the domestic gas cooker Among those in common use for large-scale catering are roasting ovens, table hotplates, fish-fryers, pastry ovens, soup boilers, vegetable steamers, instantaneous water-heaters, Bains Marie, grillers and toasters, hot closets and carving tables, incinerators, refrigerators, and bread-baking ovens of various sizes up to those nearly 100 feet long, through which the loaves pass on a continuous travelling web of iron plates supported by chains

Gas Fires.—The gas fire fundamentally consists of:

(1) A horizontal burner with a number of jets which produce a row of intensely hot but silent flames,
(2) What are known as "radiants," superimposed on these jets to become incandescent when the flames burn within them,
(3) A fire-brick back behind the radiants, and
(4) A canopy capable of conveying to a chimney or flue all the products of combustion, and of creating the necessary movement of air to ensure good ventilation

The details of burner design include regulating devices whereby the correct size, character and silence of the gas flame can be readily produced, and what is known as a "duplex" tap, by means of which some flames may be extinguished while the remainder keep burning The user is thus able to obtain the exact amount of heat required at any given time The radiants are made of refractory material specially prepared so that the fire will reach 90% of its full heating power in about five minutes from the moment of lighting, and will radiate at its greatest intensity two or three minutes later This is due partly to the form of the fuel and partly to its composition The radiant is of skeleton form, within which the flame burns It is as slender in construction as possible, but sufficiently strong to withstand a fair amount of rough handling without becoming fractured Some gas fires are constructed to accommodate "radiants" which are so designed as to simulate the appearance of a coal or coke-fire when burning. The result is obtained by the blackening of portions of the radiants, which are specially made with a backward curve, and by superimposing upon them a layer of solid pieces of refractory material resembling coke Another type is made to imitate blazing logs of wood.

As gas does not produce soot and its products of combustion are of a vaporous character, the flue area necessary is much smaller than that for a coal fire. By the use of what are called "economy" blocks, suitable gas fire flues can be constructed within the thickness of the party or external walls, rendering unnecessary the provision of brick chimney breasts Gas fires are low in running cost. It is said that with gas at 9d per therm, a room 12′ x 12′ may be heated for an hour, with the fire full on, for 1⅛d, the hourly cost being considerably reduced over a period as the room becomes warm

GASTRIC AND DUODENAL ULCER. A gastric ulcer is situated towards the centre of the stomach or near the pyloric orifice It is commoner in the female sex A duodenal ulcer is situated in the duodenum just beyond the pyloric orifice and chiefly affects men They are produced by the gastric juice which digests a damaged portion of the lining mucous membrane The cause of this damage is not usually to be found, but sometimes bacteria conveyed by the blood-stream from some focus of infection, or inflammation of the mucous membrane, are responsible. Rarer causes are the blood poisons resulting from burns of the skin, certain purpuric diseases and anaemias, or Bright's disease A dilated artery or vein may cause thinning of the overlying mucous membrane and finally ulceration and rupture, blockage of an artery by blood-clot, leading to death of a portion of mucous membrane, is a rare cause An injury is the rarest cause of all

An acute ulcer is one recently formed It is single or multiple, varies in size from that of a split pea to about an inch in diameter, and may be quite superficial or extend right through all the coats of the stomach Acute ulcers, if treated, heal in about three or four weeks, leaving small scars Sometimes they gradually extend, become thickened, and adhere to adjacent structures, now constituting chronic ulcers

Chronic ulcer is usually single, and varies in size from that of a sixpenny piece to an area covering a third of the stomach The liver or pancreas may be exposed by its erosion, and, by contraction during the healing process, the pyloric orifice or duodenum may be obstructed, or an hour-glass contraction of the stomach produced Such ulcers heal with great difficulty and frequently remain unhealed for years At any time during its formation or existence acute or chronic ulcer may erode an artery and cause bleeding, or perforate through the stomach wall, with extrusion of the gastric contents into the body cavity giving rise to general peritonitis or a local abscess

Distinguishing Characteristics.—An acute ulcer is usually characterised by the sudden vomiting of a large quantity of blood (haematemesis) without any warning whatever The blood lost may amount to as much as two quarts, although not more than half a pint may be vomited The patient becomes blanched, almost pulseless, and often unconscious For a few days subsequently black tarry motions (melaena) due to altered blood are passed In acute duodenal ulcer melaena and fainting are frequently the only signs of bleeding Sudden perforation without warning constitutes a second type of case, but it is not very common The patient is seized with violent pain in the abdomen, vomits and may collapse In twenty-four hours the abdomen distends with the onset of peritonitis, the temperature rises, and death occurs in four or five days unless the patient is promptly operated upon In a third class of case the patient has suffered for a longer or shorter time from the symptoms of indigestion before the above catastrophies occur

Chronic ulcer is characterised by attacks of pain and vomiting extending over a period of from two to twenty years The attacks

last a few weeks or months and are separated by intervals, in which the patient is quite free from symptoms, or may suffer from constant dyspepsia (indigestion). The pain, which is usually severe, is situated in the abdomen between the breast-bone and the navel, often covers quite a small area, which is tender to the touch, and may shoot through to the back

In gastric ulcer it occurs from a half to two hours, and in duodenal ulcer up to seven hours, after food In each case it may awake the patient during the night The pain is relieved in most cases by eating food or by alkaline medicine Vomiting is more common in gastric ulcer and relieves the pain The remaining symptoms are a feeling of fullness and repeating of wind and sour fluid The bleeding in chronic ulcer is less profuse than in acute ulcer and commonly consists of dark clots and material like coffee-grounds Perforation is more common in chronic than acute ulcer and more frequently leads to a local abscess. Stricture of the pylorus gives rise to more severe pain and the vomiting of large amounts at infrequent intervals A chronic ulcer may be seen in many cases by the X-rays

Treatment.—The treatment of bleeding consists in keeping the patient absolutely at rest in bed with light coverings in a cool and shaded room Sips of cold water only are allowed by the mouth, feeding being entirely conducted by nutrient enemata When the melaena has stopped, mouth feeding is commenced and the case then treated as all ulcers should be, that is to say in bed for six weeks, the diet being gradually increased through the stages of milk, eggs, cereals, fish, chicken, vegetables, and meat. When on a full diet, the patient is allowed up, and after convalescence given general instructions as to mode of life and diet Some alkaline medicine is administered two hours after food to neutralise the acid of the gastric juice, which is the chief factor in preventing the healing of the ulcer Operation is not resorted to in bleeding, but in the case of perforation it is necessary so that the hole in the stomach or duodenum may be stitched up, as this proceeding holds out the only hope of recovery. Operation is also indicated when the medical treatment of chronic ulcer has failed. The ulcer is either cut out, or, if this is impossible, a short-circuiting operation (gastro-enterostomy) is performed A new opening is made in the stomach, which is joined to the small intestine below the duodenum By this means the stomach empties itself rapidly, and a free regurgitation of intestinal contents into the stomach keeps the acidity of the gastric contents low. This operation is more particularly useful if the pylorus is obstructed. Relapse after operation occurs in a certain number of cases

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GASTRITIS, inflammation of the stomach, in which catarrh, or irritation of its mucous membrane, is the most frequent and most readily recognized sign This may be acute or chronic and depends upon some local or general condition which induces congestion in the walls of the stomach (*see* ALIMENTARY CANAL)

Acute Gastritis may arise from various causes The most intense forms, if the patient live long enough, follow the swallowing of corrosive poisons, such as strong mineral acids or alkalis which extensively destroy the mucous membrane Other, non-corrosive, poisons cause acute degeneration of the stomach wall (*see* POISONS). Acute inflammatory conditions may be secondary to zymotic diseases such as diphtheria, pyaemia, typhus fever and others. Gastritis may also be caused by the ingestion of food which has begun to decompose, or may result from eating substances which themselves remain undigested. The symptoms consist in loss of appetite, sickness or nausea, and headache, frontal or occipital, often accompanied with giddiness The tongue is furred, the breath foetid, and there is pain or discomfort in the region of the stomach, with sour eructations, and frequently vomiting, first of food and then of bilious matter An attack of this kind tends to subside in a few days, especially if the exciting cause be removed. Sometimes, however, the symptoms recur with such frequency as to lead to the more serious chronic form of the disease.

The treatment bears reference, in the first place, to any known source of irritation, which, if it exist, may be expelled by an emetic or purgative (except in cases due to poisoning) This, however, is seldom necessary, since vomiting is usually present For the relief of sickness and pain the sucking of ice and counter-irritation over the region of the stomach are of service Further, internal administration of bismuth or weak alkaline fluids, and along with these, a light milk diet, are usually sufficient to remove the symptoms

Chronic Gastric Catarrh may result from the acute or may arise independently. It is not infrequently connected with antecedent disease in other organs, such as the lungs, heart, liver or kidneys, and it is especially common in persons addicted to alcoholic excess. In this form the texture of the stomach is more altered than in the acute form, except in the toxic and febrile forms above referred to. It is permanently in a state of congestion, and its mucous membrane and muscular coat undergo thickening and other changes The symptoms are those of dyspepsia in an aggravated form (*see* DYSPEPSIA), of which discomfort and pain after food, with distension and frequently vomiting, are the chief, and the treatment must be conducted in reference to the causes giving rise to it The careful regulation of the diet, in amount, quality, and the intervals between meals, demands special attention Feeding on artificially soured milk may be useful Lavage or washing out of the stomach with weak alkaline solutions has been used with success. Bismuth, arsenic, nux vomica, the mineral acids and pepsin are all of use.

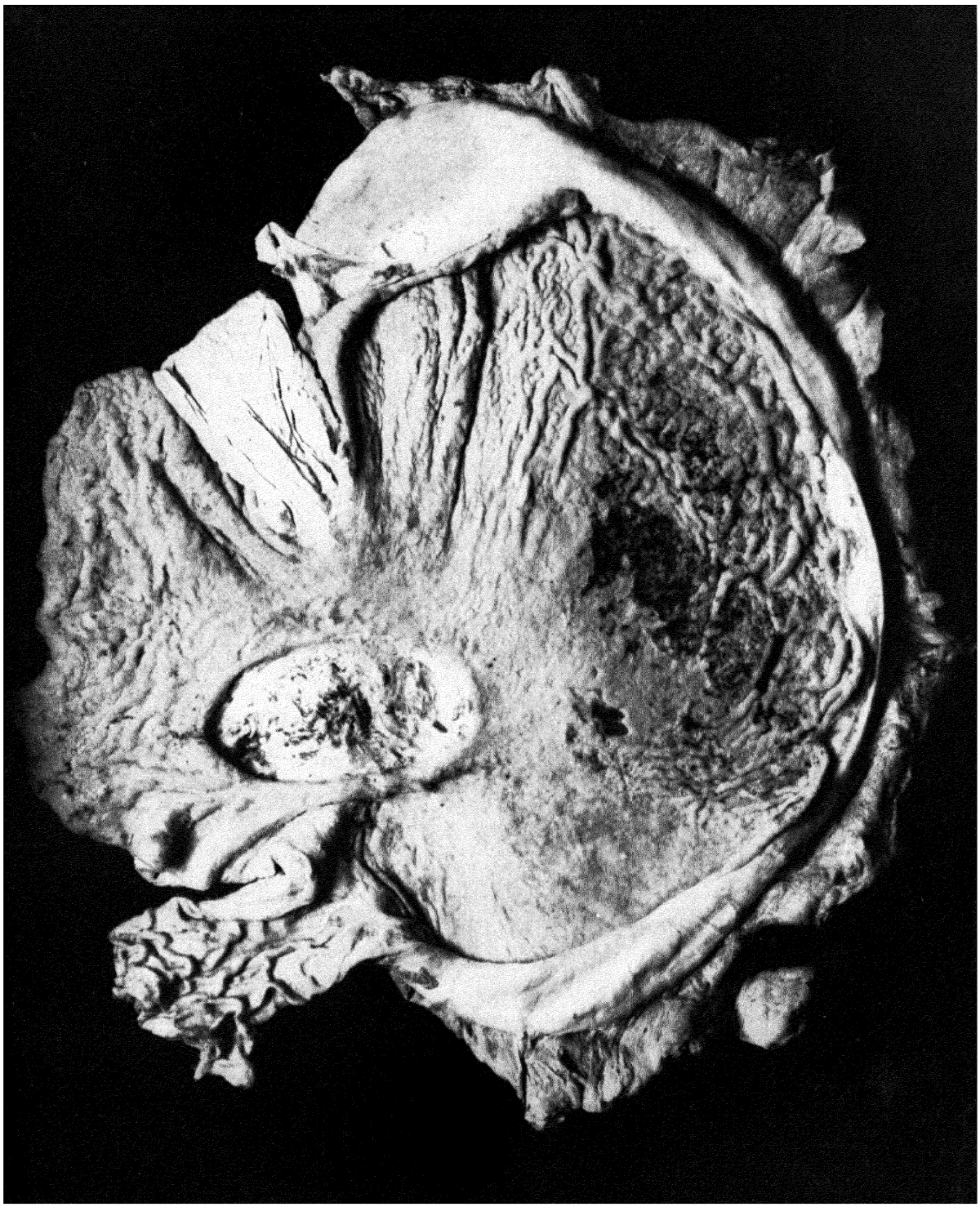
GASTRONOMY, MODERN. Is gastronomy an art or a science? This is a question on which epicures and cooks are at issue La Rochefoucauld wrote that "eating is a necessity, but eating intelligently is an art" Vauvenargues admitted unhesitatingly that "great thoughts come from the stomach" The doctrine of Epicurus bids us find an agreeable employment for our faculties in the intelligent enjoyment of the pleasures of the table And finally, to go back still farther, Ecclesiastes himself teaches us that "a man hath no better thing under the sun, than to eat, and to drink, and to be merry . . ."

Throughout the ages, meals have been made a time of relaxation, comfort and enjoyment The feasts of the middle ages were, as we know, assemblies of people desperately hungry after long days of hunting in the forests, trained to violent exercise, capable of wearing heavy armour and of doing justice to a prodigious bill of fare.

In the 17th century, the spirit of order, reason and dignity which characterized the literature of the period found a further outlet in the elaborate organization of banquets these were conducted according to a regular programme, involving a whole series of minute observances The result was that the guests got nothing but congealed gravy

The eighteenth century, witty, pugnacious, enthusiastic and volatile, introduced into cookery its elegance, its instinct for pleasure and refinement But modern cookery really dates from the end of the First Empire, the time of Brillat-Savarin and Carême It was they who substituted the "made dish" for masses of roast meat, piled in pyramidal form and held together by skewers These enormous, barbaric accumulations of food were yet another Bastille which the French Revolution overthrew

Gastronomy Is an Art.—It may fairly be said that modern gastronomy is an art, and that Molière talked like a Philistine when he made one of his characters say that "we eat to live, we do not live to eat." It is an art because it demands the co-operation of all the senses The crispness of fried dishes and pastry is agreeable to the ear The softness of well thickened sauces and melting *foies gras,* the succulent freshness of fruit, are pleasant to the touch Is there anything more delightful to the eye than a dish *au gratin,* with its captive flavours imprisoned under its golden dome? Do not odours like those of seasonings of herbs, or of truffles, afford the highest possible gratification



SADDLE-SHAPED ULCER OF THE SMALL CURVATURE

A dilated stomach with the anterior wall turned back to show a saddle-shaped ulcer of the small curvature, which has become considerably contracted, thereby narrowing the pylorus seen to the left of the ulcer

FROM BOLTON, "ULCER OF THE STOMACH" (ARNOLD AND CO.)

to the sense of smell? Of the palate there is no need to speak.

It may even be said that gastronomy is a perfect art, for so wide a range of enjoyment could not, in the opinion of the present writer be derived from listening to a symphony, hearing a poem read, or gazing at a beautiful building. Indeed, it would not be unreasonable to maintain, not merely that gastronomy is a perfect art, but that it is the only art which is perfect.

Gastronomy Is a Science.—Unquestionably gastronomy is a science, for it has its laws, its formulas, its fixed processes Art cannot be taught, whereas the profession of cookery should be preluded by a long apprenticeship Certain physico-chemical laws have to be observed in the preparation of our food; and cooks often make scientific discoveries without knowing it Why does red wine go well with roast meat and cheese? Because tannin combines with albuminous substances in a manner propitious to digestion. Why do we eat potatoes fried? Because fats and starch are chemical substances belonging to the same group of hydrocarbonates. Why do we put lemon juice on fried dishes, or in a salad? Because acids attack cellulose and saponify oil, and make them easier to digest.

Likewise, there are culinary processes which are scientific applications of the laws of nature. Roast meat, for example, must be exposed to great heat for a short time in order that a crust may form all over the surface, and then placed in a moderately heated oven and left there as long as possible in order that the browned skin may imprison all the juices of the meat and that these, by a slow process, as it were of digestion, may make the flesh tender

Again, cooks know that a sauce the principal ingredient of which is the yolk of an egg must never be allowed to boil, or else its elements will become disunited. as we say, they will curdle They know, too, that, if need be, they can be reunited simply by the addition of the yolk of another egg and a little boiling water If a dish is too salt, add at once a few spoonsful of milk or a little butter. Many practical examples of the kind could be cited

Cookery Since the World War.—The renewed interest in gastronomy is undoubtedly one of the effects of the World War For four years millions of men, living as best they could on trench fare, sought solace in the misery of their leisure hours by dreaming of good cheer For four years, whenever they came out of the line, they revelled in table-cloths, properly served meals, "made dishes" and the savours of which they were deprived. At the same time, men became more appreciative of life and its pleasures—a kind of instinctive protest against the all-pervading menace of death, a parallel to which may be found in the reaction under the Directory after the famine and executions of the Terror

As people became more genuinely appreciative of good living, the cooking of the big "palace," which hitherto had satisfied their requirements, lost its popularity Diners would no longer tolerate those dull, stereotyped meals, at which a chicken's breast is cut up into the tiniest fragments, and the sweets—half-melted ices or palsied puddings, as the case may be—have so unspeakably depressing an effect.

The motor-car has made it possible for the traveller to avoid having meals in the large towns where the expresses stop, and to try his luck in the restaurants which are now springing up in ever-increasing numbers in the country round But the adventure sometimes turns out a misadventure At many of these restaurants it is always uncertain whether there will be guests or not; the dishes, therefore, are cooked a long time beforehand and kept in tins, to be warmed up when ordered. The unpleasant surprises a guest may experience who has the ill-luck to enter an establishment of this kind which is not presided over by a conscientious *chef*, or a cook careful of her reputation, may easily be imagined.

The Good Restaurant.—Some restaurant-keepers, encouraged by the various gastronomical societies founded in recent times, have, while exploiting modern ideas of comfort, endeavoured at the same time to revive a lost tradition They provide only good wines, instead of Vouvray ruined by a smell of sulphuric acid, or Bordeaux from Algeria. They do not crowd their guests together like sardines, or furnish the place so expensively that a prohibitive increase of prices is inevitable They set no store by luxurious interiors lighted with excessive brilliance, where a few solitary individuals dine lugubriously and groups of unoccupied waiters stand about.

A first necessity in a good up-to-date restaurant is a cloak-room the use of which is optional. Think of a bachelor, who has two meals at a restaurant daily, being obliged to pay, from June to October, two hundred francs in cloak-room charges for a straw hat!

In a good restaurant, the tables are well placed, the service is simple and the bill of fare consists of a few dishes only—but the preparation of each dish must be a labour of love, executed with care and patience No orchestra disturbs the quiet of the place The head waiter does not insist on your ordering what he himself fancies; the proprietor comes to ask your opinion of the Armagnac and the kirsch served to you And a delightful surprise awaits you—the bill is moderate. The result is that you leave the restaurant having dined well, your mind at ease, your heart at peace with the world.

The Revival of Cookery.—For some time past a good deal has been heard about new dishes As a matter of fact, there is hardly a dish which has not been attempted already

Many people, it is certain, do not know that in the Middle Ages, at the Tour d'Argent, the oldest restaurant in Paris, dormouse pastry, mixed dishes of snakes, porpoise, roast swan and crane stuffed with plums were served to the guests Nor that Frederick the Great made his coffee with champagne and added mustard to give the remarkable drink a still stronger taste Nor that, before the war, a cook named Jules Maincave gave to the world fillets of mutton with crayfish sauce, beef cooked in kummel, bananas with Gruyère cheese, sardines with Camembert cheese and herring soup with raspberry jelly

These last experiments, it must be confessed, are highly unpleasant; for the ingredients in question could not possibly be made to harmonize, any more than cat and dog Nor is it at all clear how a mixture, for example, of chocolate and red wine could be rendered palatable

At the same time, it would be a mistake to go to the opposite extreme and content ourselves with the stereotyped dishes turned out by cooks devoid of imagination When a writer uses hackneyed words—a habit of which journalism affords only too frequent examples—we say that he writes in *clichés* and that he writes badly When a painter always paints the same picture over and over again, we are quick to compare him to a photographer lazily taking a succession of proofs from the same negative Similarly, in the domain of cookery, the most modest dishes should afford a good housewife an opportunity of using her inventive faculty and her intelligence There is no reason why the culinary fashions of years gone by should immobilize and enslave us, nor why the gastronomists of to-day should be less adventurous, less eager for knowledge than their predecessors who, throughout the ages, have enriched cookery with a stream of new discoveries We should not abandon hope of improving on first results We should pay no attention either to dogmatists who accept the existing order of things, repeat and solemnly hand on to posterity what they have heard from their elders, and irrevocably condemn the unknown as a matter of principle, or to those who take fright at an unfamiliar flavour, like children swallowing their first oyster If men had always acted thus, if no risks had been taken and no experiments made, whereby alone the adventurous instinct learns self-restraint, the range of our enjoyments would to-day be exceedingly limited We should be no more tolerant of the conservatism of people who will not eat roast chicken unless surrounded by watercress, or veal unless in the company of carrots or peas, or a leg of mutton with anything else than a dish of haricot beans.

What we should aim at doing is to combine with familiar recipes something which, while setting off their good qualities, yet introduces an element of surprise and provides what was wanting in them We should not hesitate to transform a sauce possessing

its traditional flavour into something more savoury and unexpected The harmonies which can be obtained from certain combinations of crisp and fatty substances and of watery and farinaceous vegetables, are worth studying

Here follow a few recipes in the new style of cookery, these will give an idea of the kind of dish which harmonizes with a modern dining-room.

Tomato Tart.—This is a simple, family dish which is sure to be appreciated by old and young alike Make an open tart of unsweetened pastry Fill it with a thick *béchamel* (a sauce made of flour and butter) flavoured with cheese, mixed with concentrated tomato essence Place on this foundation tomatoes which have been cooked in butter flavoured with onion, and stuffed with mushrooms and olives The tomatoes should have been put in the oven just before being placed in the tart Then cover the whole with breadcrumbs done with butter to a golden brown, and the tart is ready to be served. It forms a dish of three storeys, and each of them succulent

Cold Pork with Truffles.—*Foie gras* flavoured with truffles is excellent, but it seems a pity to mix two decided flavours Surely it is better to use truffles to give flavour to something which in itself is comparatively tasteless M Verdier, ex-manager of the *Maison Dorée,* and one of the greatest chefs of the day, recommends that pieces of raw truffle should be pressed as deeply as possible into a piece of fresh pork Choose a piece which is close-grained and not too lean When the pork is inlaid with a sort of mosaic of truffle, roll it, tie it up and roast it Let it cool in its own fat, and serve it cold the next day with whatever salad is in season

Haricot Beans with Cream Sauce.—School-boys and soldiers learn to hate haricot beans; but they are a vegetable which can be either detestable or delicious according to the way in which they are cooked If you want to make haricot beans really exquisite, let them soak for twenty-four hours and then boil them very slowly. Meanwhile get ready in a saucepan a spoonful of good *béchamel,* half a litre of cream, and plenty of grated Gruyére cheese Put in plenty of pepper and not very much salt When the sauce has been brought to a creamy consistency, pour it over the haricots after first straining them Sprinkle the whole with a little grated cheese, and brown lightly in the oven

If you like you can colour this dish with methylene blue This is a new idea which has scandalized the whole cooking world Methylene blue is an absolutely harmless chemical product; in fact it is actually ordered by doctors as a remedy for digestive disorders, so it cannot do anyone any harm Dissolve in water as much methylene blue as you can put on the point of a knife You will get water the colour of an African sky Boil the beans in this water, and they will take on a greenish-blue shade which will astonish your guests

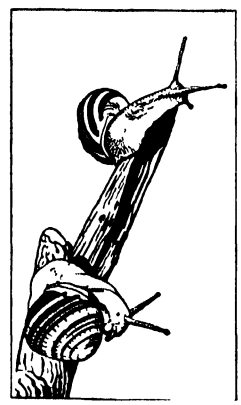
Lettuce and Orange Salad.—You need to have the soul of a rabbit to eat salad as it is usually served—green leaves slightly lubricated with oil and flavoured faintly acid with vinegar A salad is only a background; it needs embroidering To give character to a lettuce salad, cut up slivers of orange rind as small as pine needles, and sprinkle them over the salad If you want something still more entertaining for your guests, cut up a carrot into equally small slips This will at once arouse the attention of any gourmet Which is orange and which is carrot, he will wonder How does the orange come to have a flavour of carrot and the carrot a flavour of orange? You will have given him a real gastronomic entertainment.

Stewed Apples Flavoured with Tangerine.—A dish of stewed apples, rust-coloured and unadorned, is a melancholy sight Yet this economical dish, which is to be found in the least pretentious homes, can be given a very attractive flavour All that is needed is to put in little pieces of the rind of tangerines, after removing all the white pith The dish can easily be decorated with slices of tangerine which have first been freed from their pips and soaked in rum

These dishes are much easier to make than might be thought from the description They are far less difficult than most of the recipes of high-class cookery, for which strong *bouillon* of meat or fish is usually required Guests may at first be rather suspicious of their novelty, but the first mouthful will remove their apprehensions, and they will soon be in the proper frame of mind to appreciate the new style of cooking When an unfamiliar harmony of flavours forms itself on the palate, we should try to analyze the sensation just as we identify the different instruments in an orchestra. This is the right way to train our taste We shall create new sources of pleasurable sensation, and we may even enrich humanity by fresh progress in the culinary art

BIBLIOGRAPHY —Among works on gastronomy which have recently appeared, or which can definitely be regarded as authoritative, the following may be mentioned Ali-Bab, *La Gastronomie Pratique;* Auguste Escoffier, *Le Guide Culinaire,* Edouard Nignon, *Les Plaisirs de la Table;* Paul Poiret, *107 Recettes ou Curiosités Litteraires;* Paul Reboux, *Plats Nouveaux,* E Richardin, *La Cuisine Française,* Bertrand Guegan, *La Fleur de la Cuisine Française,* Paul de Cassagnac, *Les Vins de France,* Salles and Prosper Montagné, *La Grande Cuisine,* and the works of Philéas Gilbert, Edouard de Pomiane, Paul Bouillard, and Maurice des Ombiaux *See* also COOKERY (P. RE)

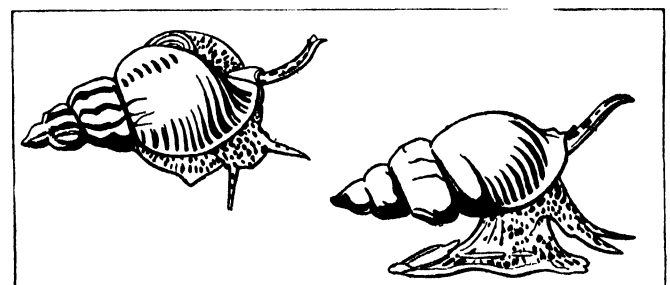
GASTROPODA, a large group of invertebrate animals ranked as a class of the phylum Mollusca and represented by such familiar forms as the limpet, the whelk, the common snail and slug There is no single English name which can be given to this group The land and freshwater forms which have shells may all be termed "snails" and the shell-less land forms "slugs," and by a reasonable usage the name "snails" or "sea-snails" may be given to marine gastropoda with shells (whelks, periwinkles, etc), and the shell-less marine forms (Nudibranchia, etc) may be called "slugs" or "sea-slugs "



BY COURTESY OF S CROOK

FIG 1 —GARDEN SNAILS CLIMBING

The gastropoda are primarily distinguished from other molluscs by their shell, which is a single structure and is spirally coiled, at least in the larval state In many gastropoda, however, it is very much modified in the adult and, though it is spiral in a large number of genera, it may lose this appearance and become (*e g*) cup-shaped or tubular In some forms it is covered over by the mantle and degenerate, and it may also be entirely absent The gastropoda are also distinguished from other molluscs by their asymmetrical organization The latter is brought about by a process which takes place in larval development, during which the anus and the organs adjacent to the latter are moved forwards ventrally from their originally posterior position and then twisted through 180°, so that they come to lie above and to one side of the head The flexure of the intestine is a phenomenon seen in other molluscs, the twisting or "torsion" of the anal complex is peculiar to gastropods, and it is believed to bring about the asymmetry mentioned above, the chief feature of which is the atrophy or the complete disappearance of the kidney, gill and auricle originally situated on the left side of the body, those of the original right side persisting in a more or less unmodified condition The clearly defined and well-developed head is likewise distinctive.



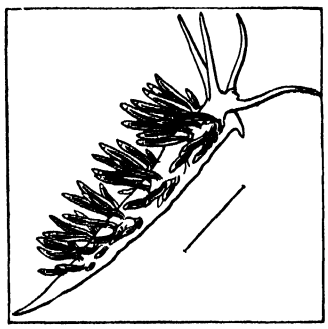
FROM MEHEUT, "ETUDE DE LA MER" (ALBERT LEVY)

FIG 2 —BUCCINUM UNDATUM

The gastropoda constitute the largest class of molluscs and number some 30,000 living species, which range in size from giant

whelk-like forms 2ft. in length, down to minute species of *Vertigo* barely a millimetre long in the adult state. An enigmatic fossil from the Wealden of Kent (*Dinocochlea ingens*) measuring over 6ft in length has been described as a fossil gastropod.

In all probability the earliest gastropods were marine animals and they now constitute an important part of the marine fauna. They have also populated fresh water and land, and the familiar Helicidae, the Zonitidae and Bulimulidae are among the largest groups of land invertebrates In general, their range of habitat is diversified They are found at very great depths in the sea as well as in the shallower water, and the pelagic gastropods (Pteropoda and Heteropoda) form part of the marine plankton (minute floating organisms) The freshwater and terrestrial gastropoda occupy a great variety of habitats and as a whole are to be reckoned as a very adaptable group, though the need for moisture and lime salts renders them less universally distributed than, *e g*, millepedes and Collembola



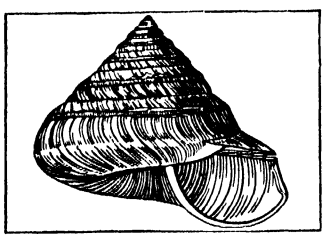
FROM ALDER AND HANCOCK, "BRITISH NUDI BRANCHIATA" (RAY SOCIETY)

FIG 3 —HERMAEA DENDRITICA

Generally speaking, gastropods are sedentary, inactive animals that rely on their hard shells and unobtrusive habits for protection The cumbrous shell and the absence of a jointed skeleton render them slow in their movements On the other hand, they are capable of very considerable muscular exertion and tend to be very tenacious of life A limited number of genera are more active and mobile and have taken to swimming, climbing and burrowing Many marine gastropods and the majority of the terrestrial and freshwater forms feed upon plants or on organic débris, and such a diet was no doubt characteristic of the primitive gastropod stock Several groups, however, have become carnivorous and are modified accordingly in habits and structure

Classification.—The classification of the gastropoda has undergone many changes in the past Even at the present time there is no universally accepted system so far as the main subdivisions are concerned, although there is a general measure of agreement as to the composition of certain of the lesser groups

The class Gastropoda, including the orders Nudibranchiata, Tectibranchiata and Pulmonata, was created by Cuvier in 1795, later he created the Pteropoda as equal in rank with the Gastropoda In 1812 Lamarck created the group Heteropoda, ranking it also equal with Gastropoda In 1846–48 Milne-Edwards established the orders Opisthobranchiata and Prosobranchiata The Pteropoda were held as a distinct class until Pelseneer in 1888 showed their affinities to the Opisthobranchiata



FROM MARTINI AND CHEMNITZ, "CONCHYLIEN CABINET" (GUSTAV FOCK)

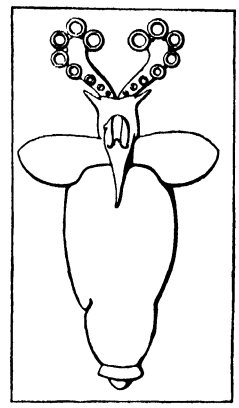
FIG 4 —PLEUROTOMARIA RUMPHII, A DEEP-WATER GASTROPOD

The diversity of opinion about the main subdivisions may be taken to imply that any natural groups of these dimensions (subclasses, orders) that may exist in the class have not yet been made apparent by morphological research Nevertheless, certain broad groupings are recognized by those authors who in the last two decades have subjected the class to comprehensive treatment

It will be convenient to contrast three such systems which have been proposed by Pelseneer, Simroth and Thiele respectively

Different as these three schemes appear at the offset, they tend in fact to recognize the same main grouping

The Streptoneura of Pelseneer contain precisely the same families (limpets, trochids, periwinkles, whelks, etc) as do the Prosobranchia of Simroth and Thiele. The rest of the class is treated as a single sub-class by Pelseneer Thiele divides them into two sub-classes (as also seems to be the intention of Hoffman, who is continuing Simroth's treatise in Bronn's *Tierreich*) But this does not involve any re-arrangement of the contents of Pelseneer's Euthyneura, as the latter are divided into two orders, equivalent in their contents to Thiele's sub-classes In short, both authors recognize the distinction between the Opisthobranchia and, the air-breathing pulmonata Thiele's promotion of these two groups to the rank of sub-classes is advantageous, however, as it emphasizes the marked structural and bionomic differences between these groups It is true that they resemble each other in certain distinctive features (*e.g*, they are hermaphrodite and the visceral complex is detorted) in which they both differ from the Streptoneura But they are otherwise very clearly defined and have a radically dissimilar evolutionary history.

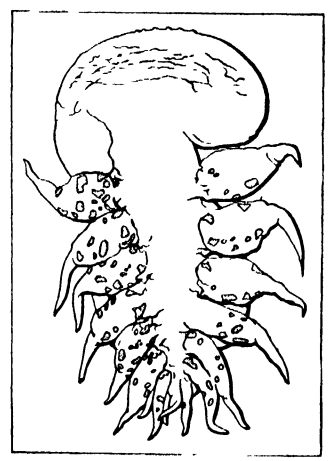


FROM CHALLENGER, "ZOOLOGY" (H M STATIONERY OFFICE)

FIG 5 —STOPGIOBRANCHAEA AUSTRALIS NOTE THE SUCKERS

Thiele's Archaeogastropoda contain the same families as Pelseneer's Aspidobranchia and Simroth's Scutibranchia His Mesogastropoda are Pelseneer's Taenioglossa and his Stenoglossa are equivalent to Pelseneer's sub-order of that name With regard to the status given to these groups Pelseneer's scheme seems at present more rational While Thiele's elevation of the Stenoglossa to the rank of an order is to some extent justified by the marked specialization of these forms as carnivores and carrion-feeders, it leaves the Taenioglossa, a large and miscellaneous group with too great an appearance of uniformity Probably Thiele's rating of the Stenoglossa is justifiable, and what is required is a more complete knowledge of the relationships of families constituting the Taenioglossa

Little can be said concerning the numerous minor divisions A great deal of work remains to be done in elucidating the constitution and relationships of families, the structure of which is imperfectly known Many of the minor groups are probably very far from representing natural associations The work of Pilsbry (1909–28) on the enormous group of land pulmonata has gone a long way towards disentangling the chaotic assemblages originally treated as "Helicidae," "Bulimulidae" and "Zonitidae," and the course of pulmonate evolution is becoming correspondingly clearer to us But even so, this large and unwieldy order is in need of comprehensive treatment along bionomic as well as morphological lines



FROM "ANIMALS OF ALL COUNTRIES" (HUTCHINSON'S PERIODICALS)

FIG 6 —TETHYS LEPORINA, SHOWING COWL-LIKE FRONTAL VEIL FORMED FROM ANTERIOR TENTACLES

ANATOMY AND PHYSIOLOGY

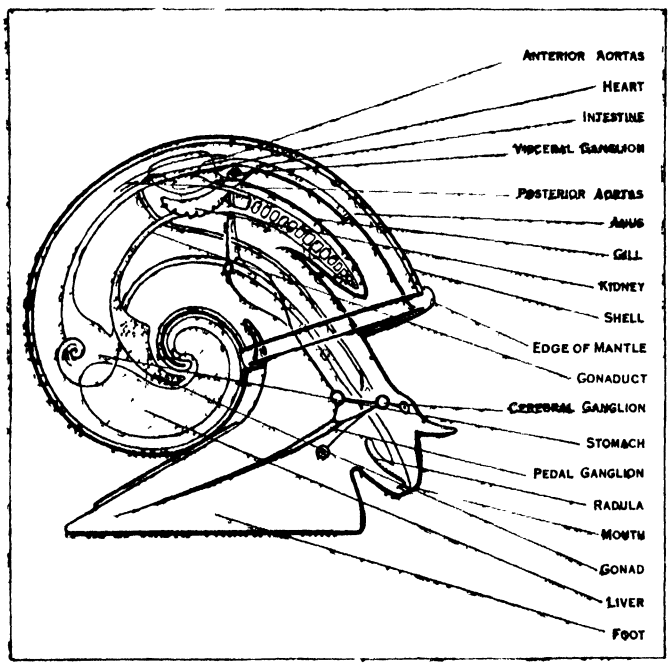
The gastropoda are divisible, as we have already seen, into a large number of groups, each distinguished by anatomical and bionomic peculiarities The significances of these divisions will be easier to grasp, if the main evolutionary tendencies that have been manifested within the class are briefly indicated in advance. The details of gastropod structure and morphology are well described in the standard text-books on this subject, and the description given here consists of a selection of such of the more important modifications as illustrate the main evolutionary changes within the group

The most primitive of living gastropods are sedentary marine animals which feed upon algae, sea-weeds or organic débris They creep about by means of a flattened foot and rely for protection on an external shell, which is usually coiled in the adult. Their internal organization, though it is affected

CLASS GASTROPODA

Pelseneer 1906	*Simroth* 1907	*Thiele* 1925–26
Sub-class 1. Streptoneura.	Order Prosobranchia.	Sub-class 1. Prosobranchia.
Order 1. Aspidobranchia.	Sub-order 1 Pectinibranchiata	Order 1. Archaeogastropoda
Sub-order 1. Docoglossa.	A Siphonostomata.	Order 2. Mesogastropoda
,, 2 Rhipidoglossa.	B Heteropoda	Order 3 Stenoglossa.
Order 2. Pectinibranchia.	C Holostomata.	Sub-class 2 Opisthobranchia
Sub-order 1. Taenioglossa	Sub-order 2 Scutibranchiata.	Order 1 Pleurocoela.
,, 2. Stenoglossa.	A. Podophthamata	Order 2 Saccoglossa.
Sub-class 2. Euthyneura	B. Edriophthalmata	Order 3 Acoela
Order 1. Opisthobranchia.	Order Pulmonata	Sub-class 3. Pulmonata.
Sub-order 1. Tectibranchia.		Order 1 Basommatophora.
,, 2. Nudibranchia		Order 2 Stylommatophora.
Order 2. Pulmonata		
Sub-order 1. Basommatophora		
,, 2. Stylommatophora		

by the "torsion" already mentioned as far as the visceral nervous commissure and alimentary canal are concerned, is still more or less symmetrical. *Pleurotomaria, Fissurella* and *Haliotis* among the Rhipidoglossa exemplify this type of organization. In the course of evolution the main departures from the latter are as follows. (1) The visceral complex (heart, gills and kidneys) becomes asymmetrical through the atrophy and disappearance of



FROM SPENGEL, "ERGEBNISSE UND FORTSCHRITTE DER ZOOLOGIE" (FISCHER)

FIG 7.—DIAGRAM OF GASTROPOD ORGANISATIONS

those of the above named organs which are situated on the right side of the adult body (2) The shell may become internal and degenerate and finally disappear and a secondary external symmetry may be established. (3) A terrestrial and air-breathing mode of life has been adopted independently by several groups (4) A carnivorous or carrion-eating habit has been acquired on several occasions (5) The creeping mode of progression has been abandoned by certain families in favour of swimming and floating or of a truly sessile (adherent) mode of life.

These by no means exhaust the list of specialization exhibited by the class, but they are the most frequent and lead to the most striking modifications of structure.

External Features and General Organization.—The body of a gastropod is divisible, like that of nearly all molluscs, into four main parts—the visceral sac, the mantle which covers the latter, the head and the foot. The morphological unity of the head and foot has been suggested by Naef, and this subject is discussed in the article MOLLUSCA. The whole animal may be visualized as having an elongate and worm-like body with the head and foot at one end The greater part of the body is spirally coiled, and the coiled portion (the visceral sac) is sheathed in a fleshy covering, the mantle, which projects as a free fold at the anterior end and hangs down like a skirt around the head and foot. In the cavity thus formed between the mantle and head the function of respiration is normally carried out either by gills or by a lung In the former case the mantle cavity is largely open to the exterior; in the second the edge of the mantle is adherent to the "neck," a small hole (the pneumostome) being left for the admission of air into the lung In certain Rhipidoglossa the mantle edge is not complete anteriorly and dorsally, but is interrupted either by a longitudinal slit or a series of holes probably representing a slit, the edges of which have fused

The mantle secretes a shell which is formed in a single piece and is in most cases spirally coiled The minute structure of the shell and its chemical composition is described in the article MOLLUSCA In individual development the shell appears in the embryo as a plate or cap-like rudiment which becomes coiled and grows in size by the deposition of mineral salts round the edge of the open end (aperture) It is likely that the forerunners of the gastropoda had a cap-shaped shell in the adult state

In the most archaic representatives of the class, however (*e g Bellerophon*, among the extinct Cambrian genera and *Pleurotomaria* among living forms) the shell is coiled It is worthy of note that in *Bellerophon* the shell is not of an elongate or screw-like spiral shape, its coils being all in one plane (planospiral), like

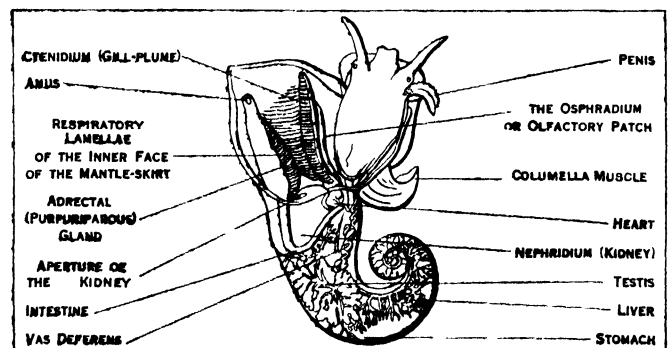
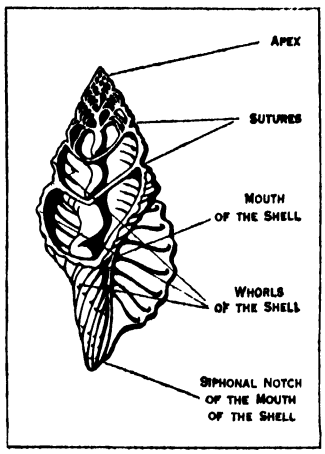


FIG 8.—MALE OF LITTORINA LITOREA, REMOVED FROM ITS SHELL, SHOWING THE ORGANS ON ITS INNER FACE

that of the primitive cephalopod *Nautilus*. The modifications of the adult shell are complex and manifold. The general plan and the terminology employed in describing shells are shown in fig. 9 and the various modifications are described and illustrated in text-books and conchological treatises It is sufficient here to allude to the most important change that is encountered in the class The shell, which is to be regarded as primitively spiral, becomes unwound and secondarily cap-shaped in many Streptoneura (*Patella, Capulus*) Furthermore, the edges of the mantle may grow over the shell and cover a large part of its surface This

condition is found in such genera as *Fissurella, Cypraea,* and *Margmella* among the Streptoneura and in various Opisthobranchia (*Aplysia*) and Pulmonata (*Vitrina*). The overgrowth of the mantle may be complete and the shell is thus internal and degenerate (Lamellariidae and slug-like Pulmonata) Finally, the shell may disappear entirely (*Tntiscania,* many nudibranchs, *Oncidium*). This progressive atrophy of the shell occurs in many groups of gastropods Although it may become of advantage to the animal as allowing it greater freedom of movement, the loss of the shell is to be regarded at least at the offset as an innate tendency of the class and probably of the molluscan phylum as a whole.



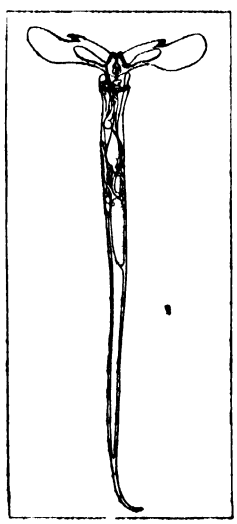
FROM LANKESTER, "TREATISE ON ZOOLOGY" (A & C BLACK)

FIG 9

The head in the gastropoda is well developed and clearly defined from the rest of the body to which it is connected by a mobile "neck." It is usually provided with sense organs, a snout or muzzle and one or two pairs of tentacles The foot is a powerful muscular organ. Usually it is rather elongate and has a flat surface suitable for a creeping gait

Notable modifications of the foot are seen in marine forms which dig in sand (*Natica, Bullomorpha*) These gastropods have the foot transformed into a "digging-shield" shaped like a snow-plough In heteropods and "pteropods," it is modified for use in swimming.

On the posterior dorsal surface of the foot there is in nearly adult Streptoneura a solid plate, the operculum. When the animal withdraws itself into its shell, this plate by reason of its position and shape remains applied to the aperture of the shell which it closes like a lid. The operculum is absent in nearly all the Euthyneura, but certain terrestrial forms such as the Helicidae secrete a glutinous or calcareous plate over the mouth of the shell when they estivate or hibernate



FROM SIR MURRAY AND HJORT, "THE DEPTHS OF THE OCEAN" (MACMILLAN LTD)

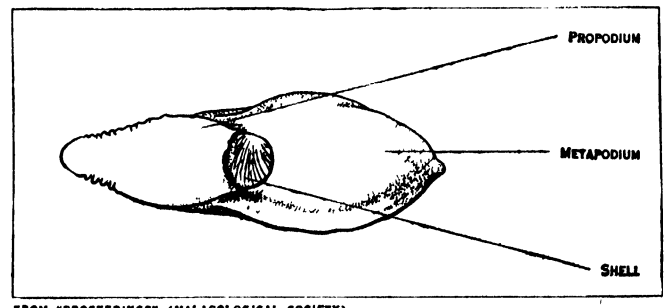
FIG 10

The foot often exhibits along its sides a ridge (epipodium) which extends from the head to the posterior extremity The epipodium is well-developed in the Rhipidoglossa and often bears appendages and sense-organs It has been assumed to have a common origin with the funnel of the Cephalopoda The head and foot are joined to the visceral mass by a narrow and highly mobile "neck" The animal is attached to the shell by the strong columellar muscle, and by the contraction of the latter the animal can withdraw itself into the shell. This muscle is inserted into the columella or axial pillar of the shell (*cf* fig 9).

The disposition of the chief external parts having thus been sketched, it will now be convenient to describe how the characteristic gastropod asymmetry is attained. Some details of the internal organization are given below; but it is necessary at this stage to recall the preliminary statement that, while some primitive forms are symmetrically organized, the main parts of the visceral complex (gills, kidneys, etc) being paired, in most gastropods the organs of the right hand side are atrophied or absent in the adult, and that in the Streptoneura the visceral commissure is twisted into a figure-of-eight. In addition, the spiral winding of the shell and visceral mass has to be accounted for

Before considering how and in what circumstances this highly characteristic organization was developed in the course of gastropod evolution, it will be best to describe the main organization and metamorphosis of a gastropod larva

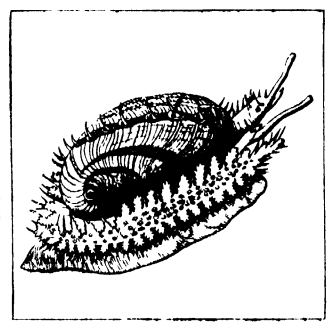
As will be seen in the section on *embryology,* the larva is symmetrical in the early stages of development, the mouth and the anus lying at opposite ends of the body. At a stage which more or less corresponds with the appearance of the shell, the anus shifts downwards and forwards and ultimately comes to lie below and near the mouth At this stage the mantle cavity is seen as a small space surrounding the anus. Such coiling as the shell may show at this stage is "exogastric," *i.e* , the coils are situated above the head and away from the foot. Soon, however, the anus, the mantle cavity and the adjacent parts rotate upwards and come to lie above the head and to the right of the latter. The coils of the shell at the same time roll downwards and assume an "endogastric" position, *i e* , they lie over the foot and away from the head. It will be seen that there are two movements involved in this reorganization of the larval symmetry, viz , the ventral flexure of the intestine and the torsion or rotation of the pallial complex up the right side of the body Though these two changes may be merged into one in individual development they must be carefully distinguished The ventral flexure is found in the gastropoda, Cephalopoda, Scaphopoda, and Lamellibranchia, torsion is found in the gastropoda alone



FROM "PROCEEDINGS" (MALACOLOGICAL SOCIETY)

FIG. 11

If processes of this kind, which occur in the course of individual development, may be taken to epitomize events which happened during the evolutionary history of the race, then it is to be inferred that metamorphosis is a summary of changes which took place in gastropod evolution. Many theories have been put forward to account for these processes They agree in attributing great importance to the influence of the spiral shell and the acquisition of a flat and elongate sole If it is true that the gastropoda are descended from animals with a simple cap-like shell and a relatively small foot, then it seems likely that, as the shell acquired a tubular shape, it became necessary to bring the originally posterior anus and associated organs into a position in which they would not be covered in by the growing shell. Hence the flexure of the intestine, the result of which was to bring the anus near the head But it plainly could not persist in this position, as the elongation of the foot would tend to drive it backwards Its rotation up the side of the body, until it came to lie above and to the right of the head, brought it into the most convenient position It is also likely that the change in the spire of the shell from an exogastric to an endogastric position may have influenced the torsional process Naef assumes that the animals which gave rise to the primitive gastropods were swimming forms In such a mode of life the exogastric spire would be no inconvenience But with the advent of a creeping habit the heavy, forwardly directed shell could no longer maintain its position and would fall on one side This displacement of the shell would almost inevitably affect the position

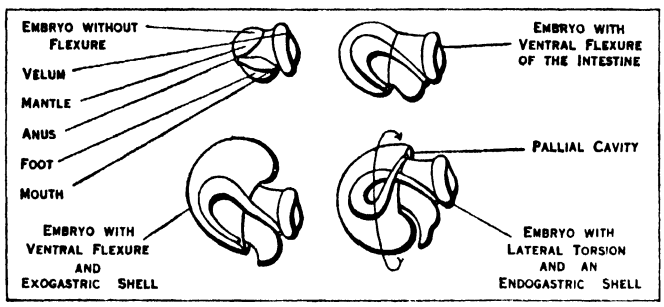


FROM LANKESTER, "TREATISE ON ZOOLOGY" (A & C BLACK)

FIG 12 —HALIOTIS TUBERCULATA

of the pallial complex The position ultimately taken up by the latter may be explained either as directly due to the displacement of the shell or as an adaptation that placed the pallial complex in a less cramped and restricted situation It is quite uncertain whether the rotation of the shell or growth of the foot was most influential in bringing about torsion It is likely that both contributed

The foregoing account must not be taken as a description of actual events but of the factors which are likely to have been

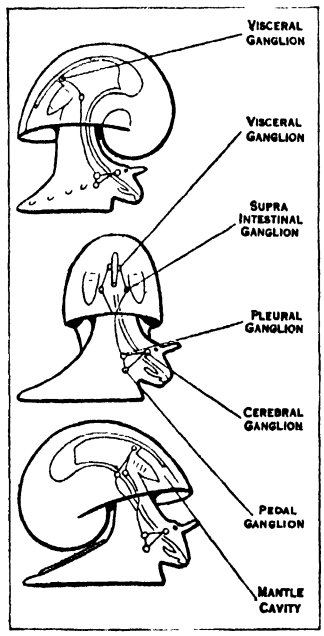


FROM LANKESTER, "TREATISE ON ZOOLOGY" (A & C BLACK)

FIG 13 —FOUR STAGES IN THE DEVELOPMENT OF A GASTROPOD SHOWING THE PROCESS OF THE BODY TORSION

concerned in producing flexure and torsion The spiral winding of the shell and the torsion of the viscera are to be carefully distinguished, as they are probably not causally connected The main process of torsion, at least in ontogeny, takes place before the spiral winding of the shell and visceral mass is manifest The cause of the actual asymmetry of the internal organs is not entirely clear. The twisting of the visceral commissure may be due to the effect of the torsion, but the atrophy and reduction of the originally left hand organs is not at first sight referable to the latter They have been explained as due to the pressure of the shell after it has assumed the endogastric position.

In the Euthyneura the process outlined above tends to be reversed (detorsion) The visceral commissure is untwisted, the anus and pallial complex in certain forms are carried to the posterior end of the body, and with the loss of the shell a secondary symmetry may be attained Naef wishes to distinguish between the detorsion of the Pulmonata and that of the Opisthobranchia and to refer them to different causes



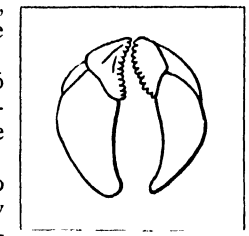
FROM SPENGEL, "ERGEBNISSE UND FORTSCHRITTE DER ZOOLOGIE" (FISCHER)

FIG 14 —DIAGRAM ILLUSTRATING TORSION IN THE GASTROPOD

INTERNAL ORGANIZATION

The Alimentary System.—The mouth is situated at the anterior end of the head, which is usually snout-like and bent somewhat downwards In many of the Streptoneura the mouth is at the end of a proboscis which can be thrust out or withdrawn into the cavity of the head A proboscis is found in certain Taenioglossa (e g , *Natica, Copulus*), the Rachiglossa and sundry opisthobranchs, notably the Gymnosomata, and is usually associated with a carnivorous diet

The mouth leads into the buccal, or pharyngeal cavity, which is furnished in most cases with solid cuticular mandibles and a tongue-like organ, the radula, which is beset with numerous rows of teeth and is used for rasping the food The mandibles are absent in certain forms—Toxoglossa, Helicinidae, heteropods—and are rudimentary in the Rachiglossa. It is uncertain whether the mandibles are to be correlated with a vegetarian diet, but they are without doubt absent or rudimentary in many carnivorous forms. The radula is secreted in a pharyngeal coecum, and is a narrow-ribbon-like organ consisting of a basal membrane supporting a number of rows of teeth usually arranged in two symmetrical sets, one on each side of a median tooth The number, arrangement, and shape of the teeth are very characteristic and are of great systematic value as they serve to distinguish not only the larger groups (sub-classes, orders, etc) but also genera and species The range in the number of teeth is very wide In some of the Eolids there are only 16 rows each with a single tooth In *Umbraculum*, on the other hand, there may be as many as 750,000 teeth



FROM LANKESTER "TREATISE ON ZOOLOGY (A & C BLACK)

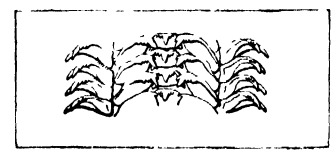
FIG 15 —MANDIBLES OF JANUS

On either side of the radula are two salivary glands which usually secrete only mucus, though in sundry carnivorous genera they contain an acid which dissolves the hard parts of animals which serve as food

The oesophagus is generally long and tubular and its inner wall is thrown into numerous folds In the Stenoglossa it bears a characteristic gland, which in *Conus* and other Toxoglossa constitutes the "poison gland" The portion of the oesophagus adjacent to the stomach is sometimes enlarged to form a muscular "gizzard," the walls of which are lined with teeth or plates

The stomach is usually thin-walled, but it is lined with a hard cuticle in many genera It has no digestive function other than that of containing food which is being digested Digestion is effected by the liver and (when present) the crystalline style The liver is usually a bilobed organ, the left lobe being larger than the right in most cases It secretes a digestive ferment which is poured into the stomach by two ducts, and it also has absorptive and excretory functions The crystalline style is a rod-shaped structure usually of tough, gelatinous consistency, which is either lodged in a special pyloric coecum or lies free in the proximal part of the intestine It is composed of globulin and, according to Mackintosh, contains an amylolytic enzyme

The intestine is long or short, according as the animal is herbivorous (e g , *Patella*) or carnivorous (e g , *Pterocera*) Its inner wall is raised into a prominent ridge, the typhlosole The anus usually lies on the right side of the body adjacent to the head, but in "detorted" forms it is at the posterior extremity of the body



FROM "CAMBRIDGE NATURAL HISTORY" (MACMILLAN)

FIG 16 —RADULA OF VERMETUS

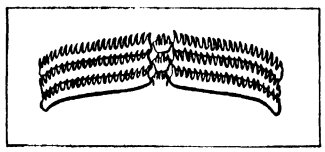
Circulatory and Respiratory Organs.—The blood is usually colourless and contains amoebocytes Haemoglobin is found in the blood of certain species of *Planorbis* and haemocyanin in a few genera The lymphatic tissue is either diffuse or concentrated in a special gland (*e g*, in certain Opisthobranchia). The heart is always dorsal in position It is usually in front of the visceral mass, but it becomes posteriorly situated in some of the Opisthobranchia as the result of complete detorsion and the re-acquisition of bilateral symmetry In the Rhipidoglossa (with few exceptions) it consists of a ventricle and two auricles, but even in this group the left auricle is larger than the right In *Fissurella* alone are the auricles equal in size In all other gastropoda there is only one auricle, the left.

There is a well-developed arterial system in nearly all gastropoda The venous blood, on the other hand, is carried to the gills through a system of irregular cavities that extends between and among the various organs From these it is carried to the gills either directly or through the kidney by means of a "portal" system

Respiration is aquatic in the majority of gastropoda and is usually carried out by gills The latter are expansions of the under side of the mantle and are primitively feather-like structures (*ctenidia*), a number of delicate vascularized filaments being borne on each side of a central stem in which are situated

two blood-vessels By one of these the venous blood is carried to the filaments for oxygenation, after which it passes in the other to the heart

In more specialized gastropoda the gills become comb-like owing to the suppression of the filaments of one side There are two gills in the more primitive Rhipidoglossa (*Pleurotomaria, Fissurella* and *Haliotis*) In all other gill-bearing forms the topographically left gill alone persists

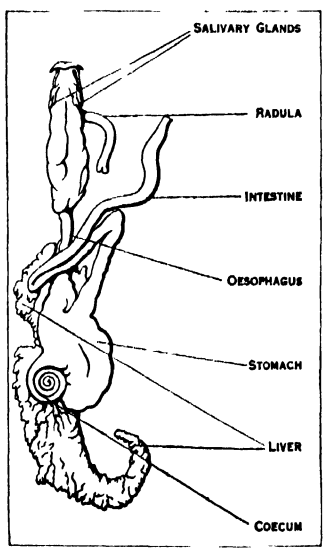


FROM "CAMBRIDGE NATURAL HISTORY" (MACMILLAN)

FIG 17 —RADULA OF FASCIOLARIA TRAPEZIUM

Although the respiration of the gastropoda is primitively aquatic and is of this nature in the larger part of the class, several important groups have become terrestrial in their habitat and either breathe air or are amphibious The consequent modifications of the respiratory apparatus are manifold and even among marine forms the normal gills are liable to curious and rather inexplicable modification The mantle in fact retains to a surprising degree a generalized capacity for discharging the respiratory function and for putting forth respiratory organs not homologous with true gills Thus respiration from the surface of the mantle may coexist with ctenidial respiration (Heteropoda, *Acmaea*) or a true gill may be found along with secondarily developed respiratory outgrowths (*Scurria*) The true gill may disappear and be replaced by numerous secondary outgrowths (*Patella*) or there may be no special branchial organs at all, and respiration is effected by the surface of the mantle (*Lepeta*)

In the gastropoda which have taken to living on land, the whole mantle-cavity is transformed into a lung Among certain marine and freshwater Streptoneura there are sundry genera (*Littorina, Cerithium, Hypsobia*) which are accustomed to live out of the water for long periods Their mantle cavity has an incipient lung-like structure, though the gill is still more or less normally developed The fully developed lung is formed by the adhesion of the mantle edge to the "neck" and the consequent closure of the mantle cavity which remains in communication with the outer air by a small aperture (the pneumostome) The pulmonate condition has been acquired separately by at least three groups of gastropoda viz , the Helicidae among the Rhipidoglossa, the Cyclostomatidae among the Taenioglossa and the Pulmonata among the Euthyneura



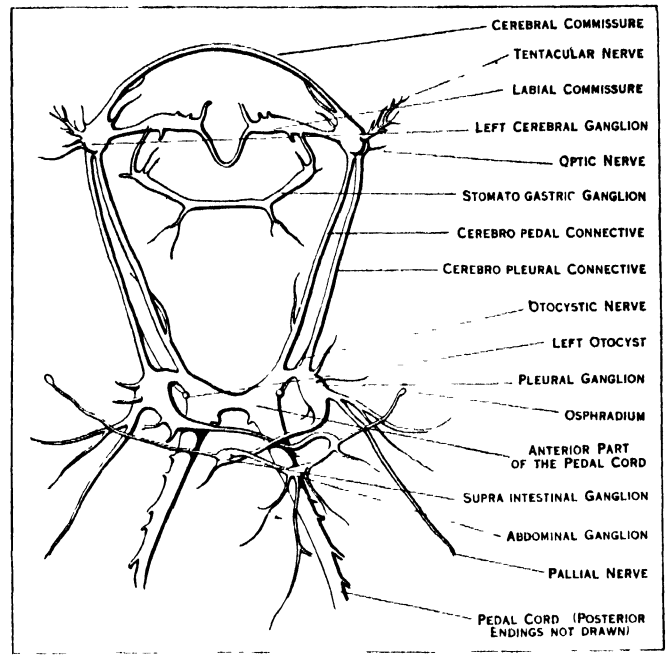
FROM BRONN, "KLASSEN UND ORNUNGEN DES TIERREICHS"

FIG 18 —ALIMENTARY CANAL OF TROCHUS JIBBEROSUS

The Nervous System.—Except in certain parasitic forms the nervous system is well developed It consists of nerve cords, ganglia connected by commissures and sense organs The various ganglionic centres and commissures are those found in other molluscs, viz , cerebral, pleural, pedal, visceral and stomatogastric Archaic traits are seen in certain Rhipidoglossa, *e g* , the slight differentiation of some of the ganglia in *Pleurotomaria* The more primitive gastropoda are distinguished by the diffuseness of the system, the various ganglia being separated by fairly long commissures In certain Taenioglossa and the Stenoglossa, among the Streptoneura, and in the Nudibranchia and Pulmonata, the commissures are shortened and the ganglia are concentrated in the head. The visceral commissure is twisted into a figure-of-eight in all the Streptoneura and in a few Tectibranchia (*Acteon, Bulla,* etc), but in nearly all the Euthyneura it is untwisted

The sense organs are eyes, otocysts (organs of balance) and rhinophores or osphradia (olfactory organs) In addition to these organs there are special sensory tracts in various regions of the body which have a less defined and less complex structure

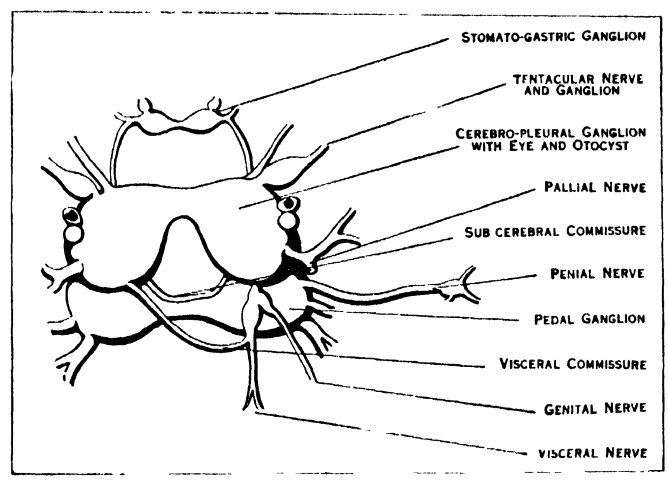
The eyes are found upon or at the base of the tentacles of the head They are primitively cup-like invaginations with a pigment-



FROM LANKESTER "TREATISE ON ZOOLOGY" (A & C BLACK)

FIG 19 —NERVOUS SYSTEM OF PATELLA

ed retinal layer, which is thus exposed to the sea water Such simply constructed eyes are seen in the limpets (Docoglossa) In other Rhipidoglossa the aperture of the cup is still open, though it is very small, and a lens is secreted In most other gastropoda the aperture is closed by the approximation and fusion of the edges of the original aperture, and a double cornea is formed The olfactory function is discharged by the osphradia in nearly all aquatic gastropoda There are two of these organs in such Aspidobranchia as have two gills and in the Docoglossa, and a single osphradium in the rest of the class They are situated in the mantle-cavity near the gills or gill and are essentially organs for testing the respiratory quality of the water In structure they



FROM LANKESTER, "TREATISE ON ZOOLOGY" (A & C BLACK)

FIG 20 —NERVOUS SYSTEM OF GONIODORIS

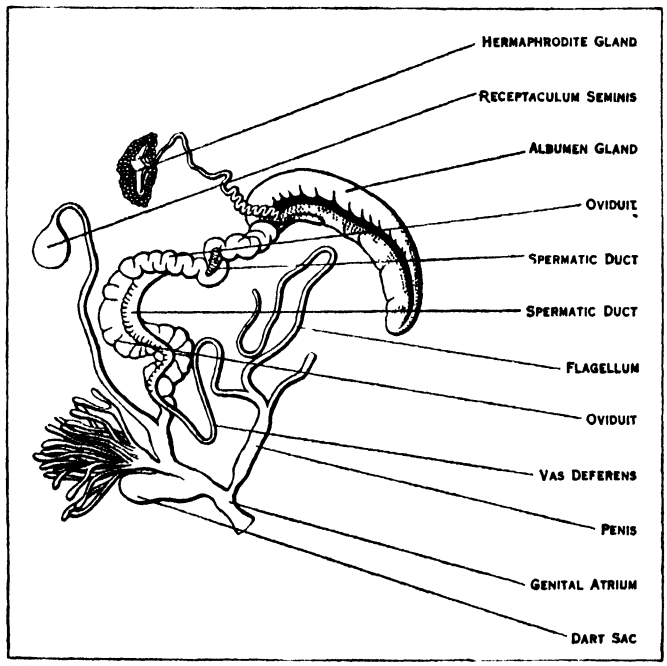
may be described as ridges of ciliated epithelium In terrestrial gastropods the osphradia are replaced by rhinophores which are borne on the tentacles The organs of balance (otocysts and statocysts) are hollow vesicles lined with ciliated epithelium in which sensory cells occur They contain hard concretions (otoliths) which impinge on ciliated endings of epithelium and

transmit stimuli to the sensory cells. Otocysts are found in the foot in creeping forms; but are sometimes nearer the cerebral ganglia

Coelom, Renal and Reproductive Systems.—The coelom is represented by the pericardium, kidneys and, theoretically, by the reproductive gland. The latter, however, is a more or less solid or acinous gland, and the cavity from the walls of which it is developed is obliterated in the adult The kidneys are paired in all the Aspidobranchia, except the Neritacea In the latter and all other gastropoda the right hand kidney is aborted and, at least in such a form as *Viviparа*, in which its development has been studied, transformed into part of the generative duct

The functional kidney communicates with the pericardium by a ciliated canal.

In all the gastropoda the gonad or reproductive gland is unpaired. In certain Aspidobranchia it opens into the reno-peri-



FROM MEISENHEIMER, "DIE WEINBERG SCHNECKE"

FIG 21.—REPRODUCTIVE ORGANS OF HELIX POMATIA

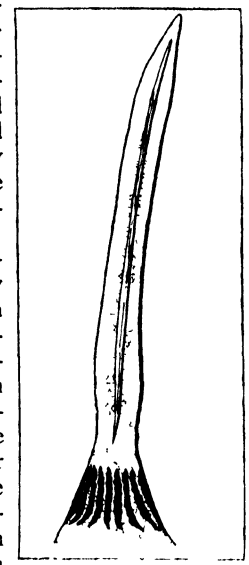
cardial canal, as in some of the Lamellibranchia, or into the kidney itself, which thus acts as a gonaduct In the Neritacea and all other gastropoda there is a separate gonaduct.

The sexes are separate in the Streptoneura with the exception of a few genera, which include certain parasitic forms Sexual dimorphism is only slightly marked The male duct ends in a penis which is developed at different points at the anterior extremity of the body. The female system in certain groups exhibits accessory organs and in the forms in which the eggs are incubated in the maternal body there is a brood-pouch The Euthyneura are hermaphrodite and the gonad is an ovo-testis. In the more primitive Euthyneura the gonaduct passes both the eggs and spermatozoa to the exterior By various stages a more specialized condition is attained in which the male and female ducts are separated and acquire separate openings (diaulic condition) In the stylommatophorous Pulmonata these are secondarily joined together Certain Nudibranchia are "triaulic," *i.e.*, they have three genital orifices, the female duct being subdivided into vaginal and oviducal conduits Accessory glands and organs are a marked feature of the Euthyneura The latter are usually protandric hermaphrodites, *i.e.*, the spermatozoa come to maturity before the ova Self-fertilization is not unknown, but usually one individual is fertilized by another It is worth noting that in one or two cases (*Patella, Crepidula*) among the Streptoneura a change of sex may take place in the same individual and that in sexually differentiated forms hermaphrodite individuals are occasionally found (*Acmaea, Lottia, Ampullaria, Conus*) Parthogenesis (development of the ovum without fertilization) is known in one case (*Paludestrina jenkinsi*)

REPRODUCTION AND DEVELOPMENT

Breeding Habits, Oviposition, Etc.—The breeding habits of very many gastropoda are unknown and in few cases is the life-history from fertilization onwards known in all its details

In certain primitive Streptoneura the eggs are fertilized externally in the sea water, but in most members of the class the male has a penis and fertilization is internal The courtship of certain land snails has been carefully studied, and as an example the complex behaviour of the Roman snail (*Helix pomatia*) which has been described by Meisenheimer should be studied In many land snails courtship is usually accompanied by some act of violent stimulation, usually by means of a calcareous pointed rod (the dart) secreted in part of the male reproductive system

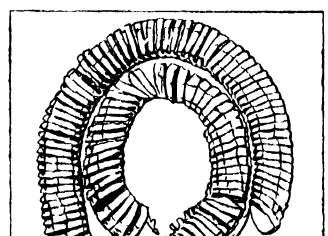


FROM MEISENHEIMER, "DIE WEIN BERG SCHNECKE"

FIG 22.—DART OF HELIX POMATIA

The eggs are usually laid soon after fertilization They are either deposited singly (*Haliotis, Gibbula, Paludestrina*) or in clusters which sometimes form an elaborate "nidus" This may be a simple gelatinous mass (*Limnea*) or a ribbon (certain Opisthobranchia) or a series of horny capsules each containing many eggs may be accumulated in a mass or strung together as a sort of "roulette" (Rachiglossa) The capsules in the latter are formed by a special gland of the foot, a lengthy operation lasting many days Certain Streptoneura attach their eggs to the external surface of their own shells or those of their neighbours (*Paludestrina*, some species of *Theodoxis, Capulus*) or deposit them inside the shell (*Vermetus*) *Ianthina* secretes a gelatinous raft on the under surface of which the eggs are suspended Most of the land snails lay their eggs in holes underground These are enclosed in a gelatinous envelope (*Limax*) or in a calcified shell (Helicidae) Certain Bulimulids lay eggs with calcified shells 2–3cm. long, resembling those of birds

The habit of carrying the eggs on the shell may be perhaps considered as a prelude to more definite and protracted care of the young *Vermetus*, as has been pointed out, carries the eggs inside the aperture of the shell and certain species of *Libera* (a pulmonate) places its eggs in the umbilicus of the shell and covers them over with a secretion rather like an epiphragm There are, however, a good many viviparous or ovoviviparous gastropods, *Viviparі, Typhobia*, a certain species of *Melania*, and sundry pulmonates incubate their eggs in the terminal part of the oviduct (uterus), while in *Tanganyicia* and *Melania episcopalis* there is a special brood-pouch which is separate from the oviduct



FROM "ANIMALS OF ALL COUNTRIES" (HUTCHINSON PERIODICALS)

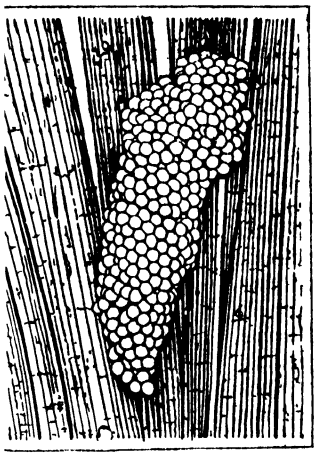
FIG 23.—EGG CAPSULES OF BUSYCON

The number of eggs varies according to the mode of life and oviposition *Purpura lapillus* (the dog whelk) deposits up to 150,000 eggs in its capsules and sundry species of *Doris* lay as many as 600,000 It should be noted that in those Rachiglossa which form capsules containing many eggs some of the latter are devoured by those embryos which emerge first Interuterine cannibalism has been recorded in the pulmonate *Limicolaria* The Pulmonata do not as a rule lay as many eggs as the Streptoneura and Opisthobranchia *Helix aspersa* deposits up to 100.

Development.—Although the gastropoda display very con-

derable variation in the adult form, the cleavage of the eggs is ıore or less the same in all the cases in which it has been studied. uch variation as may have been observed is due to variation ı the amount of yolk.

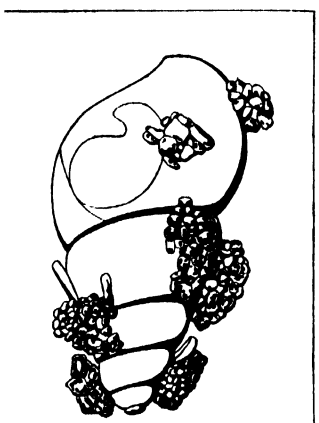
In all gastropoda which have been so far studied cleavage is ɔtal and of the type known as spiral. The egg divides into two ıd then into four cells which are either equal in size (*Patella*) or approximately equal. A third division then cuts off four small cells (micromeres) from the four original cells (macromeres). There are now eight cells consisting of a "quartette" of micromeres and the four larger macromeres. The next division gives rise to 16 cells, viz., four more micromeres, which are given off from the macromeres (second quartette) and the products of the sub-division of the first quartette of micromeres. Division proceeds in this way until a cap of numerous micromeres is found lying on top of the four macromeres. In *Patella*, in which the development is well known, the embryo is at the 32-cell stage radially symmetrical. On the attainment of the 64-cell stage this is replaced by bilateral symmetry.



Y COURTESY OF F W BOND

IG 24.—EGGS OF THE SNAIL AMPULLARIA)

Owing to certain features of the mode of cleavage, it is possible ɔ trace the "lineage" (developmental history) of individual organs ack to individual cells or quartettes produced by very early cleavge. This type of research has been a very fruitful source of mbryological knowledge, but can only be summarily mentioned ere. The micromeres give rise to the ectoderm and its derivaives, the macromeres to endoderm and mesoderm. In *Patella* astrulation is by epibole (overgrowth) of the macromeres by he micromeres. At the end of 24 hours the embryo, which up ill now has been contained in an egg-membrane, escapes and begins its free-swimming period as a trochophore larva. It is more or less spherical and surrounded by a girdle of long cilia (the prototroch) developed from special trochoblasts.



IFTER HENKING IN "BERICHTE" (NATURFOR ICHENDE GESELLSCHAFT)

FIG 25.—PALUDESTRINA ULVAE CARRYING EGGS COATED OVER BY A LAYER OF SAND-GRANULES

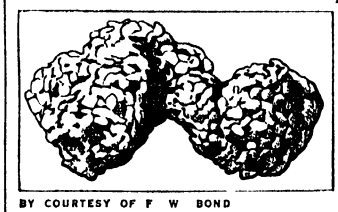
The gut is now developed, the endodermal cells dividing to form the stomach and the mouth and anus arising as ectodermal invaginations. Dorsally, a thickened plate of cells gives rise to the shell-gland, the foot is indicated by two slight prominences on either side of the mid-ventral line, and the mesoderm bands are now formed.

Enlargement of the prototroch to form the *velum* and the growth of the foot characterize the veliger stage. The metamorphosis of the larva has already been described.

The detailed development of the individual organs is not very well known in marine molluscs. We owe the bulk of our knowledge on this subject to the studies of V. Erlanger, Drummond and Tonniges on *Vivipara*, the pond snail (originally called *Paludina*). The ganglia of the nervous system arise as thickenings of the ectoderm which subsequently become joined together by connectives. The otocysts and eyes are ectodermal invaginations. The pericardium originates as a hollow in the mesoderm and the heart is first seen as a vesicle projecting down from the dorsal wall of the pericardium. The kidneys are tubular extensions of the pericardial cavity, they are joined by ectodermal invaginations which constitute the ureters. The gill appears as a series of folds in the wall of the mantle cavity. The germ cells seem in the first instance to be budded off the pericardial wall and subsequently form a spherical vesicle, the gonad. The kidney of the originally left-hand side forms part of the genital duct.

The origin of the mesoderm in *Vivipara* has been the subject of controversy (*See* E. W. MacBride, *Text Book of Embryology*).

The account of larval development and organogeny given above is founded very largely upon the study of *Vivipara*, but it probably represents the course of events in many other gastropods. Departures from this developmental history are mainly of secondary importance, and are due, for example, to the development of special larval organs (*e.g.*, the cephalic vesicle and "podocyst" of Stylommatophora), and the presence of a larger amount of yolk than is usual. The velum is suppressed in oviparous and viviparous forms, but traces of it can be seen in certain of the latter (*Cenia*, some of the Pulmonata). In certain highly modified pelagic larvae the velum is drawn out into extensive lobes (*e.g.*, the *Macgillivraya* larva of *Dolium*).

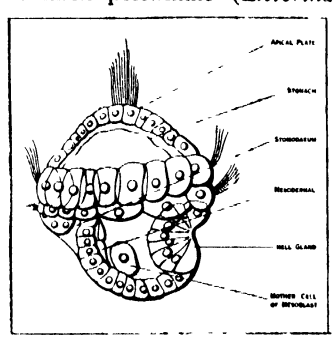


BY COURTESY OF F. W. BOND

FIG 26.—EGG CAPSULES OF COMMON WHELK (BUCCINUM UNDATUM)

DISTRIBUTION AND NATURAL HISTORY

The gastropoda have practically a world-wide distribution and are found in the sea, in brackish and fresh water and on land. The marine forms occur in all seas of which the fauna has been examined. In high latitudes they live in the bays and fjords of the Antarctic continent (*e.g.*, in the Ross sea, 84° S.) and off the northern coasts of Greenland and Franz Josef Land. Exactly how far north they occur is uncertain, but in all probability they range right across the north Polar sea. The exclusively marine forms are limited in their distribution by salinity and other environmental factors. But, though it is true that the life-zones that prevent them from invading fresh water and land interpose a strict barrier to their invasion of those habitats, there are certain groups which are intermediate between truly marine forms and those which habitually live in fresh water and on land. The common periwinkle (*Littorina littorea*) can tolerate very protracted exposure to air (*see* ANATOMY *Respiratory Organs*) and the estuaries of most great rivers contain certain forms which can endure daily and seasonal changes of salinity, etc. Similarly, among terrestrial and fresh water gastropods there are forms which are of wide tolerance and live indifferently in water or on land, either being structurally adapted, as in the case of the lung snail (*Ampullaria*) which lives in swamps, and has both a gill and a lung, or having a more or less generalized adaptability (certain species of *Limnea*). Hesse records that an exclusively terrestrial Pulmonate (*Lauria cylindracea*) has taken to living in springs in certain parts of Germany.



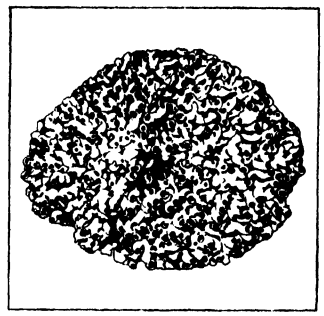
MACBRIDE "TEXT BOOK OF EMBRYOLOGY" (MACMILLAN)

FIG 27.—LATERAL VIEW OF YOUNG TROCHOPHORE LARVA OF PATELLA COERULEA

The majority of the Streptoneura are marine, but the Helicinidae among the Rhipidoglossa, the Cyclophoridae and Cyclostomatidae among the Taenioglossa have become terrestrial. The members of the genus *Theodoxis* (Neritina) are the only Rhipidoglossa that have invaded fresh water, but many groups of Taenioglossa inhabit the latter, viz., the Viviparidae, Melanidae, Ampullariidae, Valvatidae, etc. The Stenoglossa are exclusively marine. Among the Euthyneura the Opisthobranchia are likewise a marine group.

The Pulmonata are mainly terrestrial, though certain large families (Planorbidae, Limnaeidae) live in fresh water, and a few (*Amphibola, Siphonaria*) are marine or littoral (Auriculidae).

The horizontal distribution of marine gastropods can only be treated very summarily here It is sufficient to say that certain main distributional areas can be recognized which have their peculiar and characteristic faunas, the latter being composed of genera and species which are either restricted to those areas or are more frequently found there than elsewhere For example, in the region between Delagoa Bay and Cape Agulhas, which we may regard as the South African marine province, are found the following genera which occur nowhere else. *Abyssochrysos, Jeffreysiopsis, Alcira, Cynisca, Neptuneopsis* and *Alexandria.* Furthermore, *Bulla Terebra, Anculla, Patella, Mitra* and *Turritella,* though they occur in other parts of the world, are in this region very richly represented in species, so that South Africa may rightly be considered the metropolis of these genera

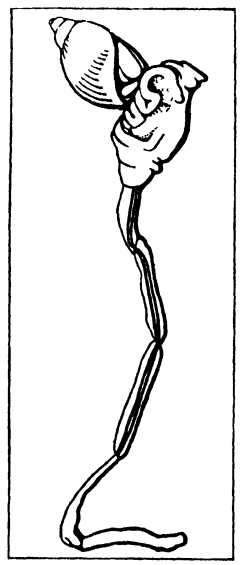


FROM "ANIMALS OF ALL COUNTRIES" (HUTCHINSONS PERIODICALS)

FIG 28 —SHELL-MASS OF VERMICULUS SPIRATUS, A SESSILE GASTROPOD

The range of individual species is, as in other groups, limited to special areas, but ambiguity as to the precise limits of species makes it difficult to define these areas with exactness in any particular case (*see* SPECIES), while our ignorance as to the opportunities for dispersal and of the physiological constitution and reactions of individual species usually make it impossible to state to what extent the range of species is the expression of a definite constitutional peculiarity

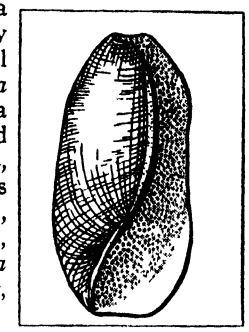
The vertical distribution of marine gastropoda shows a broad grouping of genera according to the preference of special habitats. At the landward limit of marine conditions and often beyond the high-water mark of spring tides are found semi-terrestrial forms, such as the Littorinidae Well up to high-water mark forms like the marine Pulmonate *Siphonaria* are found, while the limpets (Patellidae) range up to the same level Between tide marks (littoral zone) are found the Fissurellidae, ormers (*Haliotis*) *Oncidium,* the top shells (*Turbo*) and dog whelks (*Purpura*), as well as those which ascend further beyond the reach of maritime conditions, such as the Littorinidae Farther down the strand in the shallow water of the Laminarian zone occur a great variety of forms, notably the Nudibranchia Adaptation to a particular kind of bottom is here of great importance Burrowing forms, like *Sinum, Natica, Cypraea* and *Bulla* are more frequently found in sand, while the less active creeping forms keep to fronds of *Laminaria* and other seaweeds, the surface of algae, smooth rocks, and the like *Vermetus,* which is a sessile gastropod with an uncoiled shell, forms irregular masses on rock and coral *Eulima* and other parasitic forms are found on the external surface or in the body cavity of star-fishes and also in Holothuria *Magilus* and *Coralliophila* burrow into corals From the shallow waters downwards the gastropod fauna becomes more sparse The late W H Dall, in his report on the marine gastropoda, obtained by the "Blake" in the gulf of Mexico and the Caribbean sea, gives the following numbers of shallow and deep-water forms: Littoral species, 280; species found down to the edge of the continental shelf (about 100 fathoms) 222; deep water species, 83 Among typical abyssal genera are *Mangilia, Margarita* and *Pleurotoma.* The greatest depth from which a gastropod has been so far taken is 2,845 fathoms (U S S "Albatross" off the coast of Peru).



FROM VOETZKOW, "REISE IN OSTAFRIKA" (SCHWEIZERBART)

FIG 29 —MUCRONALIA VARIABILIS, A PARASITIC GASTROPOD SHOWING LONG PROBOSCIS

The forms which have so far been considered are those which in adult life live permanently on the sea bottom The larvae of very many of these are floating organisms which form part of the marine plankton until they metamorphose into the adult condition There are, however, three groups and some isolated genera of gastropoda which permanently live floating off the bottom These are the Heteropoda, an interesting group of Taenioglossa, some of which are curious, highly modified creatures, and the Thecosomata and Gymnosomata The last two groups, which are sometimes erroneously united into a single group called Pteropoda, form a very large part of the minute plankton of all seas. Over 4,000 specimens of *Limacina helicina* were obtained by the "Terra Nova" in a single haul in McMurdo Sound (antarctic) The purple snail *Ianthina,* which secretes a gelatinous float for its eggs, and the nudibranchs *Phyllirrhoe, Glaucus* and *Scyllaea,* are similarly pelagic, while several tectibranchs such as *Aplysia* and *Tethys* are modified for swimming, though they seem to keep near the bottom



FROM THE "BULLETIN" OF THE MUSEUM OF COMPARATIVE ZOOLOGY, CAMBRIDGE, MASS

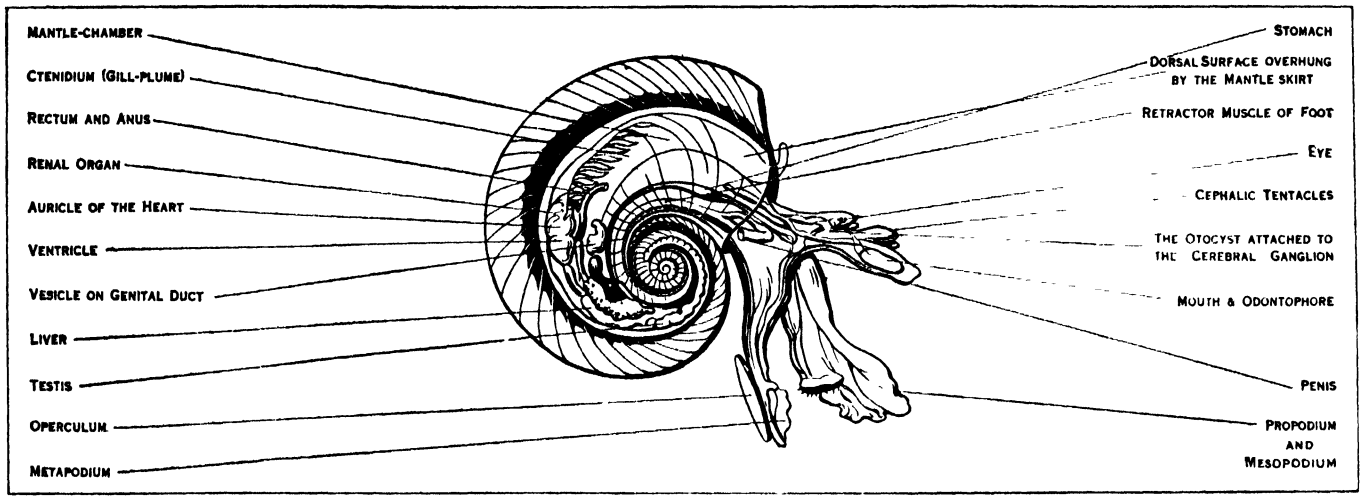
FIG 30 —SCAPHANDER CYLINDRELLUS

Freshwater gastropoda are omnipresent They are found in high tarns in the Himalayas, where *Limnea hookeri* has been taken at a height of over 18,000ft above sea level *Aplecta hypnorum* reaches as far north as 73° N in the Taimyr peninsula The most characteristic and widely spread freshwater gastropoda are members of the *Viviparidae, Melanidae, Theodoxis, Limnea* and *Planorbis* They occupy a great variety of habitats—not only rivers, lakes, streams and smaller stretches of water, but also hot springs, torrents, the "trickles" down the faces of cliffs, and marshes They also invade cattle-troughs, irrigation ditches, water mains and cisterns As in the case of marine gastropoda, there is some uncertainty as to the precise range and exact habitat of individual species, though in particular areas the habitat of certain species is fairly well defined *Vivipara vivipara,* the common river snail of the British Isles, prefers slowly-flowing rivers and canals; *Valvata macrostoma* is usually found in marshes and ditches Pilsbry and Bequaert record the fact that *Limnea natalensis undussomae, Physopsis africana,* and certain species of *Planorbis* prefer open shallow pools of small size Certain great river systems are occupied by characteristic genera For example, species of *Cleopatra* and *Lanistes* are peculiar to the Nile drainage area Other genera are practically cosmopolitan, such as *Unio, Vivipara* and *Limnea*

The gastropoda which live on land are not so tolerant of external conditions as are certain other groups of terrestrial invertebrates In Spitsbergen, which on account of divers adverse factors (low winter temperature, etc) does not sustain a very large and varied animal population, there are no land Mollusca at all, though there are a number of Collembola, Diptera, spiders, mites and other invertebrates.

Extremes of temperature do not as a rule limit the distribution of land gastropoda Lack of moisture and of lime in the soil on which they live appear to be the most important factors in preventing their spread In tropical countries lack of shade and suitable places for concealment from excessive heat and light act in a similar way. As a rule they are not found plentifully on "acid" soils Alkins and Lebour found that of 27 species, 20 were found on rather alkaline soils (pH7 0), 14 tolerated rather more alkaline soils (pH8 0), while only four were found on acid soil (pH5) They are likewise poorly represented in deserts and other dry habitats, although they are not necessarily absent from the latter if there are opportunities for burrowing and a plentiful dew-fall

Apart from these limitations the terrestrial gastropoda are almost world-wide in distribution. A slug *Anadenus* is found at 17,000ft. in the Himalayas, and *Chronos sublimis* was taken at

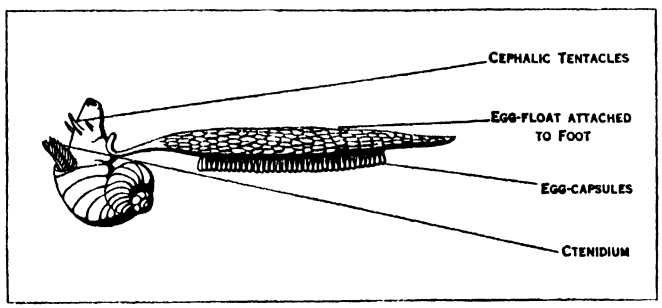


AFTER SOULEYET IN LANKESTER, "TREATISE ON ZOOLOGY" (A & C BLACK)

FIG 31 —OXYGYRUS KERAUDRENI

over 16,000ft on Mt Carstenz in New Guinea Land snails and slugs are found in well-vegetated areas, *e g*, woodland, pastures, hedges and banks, jungle, among mosses and lichens and in more arid situations such as cliff faces, rocks and sand dunes They burrow underground, climb trees and invade houses

The means by which land gastropoda are dispersed act rather more slowly than those by which marine and freshwater forms are carried about As a result, land snails and slugs are more



FROM LANKESTER, "TREATISE ON ZOOLOGY" (A & C BLACK)

FIG 32 —FEMALE JANTHINA WITH EGG FLOAT

localized in their distribution Extreme cases of such restricted distribution are seen among the Achatinellidae (tree snails) of the Sandwich Islands and the Partulas of Tahiti Many species of these groups are restricted to single valleys or ridges, and well marked mutational forms are even said to be restricted to a single tree or group of trees

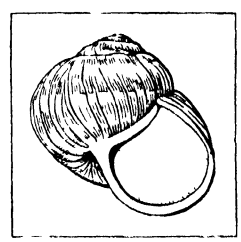
On the other hand, given suitable conditions, dispersal may be to a certain degree facilitated by their habits and constitution Bartsch has pointed out that the Cerions of the Florida Keys, etc , which can live for four days in sea-water and have the habit of fixing themselves to dead wood during estivation, have probably been transported from island to island after hurricanes which have washed away such timber from the low-lying coastal regions which the Cerions inhabit The chief continental areas of the world are each characterized by a number of peculiar families and genera, and certain deductions as to former land-connections between such areas may be made Thus the Achatinidae, Dorcasiinae, *Limicolaria, Burtoa,* etc , are exclusively found in Africa and the Bulimulidae, *Drymaeus* and *Borus,* in South America Among the land Mollusca of South America, however, are representatives of the Stenogyridae, a family characteristic of African fauna, and conversely there are *Bulimulus*-like genera in Africa

Habits, etc.—The greater number of gastropoda are passive animals of relatively small size and limited powers of locomotion Usually increase of activity is associated with the carnivorous habit Their inertia and lack of mobility are compensated by the shell, their more or less obscure appearance and secretive habits, which are their chief defences against enemies Among marine forms the great power of adhesion manifested by the foot prevents them from being washed away to unfavourable ground On land the habits of burrowing and entering crevices, of estivation and hibernation are safeguards against climatic excess Protection against drought is of great importance for animals which require much water The shelled terrestrial forms are protected against desiccation, and in addition many have the faculty of secreting a covering to the aperture of the shell after they have retired into the latter The naked forms die very quickly if exposed to very dry air or strong sunlight Both shelled and naked forms tend to secrete themselves in the daytime and to emerge in the evening or during rainy spells

Apart from the dependence upon certain necessary external conditions gastropoda seem to be adaptable animals and peculiarly tenacious of life There are well-authenticated records of land snails which have lived for years without food

Marine and terrestrial gastropoda have to contend with other hostile forces besides the physical factors of their environment Marine Mollusca are preyed upon by a variety of enemies As eggs and larvae they are eaten by very many vertebrate and invertebrate animals Fish and sea-birds feed on them in the adult state and whales consume large quantities of the planktonic forms Birds, carnivorous beetles and small mammals such as rats and mice, take a heavy toll of land snails Ducks, geese and water beetles feed on pond and river snails

The gastropoda are vegetable eaters, carnivores or live on organic débris of all kinds Most Aspidobranchia and Taenioglossa feed on plants, the marine forms browsing on algae *Natica,* the Lamellariidae, and the Heteropoda are, however, carnivorous *Natica* preys on lamellibranchs, through the shells of which it bores by means of an acid secretion Captain F Davis found that the clam *Spisulla elliptica* is persistently preyed upon by *Natica alderi* on the Dogger Bank, about 88% of the clams taken on certain hauls having their shells bored by their enemy The sessile Taenioglossa, like *Vermetus,* are plankton-feeders The Stenoglossa are mainly carnivorous and prey upon other molluscs, or else they feed on carrion Among the Opisthobranchia the Eolids feed on hydroids, the stinging cells (nematocysts) of which are retained and stored in the dorsal papillae, from which they are discharged when the animal is attacked The majority of the land Pulmonata feed on green plants, fungi, lichens or vegetable débris The snail-slug (*Testacella*) feeds on earth-worms, and *Glandina, Oleacina* and the Streptaxidae are similarly carnivorous

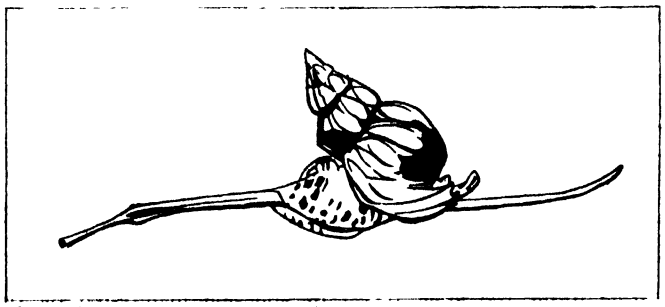


FROM TAYLOR, "MONOGRAPH OF THE LAND AND FRESHWATER MOLLUSCA OF THE BRITISH ISLES"

FIG 33 —EPIPHRAGM OF HELIX ASPERSA

Commensalism is not of such frequent occurrence among gastropoda as it is among Lamellibranchia. A certain number of

Taenioglossa are ectoparasitic (*Stilifer, Thyca,* etc), and endoparasitic (*Entoconcha, Entocolax*) upon echinoderms The only other animal that has so far been recorded as being the host of a gastropod is the stomatopod crustacean *Gonodactylus chiraja,* which harbours *Epistethe gonodactyli* In their turn gastropods serve as hosts for parasites of various kinds Certain trematode worms pass part of their life-cycle in marine and freshwater gastropods, and in two cases the association is of serious consequence to man The effect of these parasites on the snail is sometimes disastrous The author of this article found a high

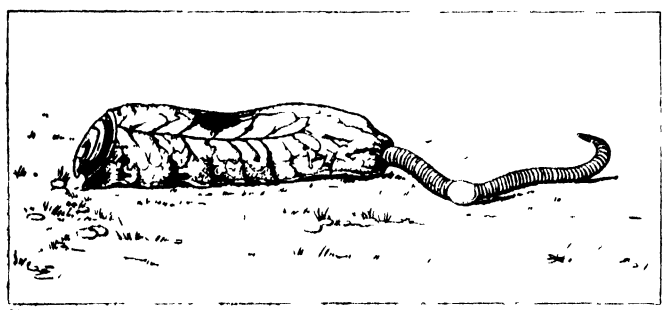


FROM MEHEUT, "ETUDE DE LA MER" (ALBERT LEVY)

FIG 34 —BUCCINUM DEVOURING A SYNGNATHUS

percentage of a small gastropod *Paludestrina ventrosa* castrated by a trematode which had invaded the reproductive organs of its host Infection by such parasites is probably high when the parasite passes the rest of its life-cycle in a vertebrate host which preys on the gastropod, as in the case of sea-birds which feed on small water snails in tidal ditches Certain dipterous flies are parasitic on land snails and several kinds of mites are found on the latter, though it is uncertain if they are actually parasitic.

The gastropoda are protected, as has been stated above, from the attacks of enemies by passive means (their shell and retiring habits) The shell, however, is not always an adequate safeguard from assault Carnivorous beetles thrust their heads into the aperture and drag the inmate out Boettger has produced some very interesting and suggestive observations on the relation between attacks of this sort and the development of projections from the sides of the shell-aperture in certain land snails (*Otala*) which are attacked by carabid beetles Whether the colour-pattern and sculpture of the shell, which is often very elaborate, are of any protective value is uncertain at present Observations upon the destruction of the common hedge snails (*Cepea*) seem to show that birds do not discriminate between the banded and the un-



FROM KUKENTHAL, "HANDBUCH DER ZOOLOGIE"

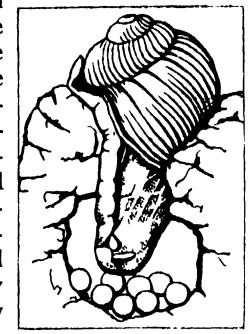
FIG 35 —TESTACELLA EATING AN EARTHWORM

banded varieties of *C hortensis* and *C nemoralis* Few positive instances of protective or warning coloration are known, as the habits and enemies of the animals concerned are so imperfectly known Various species of *Cochlicella* certainly resemble the seed-pods of the plant on which they mainly feed, and certain Clausilias are sufficiently like leaf-buds; but it is difficult to decide if these resemblances are more than fortuitous. Sundry marine forms which feed on holothurians and tunicates resemble these animals in colour; but again the protective value of the resemblance is uncertain

PALEONTOLOGY AND EVOLUTION

A great deal is known concerning the fossil remains of gastropod shells, but unfortunately we know practically nothing about the internal structure of extinct members of the class The status of many interesting and important fossils cannot therefore be satisfactorily discussed in terms of the classification usually employed

The earliest undoubted gastropod remains found in the Lower Cambrian (*Olenellus*) beds include spirally-coiled shells (*Raphistoma*) and others which are cup-shaped (*Scenella, Palaeacmea*) The latter are usually treated as representatives of the Docoglossa (limpets) which, owing to the presence of a spiral protoconch (embryonic whorl), must be considered as descended from spiral ancestors In somewhat later Cambrian horizons are found undoubted gastropod shells of a planospiral (nautiloid) shape (*Cyrtolites, Bellerophon*) These were actually regarded as nautiloids by Deshayes and placed by him in the Cephalopoda They are now held to be gastropods and have been compared with the pelagic Taenioglossan *Atlanta* The slit at the edge of the shell-aperture comparable with that found in the rhipidoglossate *Pleurotomaria,* a genus which appeared in the Silurian (possibly in the Cambrian), justifies the inclusion of *Bellerophon* among the Rhipidoglossa rather than the Taenioglossa Nevertheless the similarity of their shell to that of the pelagic *Atlanta* suggests that they were of a swimming or floating habit and gives some support to the theory of Naef that the profound changes in symmetry and general organization that mark off the gastropoda from the rest of the Mollusca were due to or associated with a change of habit, the floating pelagic life being abandoned for one spent creeping about on the sea bottom We have, however, no grounds for believing that the Cambrian Bellerophontidae represent the most primitive grade of gastropod organization In short, neither from these nor any other Cambrian genera do we obtain any clue as to the structure of the primitive gastropoda

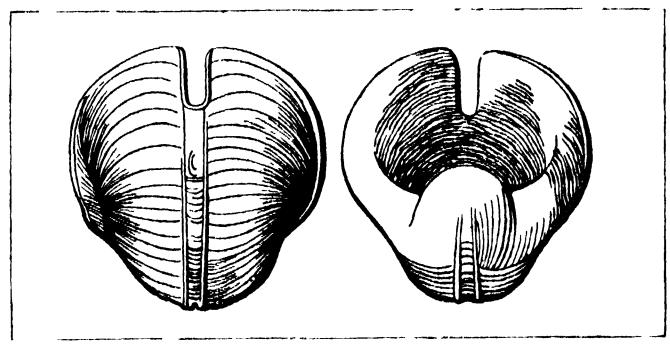


FROM MEISENHEIMER, "DIE WEINBERG SCHNECKE"

FIG 36 —OVIPOSITION OF HELIX POMATIA

Along with the undoubted Rhipidoglossa (Aspidobranchia) above described there are found gastropods which are usually held to be representatives of the *Pectinibranchia Stenotheca* seems to be related to the Taenioglossan *Capulus,* and the modern Pyramidellidae are traced to other Cambrian forms

The Streptoneura are thus well represented in the oldest fossiliferous rocks In lower and upper Silurian times they increased and many families still flourishing appeared at that epoch, *e g* , the



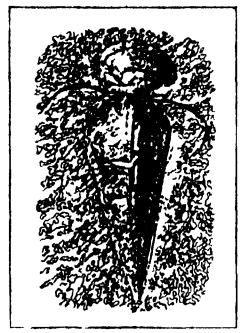
FROM A V ZITTEL, "GRUNDZUGE DER PALAEONTOLOGIE"

FIG 37 —BELLEROPHON BICARENUS (CAMBRIAN)

Scalaridae, the Capulidae and Turbinidae Many groups of Rhipidoglossa now extinct reached their developmental climax in mid-Primary times The Pleurotomariidae, represented at the present day by four very rare species, numbered several hundred species

Undoubted Euthyneura do not appear until the Carboniferous, when tectibranchs like *Acteon,* etc , are found With this fact in mind, it is necessary for us to consider briefly one of the most puzzling series of fossils that have been found in Primary rocks

For a long time certain tubular shells resembling somewhat those of "Pteropods" have been known from Cambrian strata They have variously been interpreted as thecosomatous pteropods, as cephalopods and tubicolous annelids Broili (in the last edition of Zittel's *Grundzuge der Palaontologie*) retains them in the Gastropoda as an enigmatic class, the Conularida In 1911 Walcott, in describing the Cambrian fauna of the Burgess shales (British Columbia) figured a species of the genus *Hyolithes, H carinatus*, in which are seen structures somewhat resembling the fins of pteropods It is not easy, however, to accept these structures as indicative of fins like those of thecosomatous pteropods, and as the shells of these forms are not in themselves sufficient clue to the identity of the animals it is better to accept Broili's verdict. Nevertheless, if these remains are subsequently proved to be those of pteropods, and if the hiatus in time between their appearance and that of the other Opisthobranchia is not merely due to the imperfection of the geological data, then we shall be driven to one of the two very interesting conclusions It will be necessary to assume either that the Thecosomata were developed directly from the primitive streptoneuran stock and are not from the Opisthobranchia, as is usually believed, or that the Cambrian Thecosomata have nothing to do with modern "Pteropoda," but represent an early essay in pteropod-like specialization



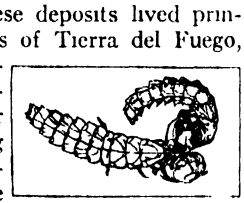
BY COURTESY OF THE SMITHSONIAN INSTITUTE

FIG 38 —HYOLITHES CARINATUS

The Pulmonata first appear in the Carboniferous *Dendropupa* and *Anthracopupa*, which seem to be undoubted land pulmonates, referable to the modern family of the Pupidae, are found in the Carboniferous of North America Undoubted Basommatophora (*Auricula, Limnea, Planorbis*) appear in the Jurassic; but it is by no means certain if the terrestrial Pulmonata actually preceded the fresh-water forms Since their first appearance in the Carboniferous the Pulmonata, both terrestrial and aquatic, steadily increased through Secondary and Tertiary times until the present day, when they are one of the largest and most highly diversified groups of living animals

ECONOMIC USES

Although the gastropods are not of outstanding service or disservice to man in any one respect they are of considerable importance in a number of ways. Their chief value is perhaps as an article of diet, for since the earliest stages in man's development they have been used as food In middle and late Paleolithic deposits in Europe, limpets, periwinkles and top shells occur In certain "kitchen middens" of the Upper Paleolithic in the west of Scotland they occur in such profusion as to lead one to suppose that the people who formed these deposits lived principally upon these molluscs The natives of Tierra del Fuego, according to Tylor, used similarly to subsist on various kinds of shellfish, and gastropods of various kinds occur in their middens At the present day H Lang (quoted by Pilsbry) states that the Achatinas (large land snails) "are a welcome addition to the food supply of most tribes" in the Belgian Congo, and that their shells "are seen lying on refuse heaps and along the rivers" Among European peoples whelks, periwinkles and ormers are largely consumed, 889 tons of whelks and 3 245 tons of periwinkles were delivered at Billingsgate market, London, in 1922 Though landsnails are only eaten in a few districts in England they are largely used in France, where *Helix pomatia* (the Roman snail) is cultivated on *escargotières* or snail farms



FROM A PHOTOGRAPH BY HUGH MAIN

FIG 39 —GLOW WORM LARVAE EATING SNAIL

As bait and as the food of edible fishes, birds and whales, gastropods are of substantial indirect value to man

The shells of gastropoda have been put to a variety of uses by the different races of mankind The mother-of-pearl obtained from large specimens of *Turbo* and *Haliotis* is imported into Europe for button-making, inlaying and sundry articles of virtu. Among native tribes shells are put to many uses Those of *Cypraea moneta* (the money cowry) are used as currency in Africa and elsewhere, and other species of *Cypraea* are reserved as ornaments for kings and chieftains in the Pacific islands The left-handed chank (*Turbinella rapa*) is used in the ritual of the god Vishnu in India. Trumpets are still made from *Triton* shells in Africa and the East, just as they apparently were among the early inhabitants of the Mediterranean The natives of Central Africa use the large shells of various species of *Achatina* as drinking-vessels and salt-containers

The rock-whelk (*Murex*) is no longer fished in the Mediterranean for the sake of the dye which was used in preparing "Tyrian" purple, but species of *Fasciolara* are still employed for obtaining dye by various native races

Gastropoda are obnoxious to man in at least two important connections. Considerable damage is done to crops by slugs and land snails A small snail *Zonitoides arboreus* is in sugar-cane root disease in Louisiana Marine gastropods are less obviously obnoxious to man, but one at least in the British Isles has proved itself a troublesome pest of oyster-beds This is the American slipper limpet (*Crepidula fornicata*), which was accidentally introduced many years ago and has since then multiplied excessively and overruns the oyster beds in south-east England A more disastrous work is done by those freshwater gastropods which harbour parasites harmful and even fatal to man and one of his more valuable domestic animals (*a*) In the Middle East, in Japan, various parts of Africa and in South America and the West Indies, species of a trematode, *Schistosoma* (=*Bilharzia*) which cause bladder disease in man, pass part of their life cycle in various species of *Isidora* and *Planorbis* A focus of this disease has been recently detected in Portugal, where *Planorbis metidjensis* is probably the intermediate host of the parasite. (*b*) The liver fluke (*Distomum hepaticum*) passes part of its life in the water snail *Limnea truncatula* Sheep grazing in flooded meadows or near streams become infected with the fluke, which causes "liver-rot"

For the historical treatment of this subject see MOLLUSCA

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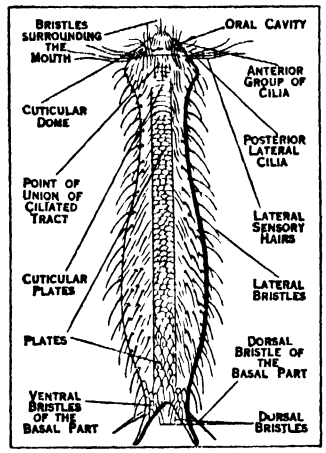
GASTROTRICHA, a small group of fairly uniform animals which live at the bottom of ponds and marshes, hiding amongst the recesses of fresh-water plants and eating organic débris and Infusoria They vary in size from one-sixtieth to one-

three-hundredth of an inch, and move by long cilia Two ventral bands of regular transverse rows of cilia are usually found The head bears some especially large cilia The cuticle which covers the body is here and there raised into overlapping scales which may be prolonged into bristles The body, otherwise circular in section, is slightly flattened ventrally There is a protrusible pharynx armed with eversible recurved teeth This leads to a muscular oesophagus with a triradiate lumen, which acts as a sucking pump and ends in a funnel-valve projecting into the oval stomach The nitrogenous excretory apparatus consists of a coiled tube on each side of the stomach, ending internally in large flame-cells A cerebral ganglion rests on the oesophagus, it is continued some way back as two dorsal nerve trunks In some species there are eyes The two ovaries lie at the level of the juncture of the stomach and rectum The large eggs are laid amongst water weeds The male reproductive system is little known The Gastrotricha are hermaphrodite The group is divided into two sub-orders, the Euichthydina, with a forked tail, and the Apodina, in which the tail is not forked About 50 species are known. The group shows no clear affinities with any of the great phyla



FROM "ZEITSCHRIFT FUR WISSENSCHAFT," AFTER ZELINKA (ENGELMANN)

GASTROTRICHA (CHAETONOTUS MAXIMUS), A SMALL GROUP OF ANIMALS LIVING AT THE BOTTOM OF PONDS AND MARSHES AND FEEDING ON ORGANIC DÉBRIS AND INFUSORIA IN SIZE THEY RANGE FROM 1/60 TO 1/300 OF AN INCH

See A C Stokes, *The Microscope* (Detroit, 1887-88), S Hlava, *Zool Anz*, xxviii, 1905, p 331

GATCHINA, now Trotsk (*q v*)

GATES, HORATIO (1728–1806), American general, was born at Maldon in Essex, England, in 1728 He entered the English army at an early age, and was rapidly promoted He accompanied Gen Braddock in his disastrous expedition against Ft. Duquesne in 1755, and was severely wounded in the battle of July 9, he saw other active service in the Seven Years' War After the peace of 1763 he purchased an estate in Virginia, where he lived till the outbreak of the American Revolution in 1775, when he was named by Congress adjutant-general In 1776 he was appointed to command the troops which had lately retreated from Canada, and in Aug 1777, as a result of a successful intrigue, was appointed to supersede Gen Philip Schuyler in command of the Northern Department In the two battles of Saratoga (*q v*) his army defeated Gen Burgoyne, who, on Oct 17, was forced to surrender his whole army This success was, however, due largely to the previous manoeuvres of Schuyler and to Gates's subordinate officers The intrigues of the Conway Cabal to have Washington superseded by Gates completely failed, but Gates was president for a time of the board of war, and in 1780 was placed in chief command in the South He was totally defeated at Camden, S.C, by Cornwallis on Aug 17, 1780, and in December was superseded by Greene, though an investigation into his conduct terminated in acquittal (1782) He then retired to his Virginian estate, whence he removed to New York in 1790, after emancipating his slaves and providing for those who needed assistance He died in New York on April 10, 1806

See John H Brandow, "Horatio Gates," *New York State Hist Assoc. Proc*, vol iii, pp 9–19 (1903)

GATESHEAD, municipal, county and parliamentary borough, Durham, England, on the Tyne opposite Newcastle, and on the L N.E R Pop (1921) 125,142 Though one of the largest county towns, neither its streets nor its public buildings, except perhaps its ecclesiastical buildings, have much claim to architectural beauty The parish church of St Mary is an ancient cruciform edifice surmounted by a lofty tower, but extensive restoration was necessitated by a fire in 1854 which destroyed a considerable part of the town Education is provided by a grammar school, a large day school for girls, and technical and art schools There is a service of electric trams, privately owned by a London company, and five bridges connect the town with Newcastle-upon-Tyne (*q v*) There are large iron works (including foundries and factories for engines, boilers, chains and cables), shipbuilding yards, glass manufactories, chemical, soap and candle works, brick and tile works, breweries and tanneries The town also has a depot of the L N E R, with large stores and locomotive works Extensive coal mines exist in the vicinity, and at Gateshead Fell are large quarries for grindstones

Gateshead (Gateshewed) probably grew up during late Saxon times, the mention of the church there in 1080 being the first evidence of settlement In 1552, on the temporary extinction of the diocese of Durham, Gateshead was attached to Newcastle, but in 1554 was regranted to Bishop Tunstall During the next century Bishop Tunstall's successors incorporated nearly all the trades of Gateshead, and Cromwell continued this policy As part of the palatinate of Durham, Gateshead was not represented in parliament until 1832 In 1336 the burgesses claimed an annual fair on St Peter's Day, and depositions in 1577 mention a borough market held on Tuesday and Friday, but these were apparently extinct in Camden's day, and no grant of them is extant

GATH, one of the five royal cities of the Philistines It would seem to be identical with the Kn-tu in the lists of Thuthmose III and Gimtu (Gintu) of the Tell-Amarna letters The name occurs several times in the Old Testament, especially in connection with the history of David Goliath, the Philistine champion, hailed from Gath Rehoboam is said to have fortified Gath, but Uzziah found it still a Philistine city Sargon's records show that he took it in 712 B C Gath was evidently a place of importance, a walled city (2 Chr on xxvi 6), and it is surprising its exact location has been lost since the time of Sennacherib The *Onomasticon* of Eusebius fixes the site near the road five Roman miles from Eleutheropolis (Beit Jibrîn) on the way to Diospolis (Lydda) The Roman road is still traceable and at the place indicated stands Tell es-Sâfi, a small mud village, having near it the mound which marks the site of the Crusaders' castle, Blanchegarde The village stands on a cliff about 300 ft high in which are many caves A fenced city on such an eminence would be remarkably strong, and surprise is naturally felt at its complete disappearance

The position of the village at Tell es-Sâfi has precluded a complete survey, but the excavations carried out there have, on the whole, proved disappointing and rendered the identification with Gath highly questionable This and the fact that the sister Philistine cities do not occupy sites naturally strong, but are merely mounds on the plain, make it possible that Gath may yet be found between the coast and the Shephelah Albright suggests 'Arâk el-Minshiyeh, or rather Ahmad el-'Arâmi a hill close beside it, as the site of Gath Tell es-Sâfi he would identify with Makkedah

See W F Albright, in *Bulletin of the American School of Oriental Research*, 1921 and 1924 (E. Ro)

GATHAS, the name given to certain chapters of the Zend-Avesta of Zoroaster It contains the discourses and exhortations of the prophet as well as 17 hymns written in an archaic metre The language is of considerable antiquity, differing considerably from that ordinarily used in the Avesta *See* Zend-Avesta and Zoroaster

GATINEAU, a river of Quebec in Canada, rising in a chain of large lakes due north of 48° N lat., and continuing southwesterly until it merges into the Ottawa, about one m below the city of that name This is one of the main sites of hydroelectric power development in the Dominion *See* Quebec and Ottawa

GATLING, RICHARD JORDAN (1818–1903), American inventor, was born in Hertford county (N C), Sept 12, 1818 He assisted in the construction and perfecting of machines for sowing cotton seeds, and for thinning the plants In 1839 he perfected a practical screw propeller for steamboats, only to find that a patent had been granted to John Ericsson for a similar

invention a few months earlier He established himself in St Louis, and taking the cotton-sowing machine as a basis he adapted it for sowing rice, wheat and other grains The introduction of these machines did much to revolutionize the agricultural system in the country.

Becoming interested in the study of medicine through an attack of smallpox, he completed a course at the Ohio medical college in 1850 In the same year he invented a hemp-breaking machine, and in 1857 a steam plough At the outbreak of the Civil War he devoted himself at once to the perfecting of fire-arms In 1861 he conceived the idea of the rapid fire machine-gun which is associated with his name By 1862 he had succeeded in perfecting a gun that would discharge 350 shots per minute, but the war was practically over before the Federal authorities consented to its official adoption The invention was adopted by almost every civilized nation Gatling died in New York city, Feb 26, 1903

GATTI-CASAZZA, GIULIO (1869–), operatic director, was born at Udine, Italy, Feb 3, 1869 He was educated at the University of Ferrara and the Royal Superior Naval Academy of Genoa, graduating as an engineer, and studied privately literature, history and music In 1893 he was made a member of the board of directors of the Municipal theatre and superintendent of the other musical institutions of Ferrara and subsequently (1898) became general artistic and administrative director of the Scala, Milan, remaining there until 1908 Among the singers who appeared under his management were Caruso and Chaliapin, and his management in general was distinguished by much vigour and initiative In 1908 he was appointed general artistic and administrative director of the Metropolitan Opera, New York

GATTY, MARGARET (1809–1873), English writer, daughter of the Rev Alexander Scott (1768–1840), chaplain to Nelson, was born at Burnham, Essex, and married in 1839 the Rev Alfred Gatty, vicar of Ecclesfield, near Sheffield Mrs Gatty is remembered for her many admirable books for children, the most famous of which is the *Parables from Nature* (5 vols 1855–71) As "Aunt Judy" of *Aunt Judy's Magazine* she became the personal friend of thousands of her child readers and correspondents

GATTY, NICHOLAS COMYN (1874–), English composer, was born at Bradfield near Sheffield on Sept 13, 1874 He was educated privately and at Downing College, Cambridge, and afterwards entered the Royal College of Music, where he studied composition under Stanford In 1907 he became musical critic to the *Pall Mall Gazette*. For many seasons he acted as musical assistant on the stage at Covent Garden In 1927 he received the degree of Mus D from Cambridge university He is principally a composer of opera, but has also written Variations on "Old King Cole" for orchestra; a suite for strings, a setting of Milton's ode "Fly, envious Time" for chorus and orchestra; three Short Odes (Clough and Shelley), variations and a sonata in G for violin and piano; two sets of piano waltzes, and a number of songs His operas are *Greysteel* (unpublished), produced at Sheffield (1906) and *Duke or Devil* (Manchester, 1909), both in one act, *Prince Ferelon*, musical extravaganza in 1 act, produced in 1919 and now established in the repertoire of the "Old Vic." (vocal score published by the Carnegie Trust); *The Tempest* (unpublished), Surrey Theatre, London, 1920, *King Alfred and the Cakes*, and *Macbeth*

GAUCHOS, a nomadic South American race inhabiting the Argentine Republic and Uruguay of mixed Spanish and Indian descent. They are tall, handsome, strikingly dressed and of great endurance, with a combination of dignity and arrogance in their bearing Their chief occupation is leather making and ranching, the wild conditions under which they live having made them excellent horsemen, skilled in the use of the lasso and bolas (*q v*)

GAUDEN, JOHN (1605–1662), English bishop and writer, reputed author of the *Eikon Basilike*, was born at Mayland, Essex, where his father was vicar Educated at Bury St Edmunds and at St John's college, Cambridge, he seems to have been at Oxford until 1630, when he became vicar of Chippenham His sympathies were at first with the parliamentary party He was chaplain to Robert Rich, second earl of Warwick, and preached before the House of Commons in 1640 Apparently his views changed as the revolutionary tendency of the Presbyterian party became more pronounced, for in 1648/9 he addressed to Lord Fairfax *A Religious and Royal Protestation* . . against the proceedings of the parliament Under the Commonwealth he faced both ways At the Restoration he was made bishop of Exeter He complained to Hyde, earl of Clarendon, of the poverty of the see, and based claims for a better benefice on a certain secret service, which he explained on Jan 20, 1661 to be the sole invention of the *Eikon Basilike, The Pourtraicture of his Sacred Majestie in his Solitudes and Sufferings*, put forth within a few hours after the execution of Charles I as written by the king himself To which Clarendon replied that he had been before acquainted with the secret and had often wished he had remained ignorant of it Gauden was advanced in 1662, not as he had wished to the see of Winchester, but to Worcester He died on May 23 of the same year

See *Private Correspondence between Chas I and Sir Ed Nicholas* pubd as vol v of the *Memoirs of John Evelyn* (1827), C Wordsworth, *Who wrote Eikon Basilike?* two letters addressed to the archbishop of Canterbury (1824), and *King Charles the First, the Author of Icon Basilikè* (1828); E J. L Scott's introduction to his reprint (1880) of the original edition, articles in the *Academy*, May and June 1883, by C E Doble, another reprint edit by E Almack for the King's Classics (1904), and E Almack, *Bibliography of the King's Book* (1896) which summarizes etc the arguments on either side and gives a full bibliography

GAUDIER-BRZESKA, HENRI (1891–1915), French sculptor, a leading representative of the Vorticist movement which held that the subject-matter of a work of art need not represent or be like anything in nature, only it must be alive with rhythmic vitality He was born at St Jean de Braye, Loire, on Oct 4, 1891 He was the son of Joseph Gaudier, a joiner After gaining a scholarship he was educated at Bristol college, and was there provided with funds to study art He went to Nuremberg and Munich and in 1910 returned to France He henceforth called himself Gaudier-Brzeska His first commission in sculpture was the statue of Maria Carmi At the age of 22 he had established his style in the marbles "The Dancer" and "The Embracers" He was killed in a charge at Neuville St Vaast on June 5, 1915 A memorial exhibition of his work was held at the South Kensington museum, London

See Ezra Pound, *Gaudier-Brzeska His Life and Work.*

GAUDY, as a noun, in the sense of rejoicing or feast, a word used of a commemoration dinner at an Oxford college.

GAUGAMELA (ARBELA), BATTLE OF (Oct. 1, 331 B C). After his defeat at Issus, Darius assembled a vast horde of men at Babylon Thence, marching northwards, he crossed to the left bank of the Tigris, and established his magazines and harems at Arbela (Erbil) From Arbela he moved forward to Gaugamela, some 32 miles westwards Having conquered Egypt, Alexander marched northwards through Palestine, crossed the Tigris at Bezabdi, north of modern Mosul, and, learning of the Persian king's whereabouts, he at once moved forward with a picked force of cavalry Having located the enemy, he rested his army for four days and fortified his camp Whilst this was taking place, Darius deployed his army on the plains of Gaugamela, which he converted into a huge parade ground by levelling it On the fourth night Alexander advanced, but when 3½ miles distant from him he called a halt, and assembled his generals Parmenio suggested that they should encamp where they were and reconnoitre the ground and the enemy To this Alexander agreed, and whilst the camp was being fortified, "he took the light infantry and the companion cavalry and went all round, reconnoitring the whole country where he was about to fight the battle" On his return he called together a conference at which he discussed what he had seen, and urged upon his generals the importance of the immediate execution of orders Whilst the soldiers were resting, Parmenio came to Alexander's tent and suggested a night attack This proposal Alexander refused to consider, his reason (more probable than the story of his disdaining such craft) being that in the approaching battle he had planned to deliver a decisive blow, and he knew well the difficulties coincident with night operations Having rejected this advice, Alexander drew up his army. The phalanx was marshalled in

the centre, the right wing consisting of its three right divisions, the hypaspists, the agema and the Companion cavalry; the left wing of the remaining three divisions of the phalanx, the Grecian cavalry and the Thessalian cavalry Thus far the order of battle was normal The problem which faced Alexander was very similar to that which confronted Cyrus in Xenophon's account of the battle of Thymbra Alexander applied the tactics

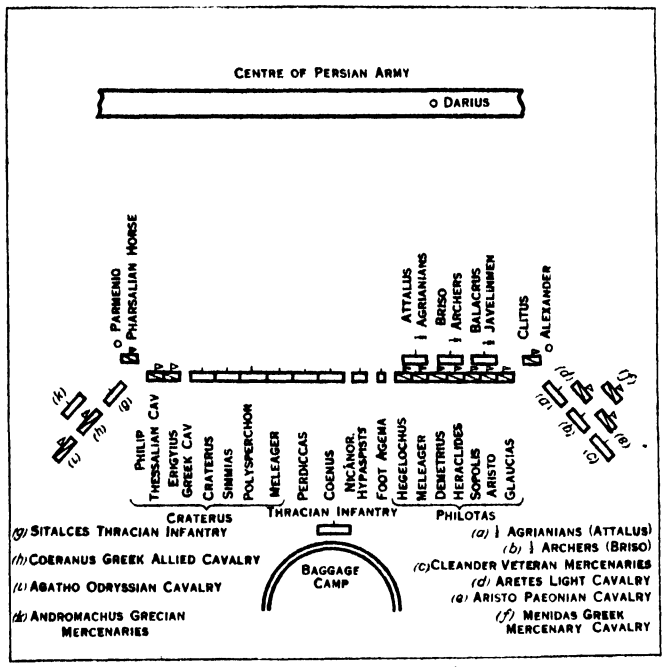


FIG 1 —DIAGRAM OF BATTLE OF GAUGAMELA (ARBELA), OCT 1, 331 B C , SHOWING DISPOSITION OF ALEXANDER S ARMY UNDER SEPARATE GENERALS
The Greeks numbered 7,000 cavalry and 40,000 foot, while the Persians were probably five times as strong The battle ended in the complete shattering of the Persian army

made use of at Thymbra Behind his front he drew up a reserve force consisting of two flying columns, these he posted one behind each wing at an angle to the front, so that they might take the enemy in flank should an attempt be made to turn the wings, or, if this did not take place, then they were to wheel inwards and reinforce the main army In front of the Companion cavalry he posted half the Agrianians, archers and javelin-men to oppose the charge of the Persian chariots The baggage guard consisted of Thracian infantry In all Alexander's army numbered 7,000 cavalry and 40,000 foot, the Persians were, in all probability, about five times as strong This order of battle should be kept clearly in mind, for, as it will be seen, it was through Alexander's ability to develop his tactics from it that he won the battle

The Battle.—The initiative was taken by Alexander He advanced, not directly on the Persians, but towards their left, and so compelled Darius to move on to the unlevelled ground Darius, fearing that his chariots would become useless, ordered his left-wing cavalry to ride round Alexander's right and halt him Alexander met this attack with his light cavalry, and a general cavalry engagement took place Then Darius launched his chariots, but they never got home, as the charioteers were shot down by the light infantry in front of the Companion cavalry The Persian left was now unmasked and in some confusion, whereupon Alexander wheeled round the Companion cavalry and with the four right divisions of the phalanx he led them towards the gap formed in the Persian front by the advance of their cavalry, and made straight for Darius. This cavalry charge, closely supported on its left by the dense array of bristling pikes in echelon, smote such terror into Darius that he fled the field Meanwhile the Persian cavalry on Alexander's original right, finding their rear threatened took to flight, and the Macedonians, following up the fugitives, slaughtered them The left wing, on account of the diagonal march, was in rear of the right, and the impetuous advance of Alexander appears to have created a gap between it and the right wing. Through this gap the Indian and Persian cavalry burst, and advanced towards the baggage camp While this action was in progress, the Persian cavalry on Darius's right wing rode round Alexander's left wing and attacked Parmenio in flank. Parmenio, now completely surrounded, sent a messenger to Alexander informing him of his critical situation He received this message whilst he was pursuing the fragments of the Persian left wing, and at once wheeled round with the Companion cavalry, and led them against the Persian right The Persian cavalry, who were now falling back, finding their retreat menaced, fought stubbornly "They struck and were struck without quarter" but were routed by Alexander The pursuit was now taken up, and was continued until midnight, when a forced march was made on Arbela About 32 miles were covered, but in vain, for Darius made good his escape Arrian states that the Persians lost 300,000 in killed and Alexander only 100, and 1,000 horses These figures are obviously unreliable

Tactics.—This battle was not won by reckless courage but by audacity tempered by a wonderful grasp of what the enemy intended to do, and how his actions could be turned to advantage. This is clearly seen if the diagrams are studied The order of battle is the normal one, but out of it is developed a very different type of attack to those of the battles of Granicus and Issus Alexander is never obsessed by past successes, also he never invents what may be called experimental attacks What he does is to measure up his antagonist and to act accordingly First he seeks information; this is the foundation of his security, for in spite of his audacity security is always the foundation of his offensive action Once he has made up his mind he distributes his force economically, his order of battle consists of a protective left and an offensive right, and in his right he concentrates his punch Having secured his plan, he rapidly moves towards the Persian left flank, not only to get beyond the level ground, but to prevent a double envelopment, and to increase the distance between his left

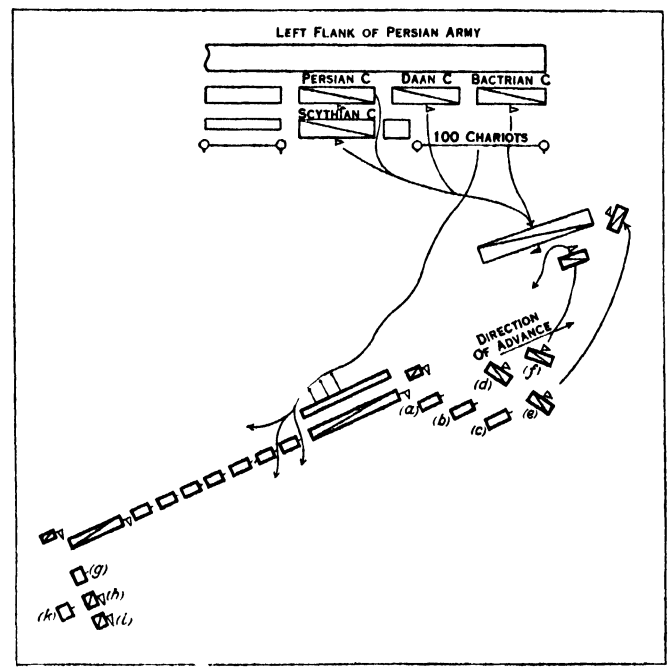


FIG 2 —ALEXANDER'S FIRST ATTACK ON THE PERSIAN EXTREME LEFT
This manoeuvre compelled Darius to uncover his left centre, thereby leaving a gap, through which Alexander foresaw he could penetrate the Persian line

and the Persian right This will enable him to shatter the Persian left before the Persian right can annihilate his own left Also, if he can only draw the Persian right well inwards, should he be able to smash the enemy's left, he will then be in a position to take their right in reverse. In diagram 2, the position of Darius, the decisive point, is off the plan to the left, yet it is the point Alexander intends to strike. He opens the battle by moving away from it, and so compels Darius to uncover the immediate left flank of his centre Though now well placed to attack in oblique order the outer flank of the Persian left wing he does not do so, for the

decisive point is not the left wing but the centre In diagram 3 it will be seen that under cover of his right flying column, he suddenly obliques inwards, and concentrates superiority of force opposite the gap once filled by the Scythian and Persian cavalry Through this gap he charges at top speed and strikes Darius *in rear* This charge succeeds, not because the Companion cavalry are advancing at top speed, but because their mobility is developed from the security afforded by the flying column and the phalanx

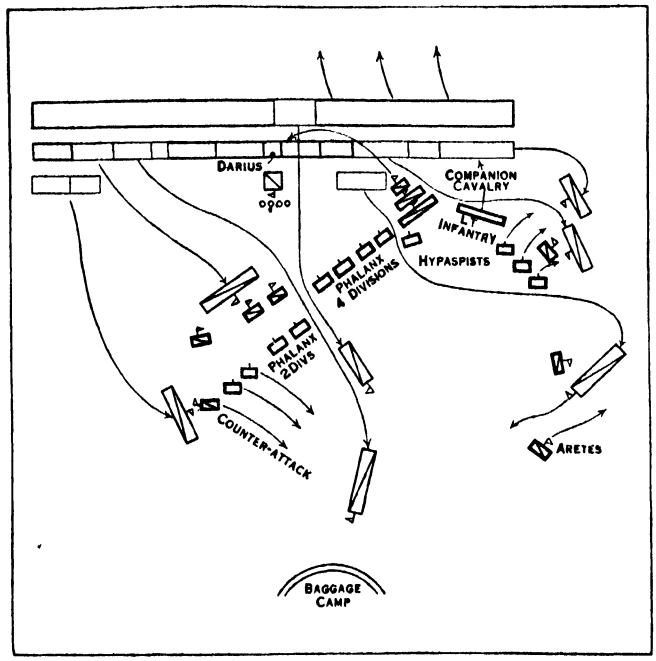


FIG 3 —DIAGRAM SHOWING PENETRATION TACTICS OF ALEXANDER
By suddenly turning inwards, under cover of his right flying column, Alexander concentrated superior forces in the gap caused by his initial manoeuvre (see fig. 2) and was thus able to take the army of Darius in the rear

The penetration by shock is absolutely successful Gaugamela is one of the most perfect examples of the tactics of penetration to be found in history

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GAUGUIN, PAUL (1848–1903), French painter, one of the pioneers of the Post-Impressionist movement He was born in Paris on June 7, 1848, the son of a journalist from Orleans and of a mother partly of Peruvian descent He spent his childhood in Peru and at Orleans, and after having done his military service in the marines he entered the banking firm of Bertin in Paris in 1871 In 1873 he married Mette-Sophie Gad, a Danish lady. In 1875 he began to spend his free time in painting Encouraged by his friend, C Pissaro, he acquired the Impressionist technique His interest in art took more and more hold of him, and in 1881 he decided to give up his appointment at the bank His means soon gave out and after an unfortunate attempt to get assistance from his wife's relations at Copenhagen, he separated from her and his children, returning to Paris without means A period of travel followed He worked on the island of Martinique (1887–88) and then went to Pont Aven in the Bretagne, where he soon became the leading spirit of a group of painters

The movement thus started was known as "Synthesism" Gauguin himself was not a theorist He wished to be rid of all that might intervene between the artist's vision and his canvas; but the other members of the group felt otherwise Emile Bernard lectured on the synthetic doctrine, Filiger contributed his mediaeval fancies, Sérusier propagated the new ideas, he clarified the vague doctrines of Gauguin The new tendency is explained by Maurice Denis, one of Sérusier's disciples in Paris, he says. "It was on our reassembling in 1888 that the name of Gauguin was revealed to us by Sérusier, who had just returned from Pont Aven and who allowed us to see not without a show of mystery the lid of a cigar box, on which we could make out a shapeless landscape synthetically designed in violet, vermilion, Veronese green and other unmixed colours, just as they are pressed out of a tube, almost without white in them 'How does that tree appear to you,' Gauguin had asked—'very green?—Well then use green —the finest green on your palette—and that shadow is rather blue? Do not be afraid to paint it as blue as possible'" "Thus," continues Denis, "was presented to us for the first time the fruitful conception of the plane surface covered with colours put together in a certain order . we learned that every work of art is a transposition, a caricature, the passionate equivalent of a sensation which has been experienced Gauguin freed us from all restraints which the idea of copying placed on our painter's instinct . . Henceforth we aspired to express our own personality If it was permissible to use vermilion in painting a tree which seemed to us at that moment reddish why not stress even to the point of deformation the curve of a beautiful shoulder, exaggerate the pearly whiteness of a carnation, stiffen the symmetry of boughs unmoved by a breath of air?" (*Theories 1890–1910*, published in 1920)

Thus Gauguin's ideas were taken up by a group of young students in Paris, which included Bonnard Denis, Ibels, Ranson, Vuillard and Maillol In 1889 "the school of Pont Aven" moved to Pouldu near by Their life there and the inn at Pouldu, the rendezvous of artists, which was adorned by Gauguin, was described by Mr Ch Chassé in *l'Occident* (1903) In 1888 Gauguin went to Arles to meet his friend, Van Gogh The two artists had planned to work together, but Van Gogh succumbed to an attack of lunacy and Gauguin left him (*See* P. Gauguin, *Avant et Après*) Among Gauguin's best work of this period are "Le Christe Jaune," and "La Lutte de l'Ange avec Jacob" He copied Manet's "Olympia," which he considered one of the masterpieces of the age, he etched a portrait of Mallarmé, executed some lithographs and carved reliefs in wood But in spite of all his efforts his financial position did not improve His journey to Martinique had inspired him with a love for the tropics and he conceived a plan of going to the South Seas where he could live cheaply and devote himself to his vocation He sold all his pictures by auction for 9,860 frcs and went to the island of Tahiti in 1891 There he lived a simple life with the natives which he described in his autobiographical novel *Noa Noa.*

On his return to Paris he exhibited his paintings at Durand Ruel, but the life in the big city no longer suited him, he left for Tahiti in 1895 never to return Out there, inspired by his admiration for primitive life, for the luminous colour of the tropical landscape, he produced paintings of great decorative beauty and originality "L'esprit Veille," "Seule," "Devant la Case," "La Fuite" and "Jours Delicieux" are among his most notable works They represent the bronzed native Maoris in their surroundings of exotic plants and primitive dwellings In 1901 he moved to Dominiha on the Marquesas isles He built himself a house and decorated it with carvings and paintings The natives treated him as one of their own and he sided with them against the overbearing European representatives of the administration The end of his life was approaching, he lived in extreme want, in order to pay his taxes he worked in a Government office for 6 frcs a day, his health was failing He died on May 9, 1903, and was buried in the Mission cemetery Victor Ségalen, a navy doctor and writer, who was in the Marquesas isles at the time, gave a vivid and sad account of his end (*Mercure de France*, June 1904)

His last important picture, entitled "D'où venons nous? Que sommes-nous? où allons-nous?" is one of his masterpieces It was painted under the shadow of an attempted suicide His description of this work in a letter to his friend, D de Montfreid, is of interest, as it throws light on his artistic creed "Before I died I wished to paint a large canvas that I had in mind, and I worked day and night that whole month in an incredible fever To be sure it is not done like a Puvis de Chavannes, sketch after nature, preparatory cartoon, etc It is all done straight from the brush on the sackcloth full of knots and wrinkles, so the appearance is terribly rough I put in it all my energy, a passion

so dolorous, amid circumstances so terrible, and so clear was my vision that the haste of the execution is lost and life surges up It does not stink of models, of technique, or of pretended rules, of which I have always fought shy, though sometimes with fear It is a canvas four metres, fifty long and one metre, seventy high The two upper corners are chrome yellow, with an inscription on the left and my name on the right, like a fresco whose corners are spoiled with age and which is appliquéed upon a golden wall To the right at the lower end a sleeping child and three crouching women Two figures dressed in purple confide their thoughts to one another An enormous crouching figure, out of all proportion and intentionally so, raises its arms and stares in astonishment upon these two, who dare to think of their destiny, a figure in the centre is picking fruit, two cats near a child, a white goat, an idol, its arms mysteriously raised in a sort of rhythm seems to indicate the Beyond Then, lastly, an old woman nearing death appears to accept everything She completed the story It is all on the bank of a river in the woods In the background the ocean, then the mountains of a neighbouring island Despite changes of tone the colouring of the landscape is constant—either blue or Veronese green Where does the execution of a painting commence and where does it end? At that moment when the most intense emotions are in fusion in the depths of one's being, when they burst forth like lava from a volcano ? The work is created suddenly, brutally if you like, and is not its appearance great, almost superhuman?"

Gauguin, then, had left Impressionism behind, he had profited by its technique in the use of using colours pure and unmixed, but his work was impregnated with symbolism, his design was expressive, his colour arrangements decorative His influence on modern art was far-reaching Besides the school of Pont Aven and the Synthesists, he inspired such artists as Ed Munch and Toulouse Lautrec His ideas revolutionized poster design and design in all Arts and Crafts work (Van de Velde, Lemmen, Gallé-Nancy) His primitive woodcarving and his terra-cotta figure called "Oviri," the Tahitan Diana, was admired by such artists as Picasso and led to the appreciation of negro sculpture His lithographs and woodcuts opened new fields in the graphic arts

See Jean de Rotonchamp, *Paul Gauguin* (1925), Ch Morice, *Paul Gauguin* (1919), Gauguin's writings *Noa Noa* (1924), the manuscript with original illustrations is in the possession of Mr D de Montfreid, who also owns the manuscripts of *Choses Diverses* (1896–97), and of *Le Sourire,* a satirical journal written in Tahiti, *Racontars d'un Rapin* (1902), written on the Marquesas islands, is reproduced for the most part in Rotonchamp's book *Avant et Après,* published by Charles Morice in *Vers et Prose* (1903), the manuscript was reproduced in facsimile (Leipzig, 1919), *Lettres de Paul Gauguin à G D de Montfreid* (1920), *The Intimate Journal of P Gauguin,* with a preface by Emile Gauguin (1923), M Guerin, *L'oeuvre Gravé de Gauguin* (1927) (I. A R)

GAUHATI, a town of British India, headquarters of the Kamrup district of Assam, mainly on the left or south, but partly on the right bank of the Brahmaputra Pop (1921) 16,480 Gauhati is the headquarters of the district and of the Brahmaputra Valley division It is beautifully situated, with an amphitheatre of wooded hills to the south During the 17th century it was taken and retaken by Mohammedans and Ahoms eight times in fifty years, but in 1681 it became the residence of the Ahom governor of lower Assam, and in 1786 the capital of the Ahom raja On the cession of Assam to the British in 1826 it was made the seat of the British administration of Assam, and so continued till 1874, when the headquarters were removed to Shillong in the Khasi hills, 67 m distant, with which Gauhati is connected by an excellent motor road Two much-frequented places of Hindu pilgrimage are situated in the immediate vicinity, the temple of Kamakhya on a hill 2 m west of the town, and the rocky island of Umananda in the Brahmaputra Gauhati is an important centre of river trade, and the largest seat of commerce in Assam The chief educational institutions are the Cotton Arts college and a law college

GAUL, GILBERT WILLIAM (1855–1919), American artist, was born in Jersey City (N J), on March 31, 1855 He was a pupil of J. G Brown and L E Wilmarth, and he became a painter of military pictures, portraying incidents of the American Civil War He was elected an associate of the National Academy of Design in 1880, and in 1882 a full academician, and in the latter year became a member of the Society of American Artists His important works include "Charging the Battery," "News from Home," "Cold Comfort on the Outpost," "Silenced," "On the Look-out," and "Guerillas returning from a raid" He died in New York, Dec 21, 1919

GAUL, Lat *Gallia,* the name of the two chief districts known to the Romans as inhabited by Celtic-speaking peoples, (*a*) *Gallia Cisalpina* or *Citerior, i e,* North Italy between Alps and Apennines and (*b*) the far more important *Gallia Transalpina* or *Ulterior,* usually called *Gallia* simply, the land bounded by the Alps, the Mediterranean, the Pyrenees, the Atlantic and the Rhine, *i e,* modern France and Belgium with parts of Holland, Germany and Switzerland

(*a*) Gallia Cisalpina (*q v*) was mainly conquered by Rome by 222 B C, later it adopted Roman civilization, whence it was often known as "*Gallia Togata*", about 42 B C it was united with Italy Its chief distinctions are that during the later Republic and earlier Empire it yielded excellent soldiers, and that it produced Virgil (by origin a Celt), Livy, Catullus, Cornelius Nepos, the elder and the younger Pliny and other distinguished writers

(*b*) Gaul proper first enters ancient history when the Greek colony of Massilia was founded (?600 B C) During the Punic Wars it became important to Rome as the highway to Spain (*q v*) In 121 B C the coast from Montpellier to the Pyrenees (*i e,* all that was not Massiliot), with its port of Narbo (mod *Narbonne*) and its trade route by Toulouse to the Atlantic, was formed into the province of Gallia Narbonensis and Narbo itself into a Roman municipality Gradually the province was extended north of Massilia, up the Rhone, while the Greek town itself became weak and dependent on Rome Narbonensis was distinguished from "Gallia Togata" as "Gallia Bracata," from the long trousers (*bracae,* incorrectly *braccae*) worn by its inhabitants

We owe our earliest detailed knowledge of pre-Roman Gaul to the *Commentaries* of Julius Caesar Gallia Narbonensis apart, Gaul was at that time divided among three more or less distinct peoples, the Aquitani, the Gauls (who called themselves Celts), and the Belgae These occupied respectively the south, the centre and the north of the country between the Pyrenees and the Rhine. The tribes were numerous Prominent among them were the Helvetii, the Sequani and the Aedui in the basins of the Rhone and the Saône, the Arverni in the Cévennes, the Senones and Carnutes in the basin of the Loire, the Veneti and other Armorican tribes between the mouths of the Loire and the Seine These were all Celts The Nervii, Bellovaci, Suessiones, Remi, Morini, Menapii and Aduatuci were Belgic, the Tarbelli and others were Aquitani; while the Allobroges inhabited the north of Gallia Bracata, having been conquered in 121 B C The ethnological divisions thus set forth by Caesar have been much discussed (*see* CELT and articles on the chief tribes)

As the result of the Gallic wars (58–51) of Caesar (*q v*) the whole of Gaul to the Rhine and the ocean became Roman territory, and in 49 Massilia was annexed But Roman territory had still to be romanized Caesar had no time to organize his conquest, this was left to Augustus As settled by him, and in part perhaps also by his successor Tiberius, Gaul fell into five administrative areas —

(i) *Narbonensis,* that is, the land between Alps, sea and Cévennes, extending up the Rhone to Vienne, is by nature distinct in many ways from the rest of Gaul It is a sun-steeped southern region, the home of the vine and olive, of the minstrelsy of the Provençal and the exuberance of Tartarin, distinct from the colder and more sober north Augustus found it already familiar with Roman ways and civilized enough to need no garrison Accordingly, it was henceforward governed by a proconsul (appointed by the senate) and freed from the burden of troops, while its local government was assimilated to that of Italy The old Celtic tribes were broken up, instead, municipalities of Roman citizens were founded to rule their territories Thus the Allobroges now disappear and the *colonia* of Vienna (Vienne) takes their place,

the Volcae vanish, and we find Nemausus (Nîmes). By AD 70 the area was "Italia verius quam provincia" (Pliny). The Gauls obviously had a natural bias towards the Italian civilization, and there soon became no difference between Italy and southern Gaul But, though education spread, the results were somewhat disappointing Trade flourished; the many towns grew rich and could afford splendid public buildings But no great writer and no great administrator came from Narbonensis.

(ii.-iv.) Across the Cévennes lay Caesar's conquests, Atlantic in climate, new to Roman ways. The whole area, often collectively styled "Gallia Comata," from the inhabitants wearing their hair long, often "Tres Provinciae," was divided into three provinces, each under a *legatus pro praetore* appointed by the emperor, with a common capital at Lugdunum (Lyons) The three were. *Aquitania,* reaching from the Pyrenees almost to the Loire, *Lugdunensis,* the land between Loire and Seine, reaching from Brittany in the west to Lyons in the south-east; and *Belgica* in the north Here also it was found possible to dispense with garrisons, not because the provinces were as peaceful as Narbonensis, but because the Rhine army was close at hand, while the splendid system of roads rendered the movement of troops easy. As befitted an unromanized region, the local government was unlike that of Italy or Narbonensis Roman municipalities were not unknown, though very few, the local authorities were the magistrates of the old tribal districts Local autonomy was carried to an extreme, but the policy succeeded If the Gauls of the Three Provinces, or some of them, revolted in AD 21 under Florus and Sacrovir, in 68 under Vindex, and in 70 under Classicus and Tutor (*see* CIVILIS, CLAUDIUS), all five leaders were romanized nobles, with Roman names and Roman citizenship, and their risings were directed rather against the Roman government than the Roman empire In general, Roman civilization was accepted more or less rapidly, in particular, the worship of "Augustus and Rome," devised by the first emperor as a bond of state religion connecting the provinces with Rome, was eagerly welcomed It agrees with the vigorous development of this worship that the Three Provinces, though romanized, retained their own local feeling As late as the 3rd century the cults of Celtic deities (Hercules Magusanus, Deusoniensis, etc) were revived, the Celtic *leuga* reintroduced instead of the Roman mile on official milestones, and a brief effort made to establish an independent, though romanized, Gaul under Postumus and his short-lived successors (AD 259–273) The area was too large and strong to lose its individuality, it was also too rural and too far from the Mediterranean to be romanized as fully and quickly as Narbonensis Even the Celtic language lingered on in forest districts into the 4th century AD Town life, however, grew The *chefs-lieux* of the tribes became practically, though not officially, municipalities, and many of these towns reached considerable size and magnificence of public buildings But they attest their tribal relations by their appellations, which are commonly drawn from the name of the tribe and not of the town itself, to this day Amiens, Paris, Rheims, Soissons and others perpetuate the memory of tribes like the Ambiani, the Parisii, the Remi, and the Suessiones Literature also flourished In the latest empire Ausonius, Symmachus, Sidonius, Apollinaris and other Gaulish writers, chiefly of Gallia Comata, kept alive the classical literary tradition, not only for Gaul but for the world

(v.) The fifth division of Gaul was the Rhenish military frontier, which was organized as two military districts The northern one was the valley of the Meuse and that of the Rhine to a point just south of Bonn, the southern was the rest of the Rhine valley to Switzerland Each district was garrisoned at first by four, later by fewer, legions, which were disposed at various times in some of the following fortresses: Vetera (Xanten), Novaesium (Neuss), Bonna (Bonn), Moguntiacum (Mainz), Argentorate (Strasbourg) and Vindonissa (Windisch in Switzerland) At first the districts, being purely military, were called after the garrisons "exercitus Germanicus superior" (south) and "inferior" (north) Later one or two municipalities were founded—the oldest, Colonia Agrippinensis, at Cologne in AD 51—and about AD 80–90 the two "Exercitus" were turned into the two provinces of Upper and Lower Germany (*see* GERMANY).

These provincial divisions were modified by Diocletian, but without seriously affecting the life of Gaul The whole country continued Roman and fairly safe from barbarian invasions till after 400 In AD 407 a multitude of Franks, Vandals, etc , broke in; Roman rule practically ceased, and the three kingdoms of the Visigoths, Burgundians and Franks began to form There were still a Roman general and Roman troops when Attila was defeated in the *campi Catalaunici* in AD 451, but the general, Aetius, was "the last of the Romans," and in AD 486 Clovis the Frank brought Roman rule in Gaul to a final end.

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GAULT: *see* CRETACEOUS SYSTEM.

GAUR or **LAKHNAUTI,** a ruined city of British India, in the Malda district of Bengal. The ruins are situated about 8 m south of English Bazar, the civil station of the district of Malda, and on the eastern bank of an old channel of the Ganges It is said to have been founded by Lakshman, the Sena king of Bengal, and its ancient name was Lakshmanavati, corrupted into Lakhnauti. Its known history begins with its conquest at the end of the 12th century by the Mohammedans, who retained it as their capital in Bengal for more than three centuries The seat of government was transferred about 1340 to Pandua (*q v*), also in Malda district When Pandua was in its turn deserted (about 1455), Gaur once more became the capital, but in 1564 owing to a change in the course of the Ganges it was abandoned for Tanda, a place somewhat nearer the main stream Gaur was temporarily reoccupied by Akbar's general in 1575, when Daud Shah, the last of the Afghan dynasty, refused to submit to the Mogul emperor This occupation was followed by a virulent epidemic, which depopulated the city and completed its downfall Since then it has been little better than a heap of ruins, almost overgrown with jungle

The western side of Gaur was washed by the Ganges, and it was protected both from inundation and from attack by great embankments Within the space enclosed by these embankments and the river stood the city proper The city in its prime measured 7½ m from north to south, with a breadth of 1 to 2 m The ramparts of the city, which was surrounded by extensive suburbs, still exist, they were works of vast labour, and were on the average about 40 ft high, and 180 to 200 ft thick at the base

Fergusson in his *History of Eastern Architecture* thus describes the general architectural style of Gaur —"It is neither like that of Delhi nor Jaunpore, nor any other style, but one purely local and not without considerable merit in itself, its principal characteristic being heavy short pillars of stone supporting pointed arches and vaults in brick" The ruins long served as a quarry for the builders of neighbouring towns and villages, till in 1900 steps were taken for their preservation by the government The finest ruin in Gaur is that of the Great Golden Mosque, also called Bara Darwaza, or twelve-doored (1526) The Small Golden or Eunuch's mosque has fine carving, and is faced with stone fairly well preserved The Tantipara mosque (1475–80) has beautiful moulding in brick, and the Lotan mosque of the same period is unique in retaining glazed tiles The citadel was entered through a magnificent gateway called the Dakhil Darwaza (?1460–74) At the south-east corner was a palace, surrounded by a wall of brick 66 ft high, of which a part is standing Near by were the royal tombs. Within the citadel is the Kadam Rasul mosque (1530), which is still used, and close outside is a tall tower called the Firoz Minar (perhaps signifying "tower of victory") There are a number of Mohammedan buildings on the banks of a great reservoir called Sagar Dighi, including, notably, the tomb of the saint Makhdum Shaikh Akhi Siraj (d 1357).

See M. Martin (Buchanan Hamilton), *Eastern India*, vol iii (1831); G H Ravenshaw, *Gaur* (1878), James Fergusson, *History of Indian and Eastern Architecture* (1876), *Reports of the Archaeological Surveyor, Bengal Circle* (1900–04).

GAUR (*Bibos gaurus*), the wild ox of India. The gaur, which extends into Burma and the Malay Peninsula, is the typical representative of an Indo-Malay group of wild cattle characterized by a ridge on the withers, compressed horns, and white legs The gaur, which reaches a height of nearly 6ft at the shoulder, is characterized by the forward curve and great elevation of the ridge between the horns The colour is blackish-grey Hill-forests are the resort of this species

GAUS, FRIEDRICH (1881–), German diplomat, born on Feb 18, 1881, at Brunswick He became in 1923 director of the legal department in the government, and was concerned in the preparation of German diplomatic documents from the end of the war onwards, but notably in questions of disarmament and of justice He took part in the Genoa (1922) and London (1924) conferences and acted as legal adviser to the German government in the preparation of the Locarno treaties

GAUSS, KARL FRIEDRICH (1777–1855), German mathematician and physicist, was born at Brunswick on April 30, 1777 He was the son of a bricklayer and owed his education to the influence of the reigning duke He went to the Caroline college and later to Gottingen In 1798 he returned to Brunswick, where he tried to earn his living by teaching privately When the new observatory at Gottingen was completed in 1807, Gauss became Director and Professor of Astronomy He practically never left the observatory until he died on Feb 23, 1855

Gauss began his mathematical researches at an early age; this early work was incorporated in his *Disquisitiones Arithmeticae* (1801) which is a standard work on the theory of numbers. This was followed by a large number of memoirs in pure mathematics Because of this work he is ranked with Laplace and Lagrange among the three greatest masters of modern mathematical analysis. Amongst other researches in this connection Gauss made extensive use of determinants and imaginaries, he arrived at the method of least squares, observed the double periodicity of elliptic functions; applied vigorous tests on the convergence of an infinite series, and worked out a solution for binomial equations He wrote on biquadratic residues, and solved the problem of the representation of numbers by binary quadratic forms; he also proved the law of quadratic reciprocity.

Gauss began his magnetic and electrical researches about 1830, his first memoir, *Intensitas vis magneticae terrestris ad mensuram absolutam revocata*, was published in 1833, in this he proposed a system of units based on the units of length, mass and time. He called these units absolute units and the unit of magnetic field has been named the Gauss. With Weber he constructed a magnetic observatory free from iron where they made observations and from which they sent telegraphic messages along a crude line which they erected In connection with his magnetic measurements, Gauss organized a German Magnetic Union so that magnetic observations were taken at a fixed time at various places in Europe. Gauss and Weber designed the instruments used in these measurements, notably an apparatus for measuring declination and the unifilar and bifilar magnetometers The union worked from 1834 to 1842, and their results were published in memoirs *Resultate aus den Beobachtungen des Magnetischen Vereins 1836–41* (1837–43) In these memoirs we find the inverse square law and Gauss's theory on earth magnetism; this theory is a mathematical presentation of the distribution of magnetism over the earth's surface rather than a theory to account for the existence of earth magnetism Gauss applied mathematics to electrostatic and electrodynamic problems; his theories were based on assumptions concerning the position and motion of imponderable electrified particles. He also carried out researches in optics and particularly on systems of lenses. These were published in *Dioptrische Untersuchungen* (1840) A memoir on capillary attraction contains a solution of a problem in the calculus of variation and another on attractions treats of the attraction of homogeneous ellipsoids Gauss took part in geodetic surveys, and wrote two memoirs, *Über Gegenstände der hoheren Geodesie* (1843 and 1846) He also wrote a treatise on astronomy, *Theoria motus corporum coelestium* (1809)

See W. Sartorius, *Gauss, zum Gedachtniss* (1856).

GAUTIER, LEON (1832–1897), French literary historian, was born at Hâvre, educated at the Ecole des Chartes, and became successively keeper of the archives of the department of Haute-Marne and of the imperial archives at Paris under the empire In 1871 he became professor of palaeography at the Ecole des Chartes He was elected member of the Academy of Inscriptions in 1887, and became chief of the historical section of the national archives in 1893 Léon Gautier rendered great services to the study of early French literature, the most important of his numerous works on mediaeval subjects being a critical text (Tour, 1872) with translation and introduction of the *Chanson de Roland*, and *Les Epopées françaises* (3 vols, 1866–67, 2nd ed, 5 vols, 1878–97, including a *Bibliographie des chansons de geste*) He died in Paris on Aug 25, 1897

GAUTIER, THEOPHILE (1811–1872), French poet and miscellaneous writer, was born at Tarbes on the 31st of August 1811 He was educated at the grammar school of that town, and afterwards at the Collège Charlemagne in Paris, but was almost as much in the studios He very early devoted himself to the study of the older French literature, especially that of the 16th and the early part of the 17th century This study qualified him well to take part in the Romantic movement, and enabled him to astonish Sainte-Beuve by the phraseology and style of some literary essays which, when barely eighteen years old, he put into the critic's hands In consequence of this introduction he at once came under the influence of the great Romantic *cénacle*, to which, as to Victor Hugo in particular, he was also introduced by his gifted but ill-starred schoolmate Gérard de Nerval With Gérard, Petrus Borel, Corot, and many other less known painters and poets whose personalities he has delightfully sketched in the articles collected under the titles of *Histoire du Romantisme*, etc, he formed a minor romantic clique who were distinguished for a time by the most extravagant eccentricity A flaming crimson waistcoat and a great mass of waving hair were the outward signs which qualified Gautier for a chief rank among the enthusiastic devotees who attended the rehearsals of *Hernani* with red tickets marked "Hierro," performed mocking dances round the bust of Racine, and were at all times ready to exchange word or blow with the *perruques* and *grisâtres* of the classical party In Gautier's case these freaks were not inconsistent with real genius and real devotion to sound ideals of literature He began (like Thackeray, to whom he presents in other ways some striking points of resemblance) as an artist, but soon found that his true powers lay in another direction

His first considerable poem, *Albertus* (1830), displayed a good deal of the extravagant character which accompanied rather than marked the movement, but also gave evidence of uncommon command both of language and imagery, and in particular of a descriptive power hardly to be excelled The promise thus given was more than fulfilled in his subsequent poetry, which, in consequence of its small bulk, may well be noticed at once and by anticipation The *Comédie de la mort*, which appeared soon after (1832), is one of the most remarkable of French poems, and though never widely read has received the suffrage of every competent reader Minor poems of various dates, published in 1840, display an almost unequalled command over poetical form, an advance even over *Albertus* in vigour, wealth and appropriateness of diction, and abundance of the special poetical essence All these good gifts reached their climax in the *Émaux et camées*, first published in 1856, and again, with additions, just before the poet's death in 1872. These poems are in their own way such as cannot be surpassed. Gautier's poetical work contains in little an expression of his literary peculiarities There are, in addition to the peculiarities of style and diction already noticed, an extraordinary feeling and affection for beauty in art and nature, and a strange indifference to anything beyond this range, which has doubtless injured the popularity of his work.

But it was not, after all, as a poet that Gautier was to achieve

either profit or fame. For the theatre, he had but little gift, and his dramatic efforts (if we except certain masques or ballets in which his exuberant and graceful fancy came into play) are by far his weakest. It was otherwise with his prose fiction. His first novel of any size, and in many respects his most remarkable work, was *Mademoiselle de Maupin* (1835). Unfortunately this book, while it establishes his literary reputation on an imperishable basis, was unfitted by its subject, and in parts by its treatment, for general perusal, and created, even in France, a prejudice against its author which he was very far from really deserving During the years from 1833 onwards, his fertility in novels and tales was very great. *Les Jeunes-France* (1833), which may rank as a sort of prose *Albertus* in some ways, displays the follies of the youthful Romantics in a vein of humorous and at the same time half-pathetic satire. *Fortunio* (1838) perhaps belongs to the same class *Jettatura,* written somewhat later, is less extravagant and more pathetic A crowd of minor tales display the highest literary qualities, and rank with Mérimée's at the head of all contemporary works of the class First of all must be mentioned the ghost-story of *La Morte amoureuse,* a gem of the most perfect workmanship For many years Gautier continued to write novels *La Belle Jenny* (1864) is a not very successful attempt to draw on his English experience, but the earlier *Militona* (1847) is a most charming picture of Spanish life In *Spirite* (1866) he endeavoured to enlist the fancy of the day for supernatural manifestations, and a *Roman de la momie* (1856) is a learned study of ancient Egyptian ways His most remarkable effort in this kind, towards the end of his life, was *Le Capitaine Fracasse* (1863), a novel, partly of the picaresque school, partly of that which Dumas was to make popular, projected nearly thirty years earlier, and before Dumas himself had taken to the style. This book contains some of the finest instances of his literary power

Yet neither in poems nor in novels did the main occupation of Gautier as a literary man consist He was early drawn to the more lucrative task of feuilleton-writing, and for more than thirty years he was among the most expert and successful practitioners of this art Soon after the publication of *Mademoiselle de Maupin,* in which he had not been too polite to journalism, he became irrevocably a journalist. He was actually the editor of *L'Artiste* for a time but his chief newspaper connexions were with *La Presse* from 1836 to 1854 and with the *Moniteur* later His work was mainly theatrical and art criticism The rest of his life was spent either at Paris or in travels of considerable extent to Spain, the Netherlands, Italy, Turkey, England, Algeria and Russia, all undertaken with a more or less definite purpose of book-making Having absolutely no political opinions, he had no difficulty in accepting the Second Empire, and received from it considerable favours, in return for which, however, he in no way prostituted his pen, but remained a literary man pure and simple He died on the 23rd of December 1872.

Accounts of his travels, criticisms of the theatrical and literary works of the day, obituary notices of his contemporaries and, above all, art criticism occupied him in turn. It has sometimes been deplored that this engagement in journalism should have diverted Gautier from the performance of more capital work in literature Perhaps, however, this regret springs from a certain misconception Gautier's power was literary power pure and simple, and it is as evident in his slightest sketches and criticisms as in *Émaux et camées* or *La Morte amoureuse* On the other hand, his weakness, if he had a weakness, lay in his almost total indifference to the matters which usually supply subjects for art and therefore for literature. He has thus been accused of "lack of ideas" by those who have not cleared their own minds of cant; and in the recent set-back of the critical current against form and in favour of "philosophic" treatment, comment upon him has sometimes been unfavourable. But this injustice will, beyond all question, be redressed again. He was neither immoral, irreligious nor unduly subservient to despotism, but morals, religion and politics (to which we may add science and material progress) were matters of no interest to him He was to all intents a humanist, as the word was understood in the 15th century But he was a humorist as well, and this combination, joined to his singularly kindly and genial nature, saved him from some dangers and depravations as well as some absurdities to which the humanist temper is exposed As time goes on it may be predicted that, though Gautier may not be widely read, yet his writings will never cease to be full of indescribable charm and of very definite instruction to men of letters Besides those of his works which have been already cited, we may notice *Une Larme du diable* (1839), a charming mixture of humour and tenderness, *Les Grotesques* (1844), a volume of early criticisms on some oddities of 17th century literature, *Caprices et zigzags* (1845), miscellanies dealing in part with English life, *Voyage en Espagne* (1845), *Constantinople* (1854), *Voyage en Russie* (1866), brilliant volumes of travel; *Ménagerie intime* (1869) and *Tableaux de siège* (1872), his two latest works, which display his incomparable style in its quietest but not least happy form

There is no complete edition of Gautier's works, and the vicomte Spoelberch de Lovenjoul's *Histoire des œuvres de Théophile Gautier* (1887) shows how formidable such an undertaking would be But since his death numerous further collections of articles have been made *Fusains et eaux-fortes* and *Tableaux à la plume* (1880), *L'Orient* (2 vols., 1881), *Les Vacances du lundi* (new ed, 1888); *La Nature chez elle* (new ed, 1891). In 1879 his son-in-law, E Bergerat, who had married his younger daughter Estelle (the elder, Mme. Judith Gautier—herself a writer of distinction—was at one time Mme Catulle Mendès), issued a biography, *Théophile Gautier,* which has been often reprinted With it should be compared Maxime du Camp's volume in the *Grands Écrivains français* (1890) and the numerous references in the *Journal des Goncourt* Critical eulogies, from Sainte-Beuve (repeatedly in the *Causeries*) and Baudelaire (two articles in *L'Art romantique*) downwards, are numerous The chief of the decriers is Émile Faguet in his *Études littéraires sur le XIXe siècle* In 1902 and 1903 there appeared two respectable academic *éloges* by H. Menal and H Potez. (G. Sa)

GAUTIER D'ARRAS, French *trouvère,* flourished in the second half of the 12th century. Nothing is known of his biography except what may be gleaned from his works He dedicated his romance of *Ère̊acle* to Theobald V, count of Blois (d 1191), among his other patrons were Marie, countess of Champagne, daughter of Louis VII and Eleanor of Guienne and Baldwin IV, count of Hainaut *Ère̊acle,* the hero of which becomes emperor of Constantinople as Heraclius, is purely a *roman d'aventures* and enjoyed great popularity His second romance, *Ille et Galeron,* dedicated to Beatrix, the second wife of Frederick Barbarossa, treats of a similar situation to that outlined in the lay of *Eliduc* by Marie de France.

See the *Oeuvres de Gautier d'Arras,* ed E Loseth (1890), *Hist litt de la France,* vol xxii. (1852); A Dinaux, *Les Trouvères* (1833–43)

GAUVAIN, AUGUSTE (1861–), French journalist and diplomat, was born at Vesoul Oct 6, 1861 From 1889 to 1892 he was on the staff of *Le Journal des Débats* and in 1893 became general secretary to the European Commission of the Danube In 1904 he was appointed French secretary to the Central Office of International Transport at Berne In 1908 he returned to the staff of *Le Journal des Débats* and from that time directed its foreign policy Gauvain, who became a member of the Academy of Moral and Political Sciences, published verbatim in 14 volumes all his articles in *Le Journal des Débats* from 1908 to 1920.

Among his works are *Les origines de la guerre européenne* (1915), *L'Europe avant la guerre* (1917), *L'affaire grecque* (1917), *La question Yougoslave* (1918), *L'encerclement de l'Allemagne* (1919)

GAUZE, a light, transparent fabric, originally of silk, and now sometimes made of linen or cotton, woven in an open manner with very fine yarn It is said to have been originally made at Gaza in Palestine, whence the name Some of the gauzes from eastern Asia were brocaded with flowers of gold or silver In the weaving of gauze the warp threads, in addition to being crossed as in plain weaving, are twisted in pairs from left to right and from right to left alternately, after each shot of weft, thereby keeping the weft threads at equal distances apart, and retaining them in their parallel position. The textures are woven either plain, striped or figured, and the material receives many designations, according to its appearance and the purposes to which it is devoted A thin cotton fabric, woven in the same way,

is known as leno, to distinguish it from muslin made by plain weaving Silk gauze was a prominent and extensive industry in the west of Scotland during the second half of the 18th century, but on the introduction of cotton-weaving it greatly declined. In addition to its use for dress purposes, silk gauze is much employed for bolting or sifting flour and other finely ground substances The term gauze is applied generally to transparent fabrics of whatever fibre made, and to the fine-woven wire-cloth used in safety-lamps, sieves, window-blinds, etc.

GAVARNI, PAUL (1804–1866), pseudonym of HIPPOLYTE SULPICE-GUILLAUME CHEVALIER, French caricaturist, born in Paris, Jan 13, 1804 In 1833 he founded the *Journal des Gens du monde*, and began a series of lithographed sketches, in which he portrayed the striking characteristics, the foibles and vices of the various classes of French society. The letter-press explanations attached to his drawings were short, forcible and highly humorous The different stages through which Gavarni's talent passed, are well worth being noted At first he confined himself to the study of Parisian manners, more especially those of the Parisian youth He was engaged as caricaturist of *Le Charivari* Many important publications owed a great part of their success to the clever and telling sketches contributed by Gavarni

Always desiring to enlarge the field of his observations, Gavarni no longer limited himself to such types as the *lorette* and the Parisian student, or to the description of the noisy and popular pleasures of the capital, but turned his mirror to the grotesque sides of family life and of humanity Whilst showing the same power of irony as his former works, enhanced by a deeper insight into human nature, Gavarni's compositions of this time generally bear the stamp of a bitter philosophy He returned from a visit to London in 1849 deeply impressed with the scenes of misery and degradation which he had observed among the lower classes of that city What he had witnessed there became the almost exclusive subject of his drawings, as powerful, as impressive as ever Most of these last compositions appeared in the weekly paper *L'Illustration* In 1857 he published in one volume the series entitled *Masques et visages* (12mo), and in 1869, about two years after his death, his last artistic work, *Les Douze Mois* (1 vol. fol) Gavarni was much engaged, during the last period of his life, in scientific pursuits He sent several communications to the Académie des Sciences, and till his death on Nov 23, 1866, he was eagerly interested in mathematical questions

Gavarni's *Oeuvres choisies* were edited in 1845 (4 vols 4to) with letterpress by J. Janin, Th Gautier and Balzac, followed in 1850 by two other volumes named *Perles et parures;* and some essays in prose and in verse written by him were published by Ch Yriarte in 1869 *See* also E and J de Goncourt, *Gavarni, l'homme et l'oeuvre* (1873, 8vo), Henri Frantz and Octave Uzanne, *Daumier and Gavarni* (special studio edition 1906). J Claretie has devoted an essay to Gavarni A catalogue *raisonné* of Gavarni's works was published by J Armelhault and E. Bocher (Paris, 1873, 8vo)

GAVAZZI, ALESSANDRO (1809–1889), an Italian preacher and patriot, who was born at Bologna on March 21, 1809 He at first became a monk (1825), and attached himself to the Barnabites at Naples, where he afterwards (1829) acted as professor of rhetoric Driven into exile on account of his liberal views he found refuge in England, where he joined the Evangelical church, and became head and organizer of the Italian Protestants in London Returning to Italy in 1860, he served as army-chaplain with Garibaldi In 1870 he became head of the Free Church (*Chiesa libera*) of Italy, united the scattered Congregations into the "Unione delle Chiese libere in Italia," and in 1875 founded in Rome the theological college of the Free Church, in which he himself taught dogmatics, apologetics and polemics He died in Rome on the 9th day of January 1889

Amongst his publications are *No Union with Rome* (1871), *The Priest in Absolution* (1877), *My Recollections of the Last Four Popes*, etc, in answer to Cardinal Wiseman (1858); *Orations*, 2 decades (1851).

GAVELKIND, a peculiar system of tenure associated chiefly with the county of Kent, but found also in other parts of England In Kent all land was presumed to be holden by this tenure until the contrary was proved, but some lands have been disgavelled by particular statutes. It is more correctly described as "socage tenure, subject to the custom of gavelkind." The chief peculiarities of the custom were: (1) A tenant could alienate his lands by feoffment at 15 years of age. (2) There was no escheat on attainder for felony (3) Generally the tenant could dispose of his lands by will. (4) In intestacy the estate descended to the sons (or, in the case of deceased sons, their representatives) in equal shares. "Every son is as great a gentleman as the eldest son is" Though females claiming in their own right were postponed to males, yet by representation they inherited together with them (5) A wife was dowable of one-half, instead of one-third of the land (6) A widower might be tenant by courtesy of one-half without having had any issue, but only so long as he remained unmarried Gavelkind was, previous to the Conquest, the general custom of the realm, but was then superseded by the feudal law of primogeniture It was abolished by the Law of Property Act, 1922, and the Administration of Estates Act, 1925

Irish gavelkind was a species of tribal succession, by which the land, instead of being divided at the death of the holder amongst his sons, was thrown again into the common stock, and redivided among the surviving members of the sept The equal division amongst children of an inheritance in land is of common occurrence outside the British Isles and is discussed under SUCCESSION (*See* also INHERITANCE, TENURE)

See T Robinson, *On Gavelkind* (1897), Pollock and Maitland, *History of English Law.*

GAVESTON, PIERS (d 1312), earl of Cornwall, favourite of the English king Edward II, was the son of a Gascon knight, and was brought up at the court of Edward I as companion to his son, the future king Early in 1307 he was banished by the king, but he returned after the death of Edward I a few months later, and at once became the chief adviser of Edward II Made earl of Cornwall, he received lands and money, and married Edward's niece, Margaret de Clare (d 1295) He was regent during the king's short absence in France in 1308, and was conspicuous at Edward's coronation These proceedings and Gaveston's own arrogance aroused the anger and jealousy of the barons They demanded his banishment; and the king, forced to assent, sent his favourite to Ireland as lieutenant, where he remained for about a year Returning to England in July 1309, Gaveston showed himself more insolent than ever In 1311 the king was forced to agree to the election of the "ordainers," and the ordinances they drew up provided *inter alia* for the perpetual banishment of Gaveston, who retired to Flanders, but returned secretly to England at the end of 1311 Soon he was publicly restored by Edward, and the barons had taken up arms Deserted by the king he surrendered to Aymer de Valence, earl of Pembroke (d 1324), at Scarborough in May 1312, and was taken to Deddington in Oxfordshire, where he was kidnapped by Guy de Beauchamp, earl of Warwick (d 1315) He was beheaded on Blacklow Hill near Warwick on June 19, 1312 Gaveston, whose body was buried in 1315 at King's Langley, Herts, left an only daughter

See W Stubbs, *Constitutional History*, vol ii (Oxford, 1896), *Chronicles of the Reigns of Edward I and Edward II*, edited by W Stubbs Rolls series (London, 1882–1883), also J C Davies, *Baronial Opposition to Edward II* (1918)

GAVIAL, a fish-eating relative of the crocodile. (*See* GHARIAL, CROCODILE)

GAVIIDAE: *see* LOON.

GAVOTTE, properly the dance of the Gavots or natives of Gap, a district in the Upper Alps, in the old province of Dauphiné It is a dance of a brisk and lively character, somewhat resembling the minuet, but quicker and less stately (*see* DANCE), hence also the use of this name for a form of musical composition

GAWABRA: *see* ARABS.

GAWAIN, son of King Loth of Orkney, and nephew to Arthur on his mother's side, the most famous hero of Arthurian romance The first mention of his name is in a passage of William of Malmesbury, recording the discovery of his tomb in the province of Ros in Wales. He is there described as *Walwen qui fuit haud degener Arturis ex sorore nepos.* Here he is said to have reigned over Galloway; and there is certainly some connection,

the character of which is now not easy to determine, between the two. In the later *Historia* of Geoffrey of Monmouth, and its French translation by Wace, Gawain plays an important and "pseudo-historic" rôle. On the receipt by Arthur of the insulting message of the Roman emperor, demanding tribute, it is he who is despatched as ambassador to the enemy's camp, where his arrogant and insulting behaviour brings about the outbreak of hostilities On receipt of the tidings of Mordred's treachery, Gawain accompanies Arthur to England, and is slain in the battle which ensues on their landing Wace, however, evidently knew more of Gawain than he has included in his translation, for he speaks of him as

> Li quens Walwains
> Qui tant fu preudom de ses mains (11 9057–58);

and later on says

> Prous fu et de mult grant mesure,
> D'orgoil et de forfait n'ot qure
> Plus vaut faire qu'il ne dist
> Et plus doner qu'il ne pramist (10 106–109).

The English Arthurian poems regard him as the type and model of chivalrous courtesy, "the fine father of nurture," and as Prof Maynadier has well remarked, "previous to the appearance of Malory's compilation it was Gawain rather than Arthur who was the typical English hero" It is thus rather surprising to find that in the earliest preserved mss of Arthurian romance, *i e*, in the poems of Chrétien de Troyes, Gawain, though generally placed first in the list of knights, is by no means the hero *par excellence* The latter part of the *Perceval* is indeed devoted to the recital of his adventures at the *Chastel Merveilleus*, but of none of Chrétien's poems is he the protagonist The anonymous author of the *Chevalier à l'épée* indeed makes this apparent neglect of Gawain a ground of reproach against Chrétien At the same time the majority of the short episodic poems connected with the cycle have Gawain for their hero In the earlier form of the prose romances, *e g*, in the *Merlin* proper, Gawain is a dominant personality, his feats rivalling in importance those ascribed to Arthur, but in the later forms such as the *Merlin* continuations, the *Tristan*, and the final *Lancelot* compilation, his character and position have undergone a complete change, he is represented as cruel, cowardly and treacherous, and of indifferent moral character Most unfortunately our English version of the romances, Malory's *Morte d'Arthur*, being derived from these later forms (though his treatment of Gawain is by no means uniformly consistent), this unfavourable aspect is that under which the hero has become known to the modern reader Tennyson, who only knew the Arthurian story through the medium of Malory, has, by exaggeration, largely contributed to this misunderstanding Morris, in *The Defence of Guenevere*, speaks of "gloomy Gawain", perhaps the most absurdly misleading epithet which could possibly have been applied to the "gay, gratious, and gude" knight of early English tradition

The truth appears to be that Gawain, the Celtic and mythic origin of whose character was frankly admitted by the late M Gaston Paris, belongs to the very earliest stage of Arthurian tradition, long antedating the crystallization of such tradition into literary form He was certainly known in Italy at a very early date, Prof Rajna has found the names of Arthur and Gawain in charters of the early 12th century, the bearers of those names being then grown to manhood, and Gawain is figured in the architrave of the north doorway of Modena cathedral, a 12th-century building Recent discoveries have made it practically certain that there existed, prior to the extant romances, a collection of short episodic poems, devoted to the glorification of Arthur's famous nephew and his immediate kin (his brother Gaheris, or Gareth, and his son Guinglain), the authorship of which was attributed to a Welshman, Bleheris, fragments of this collection have been preserved to us alike in the first continuation of Chrétien de Troyes *Perceval*, due to Wauchier de Denain, and in our vernacular *Gawain* poems Among these "Bleheris" poems was one dealing with Gawain's adventures at the Grail castle, where the Grail is represented as non-Christian, and presents features strongly reminiscent of the ancient Nature mysteries There is good ground for believing that as Grail quester and winner, Gawain preceded alike Perceval and Galahad, and that the solution of the mysterious Grail problem is to be sought rather in the tales connected with the older hero than in those devoted to the glorification of the younger knights. The explanation of the very perplexing changes which the character of Gawain has undergone appears to lie in a misunderstanding of the original sources of that character Whether or not Gawain was a sun-hero, and he certainly possessed some of the features—we are constantly told how his strength waxed with the waxing of the sun till noontide, and then gradually decreased; he owned a steed known by a definite name le Gringalet, and a light-giving sword, Excalibur (which, as a rule, is represented as belonging to Gawain, not to Arthur)—all traits of a sun-hero—he certainly has much in common with the primitive Irish hero Cuchullin The famous head-cutting challenge, so admirably told in *Syr Gawayne and the Grene Knighte*, was originally connected with the Irish champion Nor was the lady of Gawain's love a mortal maiden, but the queen of the other-world In Irish tradition the other-world is often represented as an island, inhabited by women only; and it is this "Isle of Maidens" that Gawain visits in *Diu Crone*, returning therefrom dowered with the gift of eternal youth The Chastel Merveilleus adventure, related at length by Chrétien and Wolfram, is undoubtedly such an "other-world" story It seems probable that it was this connection which won for Gawain the title of the "Maidens' Knight," a title for which no satisfactory explanation is ever given When the source of the name was forgotten its meaning was not unnaturally misinterpreted, and gained for Gawain the reputation of a facile morality, which was exaggerated by the pious compilers of the later Grail romances into persistent and aggravated wrong-doing, at the same time it is to be noted that Gawain is never, like Tristan and Lancelot, the hero of an illicit connection maintained under circumstances of falsehood and treachery Gawain, however, belonged to the pre-Christian stage of Grail tradition, and it is not surprising that writers bent on spiritual edification found him somewhat of a stumbling-block Chaucer, when he spoke of Gawain coming "again out of faerie," spoke better than he knew, the home of that very gallant and courteous knight is indeed Fairy-land, and the true Gawain-tradition is informed with fairy glamour and grace

Bibliography—See *Syr Gawayne*, the English poems relative to that hero, ed F Madden (Bannatyne club, 1839), *Histoire littéraire de la France*, vol xxx (1888), intro and summary of episodic "Gawain" poems by Gaston Paris, J L Weston, *Legend of Sir Gawain* (1897), and *Legend of Sir Perceval* (1906), *Sir Gawain and the Green Knight* (1898), *Sir Gawain at the Grail Castle* (1904), *Sir Gawain and the Lady of Lys* (1907), all three trans by J L Weston in Nutt's *Arthurian Romances*, vols i, vi and vii For the Celtic derivation of this and other Arthurian characters *see* R S Loomis, *Celtic Myth and Arthurian Romance* (Columbia Univ. Press, 1927) (J L. W.)

GAWAMA'A: *see* Arabs

GAWLER, a town of Gawler county, South Australia, on the Para river, 24¾ m by rail N E of Adelaide It is one of the most thriving places in the colony, being the centre of a large wheat-growing district, it has also engineering works, foundries, flour-mills, breweries and saw-mills, while gold, silver, copper and lead are found in the neighbouring hills

GAY, JOHN (1685–1732), English poet, was baptized on Sept 16, 1685 at Barnstaple On leaving school he was apprenticed to a silk mercer in London, but being weary, according to Dr Johnson, "of either the restraint or the servility of his occupation," he soon returned to Barnstaple, where he spent some time with his uncle, the Nonconformist minister He then returned to London, and though no details are available for his biography until the publication of *Wine* in 1708, the account he gives in *Rural Sports* (1713), of years wasted in attending on courtiers who were profuse in promises never kept, may account for his occupations Among his early literary friends were Aaron Hill and Eustace Budgell In *The Present State of Wit* (1711) Gay attempted to give an account of "all our periodical papers, whether monthly, weekly or diurnal" To Lintot's *Miscellany* (1712) he contributed "An Epistle to Bernard Lintot," containing some lines in praise of Pope, and a version of the story of Arachne from the sixth book of the *Metamorphoses* of Ovid He

was for a short time (1712–14) secretary to the duchess of Monmouth. Swift got him a place as secretary to the ambassador at the Hanoverian court, but before he could take up the post Queen Anne died, and all hope of official preferment was removed with her death.

The dedication of his *Rural Sports* (1713) to Pope was the beginning of a lasting friendship. In 1713 he produced a comedy, *The Wife of Bath*, which was acted only three nights, and *The Fan*, one of his least successful poems; and in 1714 *The Shepherd's Week*, a series of six pastorals drawn from English rustic life, written in ridicule of the Arcadian pastorals of Ambrose Philips, but entertaining on their own account. In 1715, probably with help from Pope, he produced *What d'ye call it?* a dramatic skit on contemporary tragedy, with special reference to Otway's *Venice Preserved* In 1716 appeared his *Trivia, or the Art of Walking the Streets of London*, a poem in three books, for which he received several hints from Swift. *Trivia* has a dry wit and an admirable style; its matter makes it a social-historical document of some importance. In Jan. 1717 Gay produced the comedy of *Three Hours after Marriage*, which was a failure In this piece he had assistance from Pope and Arbuthnot, but they were glad to have it assumed that Gay was the sole author

Gay had numerous patrons, and in 1720 he published *Poems on Several Occasions* by subscription, realizing £1,000 or more In that year James Craggs, the secretary of State, presented him with some South Sea stock Gay, disregarding the prudent advice of Pope and other friends, invested his all in South Sea stock, and lost everything The shock made him dangerously ill, but his friends came to his assistance He had patrons in William Pulteney, afterwards earl of Bath, in the third earl of Burlington, who constantly entertained him at Chiswick or at Burlington House, and in the third earl of Queensberry He was a frequent visitor with Pope, and received unvarying kindness from Congreve and Arbuthnot In 1724 he produced a tragedy called *The Captives* In 1727 he wrote for Prince William, afterwards duke of Cumberland, his famous *Fifty-one Fables in Verse*, for which he naturally hoped to gain some preferment He refused the situation of gentleman-usher to the Princess Louisa, who was still a child His friends thought him unjustly neglected by the court, but he had no particular claim on the king's favour, and had already received (1722) a sinecure as lottery commissioner with a salary of £150 a year, and from 1722 to 1729 he had lodgings in the palace at Whitehall.

He certainly did nothing to conciliate the favour of the Government by his next and most famous production, the *Beggars' Opera*, a lyrical drama produced on Jan 29, 1728 by Rich, in which Sir Robert Walpole was caricatured. The part of Polly Peachum was played by Lavinia Fenton, afterwards duchess of Bolton This piece, which was said to have made "Rich gay and Gay rich," was an innovation, and for a time it drove Italian opera off the English stage Under cover of the thieves and highwaymen who figured in it was disguised a satire on society, for Gay made it plain that in describing the moral code of his characters he had in mind the corruptions of the governing class The play ran for 62 nights, though the representations, four of which were "benefits" of the author, were not, as has sometimes been stated, consecutive. Swift is said to have suggested the subject, and Pope and Arbuthnot were constantly consulted while the work was in progress, but Gay must be regarded as the sole author. He wrote a sequel, *Polly*, the representation of which was forbidden by the lord chamberlain, no doubt through the influence of Walpole. This act of "oppression" proved an excellent advertisement for *Polly*, which was published by subscription in 1729, and brought its author more than £1,000. The duchess of Queensberry was dismissed from court for enlisting subscribers in the palace. The duke of Queensberry gave him a home, and the duchess continued her affectionate patronage until Gay's death, which took place on Dec. 4, 1732 He was buried in Westminster Abbey. The epitaph on his tomb is by Pope, and is followed by Gay's own mocking couplet:—

> Life is a jest, and all things show it,
> I thought so once, and now I know it

Acis and Galatea, an English pastoral opera, the music of which was written by Handel, was produced at the Haymarket in 1732. The profits of his posthumous opera of *Achilles* (1733), and a new volume of *Fables* (1738) went to his two sisters, who inherited from him a fortune of £6,000 He left two other pieces, *The Distressed Wife* (1743), a comedy, and *The Rehearsal at Goatham* (1754), a farce. The *Fables*, slight as they may appear, cost him more labour than any of his other works The narratives are in nearly every case original, and are told in clear and lively verse The moral which rounds off each little story is never strained They are masterpieces in their kind, and the very numerous editions of them prove their popularity They have been translated into Latin, French and Italian, Urdu and Bengali Gay's fame was revived by the three and a half years' run (June 5, 1920 to Dec 17, 1923) of the *Beggar's Opera* at the Lyric theatre, Hammersmith

The two best editions of Gay's *Poetical Works* are those by J Underhill (1893) and by J C Faber (1926), the latter including *Polly* and the *Beggar's Opera*. The *Plays* and the *Poems* were edited in the Abbey Classics (1923) The *Beggar's Opera* was also edited by G H. McLeod (1906; rev ed. with music, 1921) and by O. Doughty (1922). *See* also L Melville, *Life and Letters of J Gay* (1921) and W E Schultz, *Gay's Beggar's Opera, its content, history and influence* (New Haven, 1923) *Gay's Chair* (1820), edited by Henry Lee, a fellow-townsman, contained a biographical sketch by his nephew, J. Baller

GAY, WALTER (1856–), American artist, was born at Hingham (Mass), on Jan 22, 1856 In 1876 he became a pupil of Léon Bonnat in Paris He received an honourable mention in the Salon of 1885, a gold medal in 1888, and similar awards at Vienna (1894), Antwerp (1895), Berlin (1896), and Munich (1897) He became an officer of the Legion of Honour and a member of the Society of Secession, Munich Works by him are in the Luxembourg, the Tate Gallery (London), and the Boston and Metropolitan (New York) Museums of Art His compositions are mainly figure subjects portraying French peasant life

GAYA, a town and district of British India, in the Patna division of Bihar and Orissa, with a station on the Grand Chord line of the East Indian railway With a population (1921) of 67,562 it is, next to Patna, the most populous town in the province Gaya is a celebrated place of Hindu pilgrimage, for it is a sacred duty for Hindus to make offerings there for the salvation of their parents and ancestors, it is estimated that no less than 300,000 pilgrims come annually There are altogether 45 sacred places between (and including) Pretsil hill on the north and Bodh-Gaya on the south, a distance of 15 m , but most are in Gaya itself The principal shrine is the Vishnupad temple built by the Mahratta princess, Ahalya Bai, in 1787 Others are the rocky temple-crowned hills of Ramsila (372 ft) and Brahmajuni (450 ft) The last, which overlooks the civil station, has been identified with the Gayasirsa hill on which Buddha preached

The District of Gaya, with an area of 4,714 sq m and a population (1921) of 2,152,030, consists of a wide plain, with wooded hills along the southern boundary, whence the country falls with a gentle slope towards the north The hills in the south, which contain scenes of the most picturesque beauty, rise to a height of 2,202 ft. at Durvasarhi and to 1,832 ft in the Mahabar hills A long range extends from near Bodh-Gaya north-eastwards, and elsewhere in the open plain, rocky hills occur, either detached or in groups, such as Maher, 1,620 ft , Kauwadol and the Barabar hills. The northern part of the district is highly cultivated, the portions to the east and west are less fertile, while in the south the country is thinly peopled, and in the jungles covering the hills and the country below them, tigers, leopards, bear and deer are found The principal rivers are the Son, which marks the boundary between Gaya and the Shahabad, the Punpun and the Phalgu, formed by the junction of two large hill streams, the Nilajan and Mohana The last three rivers are subject to heavy floods Agriculture depends largely on artificial irrigation, which is mainly effected by an indigenous system of channels leading from the rivers and storage reservoirs made by building embankments across the lines of drainage. The north-west of the district is irrigated by part of the Son canal system Mica mines are worked in the south-west of the district, which contains part of the Bihar

mica belt, one of the largest sources of the world's supply. Other industries are the production of shellac, which centres on Imamganj, the weaving of carpets and blankets, notably at Obra, and the manufacture of brass utensils and of black stone-ware, chiefly ornaments sold to pilgrims at Gaya. The district is traversed by the Grand Chord line of the East India railway, the South Behar railway running into the Monghyr district, and a branch line to Patna. Gaya district is singularly rich in ancient sites and has many archaeological remains associated with the early history of Buddhism Bodh-Gaya, about 6 m S. of Gaya, is one of the holiest sites of Buddhism A mound on the Sobhnath hill has been identified with the burial place of Kasyapa, the greatest of Buddha's disciples, the remains of a monastery are in a valley (Hasra Kol) near by, where fine sculptured figures have been found. In the Barabar hills there are rock-cut caves or rooms, in some of which the rock has been wrought to an extraordinary polish An inscription of Asoka in one group shows they were dedicated to the use of ascetics called Ajivikas The other group was hewn out of the rock for the use of the same sect by his grandson, Dararatha, they are called the Nagarjuni caves, after a Buddhist teacher of that name who is believed to have lived in them in the 2nd century A D

GAYAL, a domesticated ox allied to the Gaur (*q v*) but distinguished by the more conical and straighter horns, and the straight line between them Gayal are kept by the natives of the hill-districts of Assam, Tenasserim, and Upper Burma

GAY-LUSSAC, JOSEPH LOUIS (1778–1850), French chemist and physicist, was born at St Léonard, in the department of Haute Vienne, on Dec 6, 1778 He entered the École Polytechnique at the end of 1797, three years later he was transferred to the École des Ponts et Chaussées, and shortly afterwards he went to assist C L Berthollet in his researches In 1802 he was appointed demonstrator to A F. Fourcroy at the École Polytechnique, where subsequently (1809) he became professor of chemistry, and from 1808 to 1832 he was professor of physics at the Sorbonne, a post which he resigned for the chair of chemistry at the Jardin des Plantes. In 1806 he was made an academician In 1831 he was elected to represent Haute Vienne in the chamber of deputies, and in 1839 he entered the chamber of peers He died in Paris on May 9, 1850

Gay-Lussac's earlier researches were mostly physical in character and referred mainly to the properties of gases, vapour-tensions, hygrometry, capillarity, etc His first memoir, published in 1802, dealt with the expansion of gases In 1804 the French Academy, desirous of securing some observations on the force of terrestrial magnetism at great elevations above the earth, obtained the use of a balloon, and entrusted the task to him and J. B Biot In their first ascent from the garden of the Conservatoire des Arts on Aug 24, 1804 an altitude of 4,000 metres was attained; Gay-Lussac made a second ascent by himself on Sept 16, when the balloon rose 7,016 metres above sea-level At this height, he made observations not only on magnetism, but also on the temperature and humidity of the air, and collected several samples of air at different heights The magnetic observations led him to the conclusion that the magnetic effect at all attainable elevations above the earth s surface remains constant, and on analysing the samples of air he could find no difference of composition at different heights (For an account of both ascents see *Journ. de phys*, 1804 and BALLOON) In the same year, in conjunction with Alexander von Humboldt, he read a paper on eudiometric analysis (*Ann de Chim*, 1805), it contained the germ of his most important generalization, the law of combination by volumes, which was, however, not enunciated in its general form until after his return from a journey through Switzerland, Italy and Germany

In 1809 his important memoir on gaseous combination was published, in it he pointed out that when gases combine with one another they do so in the simplest proportions by volume, and that the volume of the compound formed bears a simple ratio to that of the constituents (*see* CHEMISTRY: *Physical*)

About this time Gay-Lussac's work became more purely chemical In 1808, he succeeded, with the collaboration of L J Thénard, in preparing potassium by the action of red-hot iron on fused potash, the properties of the element were studied and in 1809 he used it for the reduction of boron from boracic acid in 1809 Gay-Lussac carried out some work on chlorine (1809) and iodine (1814) which brought him into direct rivalry with Humphry Davy He considered "oxymuriatic acid" (chlorine) to be a compound, whereas Davy saw no reason to suppose that it contained oxygen and regarded it as an element, a view which Gay-Lussac was reluctantly compelled to accept

In 1810 Gay-Lussac published a paper which contains some classic experiments on fermentation, a subject to which he returned in a second paper published in 1815 At the same time he was working with Thénard at the improvement of the methods of organic analysis, and by combustion with oxidizing agents, first potassium chlorate and subsequently copper oxide, he determined the composition of a number of organic substances His last great piece of pure research was on prussic acid In a note published in 1811 he described the physical properties of this acid, but he said nothing about its chemical composition till 1815, when he described cyanogen as a compound radicle, prussic acid as a compound of that radicle with hydrogen alone, and the prussiates (cyanides) as compounds of the radicle with metals The proof that prussic acid contains hydrogen but no oxygen was a most important support to the hydrogen-acid theory, and completed the downfall of Lavoisier's oxygen theory, while the isolation of cyanogen was of equal importance for the subsequent era of compound radicles in organic chemistry

As a result of his success as an investigator Gay-Lussac's services as a technical adviser became in great demand He had been a member of the consultative committee on arts and manufactures since 1805, he was attached to the "administration des poudres et salpêtres" in 1818, and in 1829 he received the lucrative post of assayer to the mint His services to industry included his improvements in the processes for the manufacture of sulphuric acid (1818) and oxalic acid (1829), methods of estimating the amount of real alkali in potash and soda and for estimating the available chlorine in bleaching powder by a solution of arsenious acid, directions for the use of the centesimal alcoholometer published in 1824 and specially commended by the Institute, and the elaboration of a method of assaying silver by a standard solution of common salt Among his research work of this period may be mentioned the improvements in organic analysis and the investigation of fulminic acid made with the help of Liebig, who gained the privilege of admission to his private laboratory in 1823–1824

The most complete list of Gay-Lussac's papers is contained in the Royal Society's *Catalogue of Scientific Papers*, which enumerates 148, exclusive of others written jointly with Humboldt, Thenard, Welter and Liebig Many of them were published in the *Annales de chimie*, which after it changed its title to *Annales de chimie et physique* he edited, with Arago, up to nearly the end of his life, but some are to be found in the *Mémoires d'Arcueil* and the *Comptes rendus*, and in the *Recherches physiques et chimiques*, published with Thenard in 1811.

GAZA, THEODORUS (*c* 1400–1475), one of the Greek scholars who were the leaders of the revival of learning in the 15th century, was born at Thessalonica On the capture of his city by the Turks in 1430 he fled to Italy. During three years spent in Mantua he learned Latin from Vittorino de Feltre, supporting himself meanwhile by teaching Greek, and by copying mss In 1447 he became professor of Greek in the new university of Ferrara, to which his fame soon attracted students from all parts of Italy He had taken some part in the councils which were held in Siena (1423), Ferrara (1438), and Florence (1439), with the object of bringing about a reconciliation between the Greek and Latin Churches, and in 1450, at the invitation of Pope Nicholas V, he went to Rome, where he was for some years employed in making Latin translations from Aristotle and other Greek authors After the death of Nicholas (1455), Gaza removed to Naples, where he enjoyed the patronage of Alphonso the Magnanimous for two years (1456–58) Shortly afterwards he was appointed by Cardinal Bessarion to a benefice in Calabria, where he died about 1475 His Greek grammar (in four books), written in Greek, first printed at Venice in 1495, and afterwards partially translated by Erasmus in 1521, although in many respects defective, especially in its syntax, was for a long time the lead-

ing text-book His translations into Latin were very numerous

See G. Voigt, *Die Wiederbelebung des klassischen Altertums* (1893), and article by C. F Bahr in Ersch and Gruber's *Allgemeine Encyklopadie*. For a complete list of his works, *see* Fabricius, *Bibliotheca Graeca* (ed Harles), x.

GAZA, the most southerly city of the Philistine Pentapolis, separated from the sea by 3 m of sand dunes It was a centre where ancient trade routes met, and through it passed the frankincense from Arabia on its way to the Mediterranean world It is now the first town on the railway from Egypt to Palestine and since 1922 capital of the southern province of Palestine The town is well supplied with water Before the World War it was a prosperous town with good bazaars, a considerable manufacture of black pottery, and a growing export trade in barley "Gaza was more than half destroyed by the war and now (1927) the population which had been somewhat replenished since, is dwindling away northward in search of sustenance" The small harbour of Gaza (El-Mineh) is used mainly for the export of grain The anchorage is seven fathoms The only industry is provided by about 100 primitive looms on which is made coarse cloth for Bedouin cloaks The population (16,000 before the War) has greatly decreased.

History.—The Egyptian monarch, Thutmose III. (*c* 1500 B C) found in Gaza a convenient base for operations against Syria Gaza's king was a vassal of the Pharaohs in the Tell Amarna period about a century later Joshua's victories brought him to its neighbourhood but not within its walls It was one of the strongholds from which the Philistines harassed Israel; and Gaza, famous for the worship of Dagon and Derketo, was the scene of Samson's glorious death. Solomon and Hezekiah gained a footing here without being able to retain it Her traffic in slaves evoked the curse of Amos In 735 B C Tiglath-Pileser made it tributary to Assyria Gaza coquetted with Egypt and received condign punishment from Sargon In the three centuries following it was bandied between Babylon and Egypt Gaza resisted Alexander the Great only to be broken and made a "desert." From the third to the first centuries B C. Egyptian, Syrian and Jewish armies fought for its possession The Romans made Gaza into an important place (named Minoa) and Augustus presented it to Herod New Gaza was built on another site in the first century A D. Although it showed itself ill-disposed to accept Christianity, a Christian community settled here early, and the Philemon, to whom St. Paul addressed a letter, was said to have been its first head

In A D 634 it surrendered to Omar's troops, and since Hashim the great-grandfather of the Prophet was buried here became a sacred Muslim city In the 12th century the crusaders found it almost desolate Baldwin III erected a fortress (1149) but after Hattin Gaza surrendered The Khwarismians inflicted a painful defeat here on the Christian and Saracen armies whom dire necessity drove into a strange and fleeting alliance In the 16th century the Turks crushed the Mamelukes here and Egypt lay open to Salim I. Gaza fell to Bonaparte (1799) Three battles were fought at Gaza during the World War—the first, March 26–27, and the second, April 19, 1917, in which Gen Sir Archibald Murray failed to take and hold the city; and the third in November of the same year when Gen Allenby secured its evacuation by breaking through the Turkish line at Beersheba. The town was much ruined and the mosques damaged

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Battles of Gaza, 1917.—Gaza forms the natural "gate" into Palestine from Egypt by the coast route Thus when in 1917 the British Government decided to change their operations for the defence of the Suez Canal into an offensive against the Turkish forces in Palestine, Gaza formed the obvious initial objective But the first and second direct attacks, on March 26 and April 17–19, failed, and it was not until the autumn that Gaza fell as a result of Allenby's indirect move, first against Beersheba and then against the weak centre of the Turkish front between Beersheba and Gaza For a description of these operations, which culminated in the capture of Jerusalem, *see* Palestine, Operations in.

GAZALAND, a district of Portuguese East Africa. Formerly indicating a large region between Delagoa bay and the Pungwe river, the name is now confined to the lower Limpopo district The modern territory of Gaza, part of the district of Lourenço Marques, is 73,584 sq km in extent, comprising 5 sub-districts. It is one of the chief recruiting grounds for negro labour in the Transvaal gold mines The region derives its name from the Swazi chief Gaza, a contemporary of Chaka, the Zulu king Refugees from various clans oppressed by Dingaan (Chaka's successor) were welded into one tribe by Gaza's son Manikusa, who took the name of Sotchangana, his followers being known generally as Matshangana Between 1833 and 1836 Manikusa made himself master of the country as far north as the Zambezi and captured the Portuguese posts at Delagoa bay, Inhambane, Sofala and Sena, killing nearly all the inhabitants. The Portuguese reoccupied their posts, but held them with great difficulty, while in the interior the Matshangana continued their ravages unchecked, depopulating large regions Manikusa died about 1860, and his son Umzila established himself in independence north of the Manhissa river as far as the Zambezi and inland to the continental plateau, a position he maintained till his death (*c* 1884) His chief rival was a Goanese named Gouveia, who came to Africa about 1850 Having obtained possession of a *prazo* in the Gorongoza district, he ruled there as a feudal lord while acknowledging himself a Portuguese subject. Portugal's hold on the coast had been more firmly established at the time of Umzila's death, and Gungunyana, his successor, was claimed as a vassal, while efforts were made to open up the interior. This led in 1890–91 to collisions on the borderland of the plateau with the newly established British South Africa Company, and to the arrest by the company's agents of Gouveia, who was, however, set at liberty and returned to Mozambique via Cape Town An offer made by Gungunyana (1891) to come under British protection was not accepted In 1892 Gouveia was killed in a war with a native chief Gungunyana maintained his independence until 1895, when he was captured by a Portuguese force and exiled He died in 1906 With the capture of Gungunyana opposition to Portuguese rule largely ceased Later a considerable number of Europeans settled in Gazaland, devoting themselves chiefly to the cultivation of the sugar-cane, rice and maize The chief town is Chai Chai (Villa Nova de Gaza), a port on the Limpopo

See G McCall Theal, *History of South Africa since 1795,* vol. v. (1908), Eric Walker, *A History of South Africa* (1928)

GAZELLE, the name given to a group of antelopes forming the genus *Gazella* (*see* Antflope)

GAZETTE, a name given to news-sheets or newspapers having an abstract of current events (*see* Newspapers)

GBANDI, a people of Liberia west of the Loma or Toma, with whom (and with the Kpelle) (*q v*) they have many affinities

See D Westermann, *Die Kpelle, ein Negerstamm in Liberia* (1921).

GBE, a people physically and socially resembling the Kpelle, living in Liberia north of the Krumen folk and speaking an idiom akin to the Krumen dialects

GDYNIA, a Polish seaport and naval base, on the bay of Gdynia, opening out into Danzig bay, on the Baltic It is 12 m. N W of Danzig, with which it is connected by railway The Polish Government in building a railway to the port passing over territory entirely Polish, has also a scheme for a canal to the port from a convenient point on the Vistula, thus tapping the whole waterway system of Poland

During the struggle with Soviet Russia in 1920, the Poles were unable to utilize Danzig for naval or military purposes, and this led them to build a port of their own at Gdynia By 1924 they had built the southern mole, 550 metres in length, and a breakwater 175 metres long, forming part of the northern mole, together with a landing stage 150 metres long, a narrow gauge railway along the southern mole, an electric power station, water supply and other equipment. A contract for further construction was signed by a Franco-Polish syndicate, the date for the completion of the contract being Dec 31, 1930.

Its main provisions are (1) the making of an entrance canal,

11 metres deep, to the harbour, (2) the construction of the harbour with a water area of about 400 ac and 1,060 metres of quays, together with a basin eight metres deep and a pier for passenger vessels, the depth of water at the quays being from eight to 10 metres and (3) the digging of an inner basin or dock on the foreshore, with a water area of about 100 ac and a depth of water at the quays of 10 metres The Polish Government proposes to spend a large sum on the equipment of the port, comprising large warehouses, a grain elevator, powerful cranes, railway sidings and paved roads In 1930 the port will have quayage for 30 large steamers and a handling capacity annually of 2,500,000 tons, but it will be constructed so as to permit of a great increase in its size and capacity In 1925, 85 vessels, of 73,351 net tonnage, entered, and 79 vessels, of 69,981 net tonnage, cleared the port, exclusive of coastal shipping

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GEAR, an outfit, applied to the wearing apparel of a person, or to the harness and trappings of a horse or any draft animal, as riding-gear, hunting-gear, etc , also to household goods or stuff The phrase "out of gear," though now connected with the mechanical application of the word, was originally used to signify "out of harness" or condition The word is also used of apparatus generally, and especially of the parts collectively in a machine by which motion is transmitted from one part to another by a series of cog-wheels, continuous bands, etc. (*See* BICYCLE, MECHANICS, MOTOR VEHICLES, POWER TRANSMISSION, STEAM ENGINE)

GEAR-CUTTING MACHINES: *see* MACHINE TOOLS

GEBER or **JABIR,** more fully Abū Mūsā Jābir ibn Hayyān, was the most celebrated chemist of mediaeval times There is reason to believe that he belonged to the famous South Arabian tribe of Al-Azd, some members of which settled in the town of Kūfa shortly after its foundation by the Caliph Omar in AD 638 Jābir's father, Hayyān, was a druggist in Kūfa and an ardent supporter of the 'Abbasid family, at that time plotting to secure the caliphate It is probable that Jābir was born at the town of Tus (near the present Meshed) in the year AD 721 or 722, while his father was in Persia as an 'Abbasid agent Shortly afterwards, Hayyān was arrested and executed by 'Umayyad officers, and the younger Jābir was sent to Arabia, where he studied under Harbi at Ḥimyari As a youth, Jābir attached himself to the sixth Shi'ite Imām, Ja'Far al-Ṣādiq, from whom he probably obtained his first introduction to occultism, though perhaps not to alchemy itself He is said to have afterwards joined the Sufi order, then recently founded by Abū Hāshim of Kūfa (died AD 777–778) In later life, Jābir became a friend of Hārūn al-Rashīd's powerful ministers the Barmakides, and, according to tradition, shared their banishment from Baghdad in AD 803 Retiring to Kūfa, he spent the rest of his life in obscurity, though one authority maintains that he survived until the accession of the Caliph Al-Ma'mūn in AD 813 His laboratory at Kūfa came to light some two centuries later, during building operations in a quarter of the town known as the Damascus Gate

Jābir was a voluminous writer, and fortunately made a list of the titles of his books, which was reproduced in part by Ibn Al-Nadīm in his *Kitāb al-Fihrist*, a Muslim encyclopaedia of the 10th century AD Many of these books are still extant, nearly 100 having been reported as existing in manuscript or native lithographs in various European, Indian and North African libraries. They are, however, for the most part unedited (1928), and it is therefore impossible to express a final conclusion upon Jābir's scientific knowledge In 1893, nine small works were edited and translated by O Houdas and published by M P E Berthelot in his *La Chimie au Moyen Âge* (Paris), but they are by no means the most important Among the Latin alchemical manuscripts in the *Bibliothèque Nationale* Berthelot found a mutilated treatise, entitled *Liber de Septuaginta (Johannis), Translatus a Magistro Renoldo Cremonensi* (Gerard of Cremona), which he considered was probably a translation from the Arabic Jābir. At that time (1893), the Arabic version was unknown; it was, however, discovered in 1926 by Prof Max Meyerhof, who found two separate manuscripts of it in the private libraries of Nureddin Bey Mustafa and Ahmad Pasha Taimur, at Cairo Berthelot's conjecture was therefore well founded Of the remaining extant treatises, the most noteworthy are the *Great Book of Properties,* the three *Books of the Element of the Foundation,* and a *Book of Poisons,* the last having been discovered in 1928 by Prof Julius Ruska of Berlin

Jābir's thought is often confused and superstitious, yet he has a two-fold importance for the history of chemistry In the first place he was a skilled and ingenious experimentalist, and describes for the first time the preparation of nitric acid, the method of conducting certain essential chemical operations, and many other things of the same kind Secondly, he suggested the comprehensive theory that all metals are composed of two principles resembling sulphur and mercury This theory, which was a development of the Aristotelian conception of two "exhalations," persisted for many centuries and was at last modified into the phlogiston theory of Beccher and Stahl (17th and 18th centuries AD) Jābir explained the existence of different varieties of metals by assuming that the sulphureous and mercurial principles are not always pure and that they do not always combine together in the same proportion If they are perfectly pure and combine together in the most perfect natural equilibrium, then the product is the most perfect of metals, viz , gold Defects in purity or proportion or both result in the formation of silver, lead, tin, iron or copper; but since these metals are all essentially composed of the same constituents as gold, the accidents of combination may be removed by suitable treatment Such treatment, which Jābir believed could be effected by means of elixirs, was the object of *Alkimia* or alchemy

Jābir's chemical theory was thus a development of Greek scientific and occult philosophy Etymological and other evidence renders it likely that his contact with Hellenism was made through Persian channels rather than through Syria and Egypt The reputation he acquired has never since been equalled in the whole development of chemistry, there is, indeed, scarcely a single later Arabic alchemical work in which he is not quoted, or at least mentioned When, in the 12th and 13th centuries, Islamic science was transmitted to Latin Christianity, the fame of Jābir went with it, and, as we have seen, at least one of his books was translated into Latin There are, however, several Latin treatises (*Summa perfectionis, magisterii, De investigatione perfectionis, De inventione veritatis, Liber fornacum, Testamentum Geberi*) which pass under his name, but of which no Arabic original has hitherto come to light These works, while their content as a whole can be fairly closely paralleled in the presumably authentic Arabic works, show a very much greater regard for systematic treatment and exposition than the latter; hence several scholars, notably Kopp, Wiedemann, Berthelot and Darmstadter, have regarded them as European forgeries fathered upon the venerable name of Jābir They are universally regarded as the most important of mediaeval chemical works, and the problem of their authorship is in urgent need of solution It is perhaps significant that a 13th-century manuscript of the *Summa* and *De investigatione perfectionis,* discovered at Florence in 1925 by Darmstadter, contains also a Latin version of the genuine Arabic work, *The Book of Mercy*

See M P E Berthelot, *La Chimie au Moyen Age* (3 vols , Paris, 1893), E Darmstadter, *Die Alchemie des Geber* (Berlin, 1922) and *Liber Misericordiae Geber* (Archiv fur Geschichte der Medizin, xvii 4, 181–197, 1925), J Ruska, *Über des Schriftenverzeichnis des Gâber ibn Hajjân* (Archiv f Gesch d Med xv, 53–67, 1923) and *Die siebzig Bucher des Gaber ibn Hajjan* (Lippmann Festschrift, Berlin, 1927, pp 38–47), E J Holmyard, "Jābir ibn Hayyan" (*proc Roy Soc Med*, 1923, xvi, 46–57), *An Essay on Jābir ibn Hayyan* (Lippmann Festschrift, 28–37), and *The works of Geber* (London, 1928) A complete edition of the Arabic works, with translation into English by E J Holmyard, is in course of publication (Paris, 1928)

GEBHARD: TRUCHSESS VON WALDBURG (1547–1601), elector and archbishop of Cologne, second son of William, count of Waldburg, was born on Nov 10 1547, at Cologne, studied at Ingolstadt, Perugia and Louvain, and took orders He held various positions at the cathedrals of Augsburg, Strasbourg, Cologne, and again at Augsburg, and in Dec 1577 was elected elector archbishop of Cologne He became a convert to the Reformed doctrines, but it was suspected that his conversion was due to his desire to marry Agnes, countess of Mansfeld The marriage was celebrated in February 1583, and caused a great scandal

Gebhard declined to give up his see, and collected an army. In April he was deposed and excommunicated by Pope Gregory XIII ; a Bavarian prince, Ernest, bishop of Liége, Freising and Hildesheim, was chosen elector, and war broke out between the rivals The Lutheran princes of Germany gave no real support to Gebhard, who had Calvinistic leanings, and the only armed assistance he received was from John Casimir, administrator of the Rhenish Palatinate Early in 1584 he was driven from Bonn He found refuge in the Netherlands In 1589 Gebhard went to live at Strasbourg, where he had held the office of dean of the cathedral since 1574 He died at Strasbourg on May 31, 1601 Gebhard was a drunken and licentious man, who owes his prominence rather to his surroundings than to his abilities

See J. H. Hennes, *Der Kampf um das Erzstift Koln* (Cologne, 1878), L. Ennen, *Geschichte der Stadt Koln* (Cologne, 1863–80) ; and *Nuntiaturberichte aus Deutschland. Der Kampf um Koln,* edited by J. Hansen (Berlin, 1892)

GEBHARDT, EDUARD VON (1830–1925), German painter, was born in Estonia, and studied at Düsseldorf, where he became a professor in the academy in 1873 He modelled his style on that of the old Nuremberg and Flemish schools, and depicted scriptural subjects, using the German costume of the 15th and 16th centuries for his figures But his heads were drawn from nature, from the tough and hardy population of his native land. His art constituted a reaction towards realism after the staged and vapid productions of the Piloty school Among his more important works are the "Last Supper," and the "Ascension," in the National Gallery at Berlin; the "Crucifixion" in the cathedral at Reval; there are examples of his work in the museums of Elberfeld, Düsseldorf, Dresden, Barmen, Breslau, and Magdeburg Between 1884–91 he worked on mural decorations for a hall in the monastery of Loccum, Hanover He also painted portraits He died at Düsseldorf on Feb 3, 1925.

GEBWEILER: *see* GUEBWILLER

GECKO, a general term applied to any lizard of the family *Geckonidae* For the most part geckoes are small creatures with a soft skin, a short, stout body, large head and weak limbs, the most salient constant characteristic of the group is the absence of connivent eyelids, the eyes, which are usually large and prominent, being protected by a transparent, watchglass-like covering which is probably a modified nictitating membrane

The group is cosmopolitan in distribution, occurring everywhere in warmer climates, even on the remotest oceanic islands, and is adapted to very diverse habitats All its members are insectivorous and the great majority have the digits modified for climbing, the fingers and toes are dilated either terminally or at their bases and the lower surface of the dilation is covered with transverse plates whose arrangement is exceedingly diverse in the different genera, each plate is beset with numerous tiny, hair-like processes which give the whole surface a velvety appearance When the feet are placed on any surface the velvety pile accomodates itself to the slightest irregularities and pressure forces the air out from between the hairs, the resulting vacuum gives sufficient adhesion to enable many species to climb absolutely smooth and vertical surfaces and even to run across a whitewashed ceiling Claws are well developed in most species and, in a few, are provided with a special sheath, into which they are retractile The most remarkable modification of the feet is found in the genus *Palmatogecko* from the deserts of Damaraland, here there is no adhesive apparatus but the toes are webbed to their extremities to enable the animal to walk over and burrow into the loose sand

The tail is extremely fragile and is quickly regenerated, the new one having a simpler scalation than the original. Often the tail is peculiar in shape, it may be long and tapering or short and blunt, or even globular, in one species (*Gymnodactylus platyurus*) it is leaf-shaped It seems highly probable that in many instances, particularly where it is large and globular, the tail serves as a storehouse of reserve nutriment on which the animal can draw during unfavourable conditions As a rule the skin is soft and delicate, and covered with minute granules, but frequently there are large tubercles intermixed with these *Teratoscincus,* a western Asiatic desert dweller, has, however, developed large, overlapping smooth scales which enable it to slip through the sand with the minimum of friction. Colours as a rule are drab, greys, browns, and dirty whites predominating, and to the weird and forbidding aspect thus produced the general prejudice against those creatures in the countries where they occur, which has led to their being classed with toads and snakes, is no doubt to be attributed. Their bite was supposed to be venomous, and their saliva to produce painful cutaneous eruptions; even their touch was thought sufficient to convey a dangerous taint It is needless to say that in this instance the popular mind was misled by appearances. The geckoes are exceedingly useful creatures, feeding on insects. Many species have a voice, the call differing with the species but being usually a feeble click or chirp All species so far as known are oviparous, the eggs being white, hard-shelled and usually laid beneath the bark of trees or attached to the under side of leaves.

(H. W. P)

GED, WILLIAM (1690–1749), the inventor of stereotyping, was born at Edinburgh In 1725 he patented his invention, developed from the simple process of soldering together loose types of Van der Mey Ged, although he succeeded in obtaining a cast in similar metal, of a type page, could not persuade Edinburgh printers to take up his invention, and finally entered into partnership with a London stationer named Jenner and Thomas James, a typefounder. The partnership, however, turned out very ill; and Ged, broken-hearted at his want of success due to trade jealousy and the compositors' dislike of the innovation, died in poverty on Oct 19, 1749 Two prayer-books for the university of Cambridge and an edition of Sallust were printed from his stereotype plates In his time the best type was imported from Holland, and Ged had repeated offers from the Dutch which, from patriotic motives, he refused His sons tried to carry out his patent, and it was eventually perfected by Andrew Wilson

GEDDES, SIR AUCKLAND CAMPBELL, K C B., 1917, and G C M G, 1922 (1879–), British politician, was born on June 21, 1879, the son of Auckland Campbell Geddes of Edinburgh and the younger brother of Sir Eric Geddes, and was educated at George Watson's college, Edinburgh, and Edinburgh university He studied medicine, qualified as a practitioner, was at the London hospital for a time and later studied at Freiburg. He was a demonstrator and professor of anatomy first at Edinburgh, then at the Royal college of surgeons, Dublin, and afterwards at McGill university, Montreal. He also had some military experience in the South African War and afterwards in the World War

In 1916 Geddes became director of recruiting, and in Aug, 1917, minister of National Service, a seat in parliament being found for him at Basingstoke. After the Armistice Geddes became president of the Local Government Board and minister of Reconstruction, and in May, 1919, president of the Board of Trade. At the Board of Trade he began the removal of the barriers to British trade which the war had necessarily set up, and he had to deal with the difficulties which immediately arose in the coal industry In this delicate task he was at least temporarily successful, and managed materially to reduce the price of domestic coal In the same year an opportunity was afforded him to return to academic life by his election as principal of McGill university He accepted the appointment, subject to its not being operative till the abatement of the coal crisis allowed of his leaving the Board of Trade. But during the delay the Government prevailed on him to accept instead the post of British ambassador in Washington His tenure of the embassy (1920–3) was crowded with important negotiations in which he showed himself a successful diplomatist On leaving Washington Geddes left the public service and became chairman of the Rio Tinto Company

GEDDES, SIR ERIC CAMPBELL, G C.B , 1919 (1875–), British man of business and administrator, born in India on Sept. 26, 1875, is the son of Auckland Campbell Geddes of Edinburgh, and the elder brother of Sir Auckland Geddes He was educated at the Oxford Military college and Merchiston Castle school, Edinburgh He gained some business experience at lumbering in the United States, and was afterwards connected

with railways—first, the Baltimore and Ohio system, and then the Rohilkhand and Kumaon in India Returning to England he joined the North Eastern Railway Co. under Sir George Gibb, and, having succeeded him in 1906, was himself the general manager of this line when the World War broke out

Geddes was one of the business men whom Lloyd George, on becoming Minister of Munitions, enlisted in Government employ He became deputy director general of munitions supply, 1915–16, and was then appointed, though a civilian, director general of transportation, and succeeded in bringing the British lines of communication in France into a high state of efficiency He was transferred to the Admiralty in May, 1917, as controller, in order to develop and utilize the whole of the shipbuilding resources of the country and concentrate them under one authority. A month or two later, in spite of having no parliamentary experience, he was appointed First Lord of the Admiralty, and was returned to the House of Commons as M P for the borough of Cambridge After the Armistice Geddes was employed on questions connected with demobilization. When the Government was reconstructed in Jan., 1919, he left the Admiralty in order to organize and preside over a new Ministry of Transport In 1921 a bill introduced by Geddes for the re-grouping of the railways was passed, he then resigned office in Oct , and the ministry was reduced in personnel and importance Sir Eric himself was appointed in Aug , 1921, chairman of a small committee, later known as the "Geddes Axe," to recommend public economies to the Government In various reports in the winter of 1921–22 the committee recommended savings amounting to £86,000,000, but Sir Eric complained that only £52,000,000 of this amount was actually saved In 1922 he left Parliament and returned to a business career, becoming chairman of the Dunlop Rubber Co and of Imperial Airways, Ltd

GEDDES, NORMAN BEL (1893–), American scenic artist, was born in Adrian, Mich , on April 27, 1893. After a short period at the Cleveland school of art, he went to the Chicago Art institute From Chicago he moved to Detroit, where he was engaged as a commercial artist Interested in the theatre, he soon secured a position as scenic director, his work attracting the attention of a California director He removed to Los Angeles, where he presented his first dramatic production, *Nyu*, in 1916 His first scenic work in New York was for Chas W Cadman's *Shanewis*, presented in 1918 at the Metropolitan opera house, since which time he has designed many operas, musical comedies and plays, his most popular success being *The Miracle*. He designed and produced *Jeanne d'Arc* in Paris in 1925 He was co-designer of the Guild theatre in New York, and the author of *A Project for a Theatrical Presentation of the Divine Comedy of Dante Alighieri* (1924)

GEDDES, PATRICK (1854–), British biologist and sociologist, was born at Perth on Oct 20, 1854 Trained in biology in the laboratory of T H Huxley, University College, London, and at several continental universities, he became successively demonstrator in physiology at University College, London, in zoology at Aberdeen and in botany at Edinburgh In 1883 he was appointed professor of botany at University College, Dundee, and in 1919 became professor of sociology and civics at Bombay university Geddes did pioneer research in the evolution of sex His interest from the beginning was in the relation of biological science to society, and in particular to the problems of civics His Outlook Tower in Edinburgh was for many years a stimulating laboratory of sociological enquiry, from which sprang a publishing house in Edinburgh and the regional survey movement, with its synthetic study of the organic relationship between city, country and industrial area—the theme of countless lectures and papers by Geddes, and of group meetings in many countries throughout a period of more than thirty years Geddes, while retaining his professorship of botany at Dundee, was one of the founders of the Sociological Society in London (1903), giving attention mainly to the civic aspect of its work. Going in 1914 to London, he organised a civic exhibition. During his professorship in Bombay he made surveys and reports on many Indian cities and gardens, and in Jerusalem produced designs for enlarging the city and for the several university colleges. In collaboration with J Arthur Thomson he wrote *The Evolution of Sex* (1889, rev ed 1901) and other works on kindred subjects

His works include *Cities in Evolution* (1913) and *The Life and Works of Sir Jagadis Chandra Bose* (*q v.*), the Bengali physicist (1920).

GEDYMIN (d 1342), grand-duke of Lithuania, was supposed by some to have been the servant of Witen, prince of Lithuania, but more probably he was Witen's younger brother and the son of Lutuwer, another Lithuanian prince Gedymin inherited a vast domain, comprising Lithuania proper, Samogitia, Red Russia, Polotsk and Minsk, but these lands were environed by powerful foes, the most dangerous being the Teutonic Knights and the Livonian Knights of the Sword. The systematic raiding of Lithuania by the knights under the pretext of converting it had long since united all the Lithuanian tribes against the common enemy; but Gedymin aimed at establishing a dynasty which should make Lithuania not merely secure but mighty, and for this purpose he began negotiations with the Holy See At the end of 1322 he wrote to Pope John XXII soliciting his protection against the persecution of the knights, informing him of the privileges already granted to the Dominicans and the Franciscans in Lithuania, and desiring that legates should be sent to receive him also into the church. Gedymin then issued circular letters, dated Jan 25, 1325, to the principal Hanse towns, offering a free access into his domains to settlers The immigrants were to choose their own settlements and be governed by their own laws Similar letters were sent to the Wendish or Baltic cities, and to the bishops and landowners of Livonia and Esthonia In short Gedymin anticipated Ivan the Terrible and Peter the Great by throwing open the semi-savage Russian lands to western culture

In Oct. 1323 representatives of the archbishop of Riga, the bishop of Dorpat, the king of Denmark, the Dominican and Franciscan orders, and the Grand Master of the Teutonic Order assembled at Vilna, when Gedymin confirmed his promises and undertook to be baptized as soon as the papal legates arrived A compact was then signed at Vilna confirming the promised privileges But the christianizing of Lithuania was by no means to the liking of the Teutonic Knights, and they strove to nullify Gedymin's design Gedymin's chief object was to save Lithuania from destruction at the hands of the Germans But he was still a pagan reigning over semi-pagan lands, he was equally bound to his pagan kinsmen in Samogitia, to his orthodox subjects in Red Russia, and to his Catholic allies in Masovia His policy, therefore, was necessarily tentative and ambiguous Thus his raid upon Dobrzyn, the latest acquisition of the knights on Polish soil, gave them a weapon against him The Prussian bishops, who were devoted to the knights, at a synod at Elbing questioned the authority of Gedymin's letters and denounced him as an enemy of the faith, his orthodox subjects reproached him with leaning towards the Latin heresy, while the pagan Lithuanians accused him of abandoning the ancient gods Gedymin then repudiated his former promises, he refused to receive the papal legates who arrived at Riga in Sept 1323, and dismissed the Franciscans. Gedymin saw that the pagan element was still the strongest force in Lithuania, and could not yet be dispensed with in the coming struggle for nationality But, through his ambassadors, he privately informed the papal legates at Riga that his difficult position compelled him to postpone his own baptism, and the legates showed their confidence in him by forbidding the neighbouring states to war against Lithuania for the next four years, besides ratifying the treaty made between Gedymin and the archbishop of Riga Nevertheless in 1325 the Order, disregarding the censures of the church, resumed the war with Gedymin, who by the marriage of his daughter to Casimir, son of Wladislaus Lokietek, king of Poland, had improved his position

While on his guard against his northern foes, Gedymin from 1316 to 1340 was extending his rule over neighbouring Russian principalities The principality of Halicz-Vladimir was obtained by the marriage of his son Lubart with the daughter of the Halician prince; Kiev seems to have been acquired by conquest. Gedymin also secured an alliance with the grand-duchy of Muscovy by marrying his daughter, Anastasia, to the grand-duke

Simeon He was strong enough to counterpoise the influence of Muscovy in northern Russia, and assisted the republic of Pskov, which acknowledged his overlordship, to break away from Great Novgorod His internal administration bears all the marks of a wise ruler He protected the Catholic as well as the orthodox clergy, encouraging them both to civilize his subjects; he raised the Lithuanian army to the highest state of efficiency then attainable, defended his borders with a chain of strong fortresses; and built numerous towns including Vilna, the capital (*c* 1321) Gedymin died in the winter of 1342 of a wound received at the siege of Wielowa He was married three times, and left seven sons and six daughters

See Teodor Narbutt, *History of the Lithuanian Nation* (Pol) (Vilna, 1835), Antoni Prochaska, *On the Genuineness of the Letters of Gedymin* (Pol) (Cracow, 1895), Vladimir Bonifatovich Antonovich, *Monograph concerning the History of Western and Southwestern Russia* (Rus) (Kiev, 1885). (R N. B., X)

GEELONG, a seaport of Grant county, Victoria, Australia, situated on a land-locked arm of Port Phillip known as Corio bay, 45 m by rail S W of Melbourne Pop (1925) 39,100 Geelong was incorporated in 1849 As a manufacturing centre it is of considerable importance The first woollen mill in the colony was established here, and the tweeds, cloths and other woollen fabrics of the town are noted throughout Australia There are extensive tanneries, flour-mills and salt works, while at Fyansford, 3 m distant, there are important cement works and paper-mills Corio bay, a safe and commodious harbour, has a depth of 25 ft at low water and is being deepened to 29 ft There is extensive quayage, and the largest wool ships are able to load alongside the wharves, which are connected by rail with all parts of the colony The facilities given for shipping wool direct to England from this port have caused a very extensive wool-broking trade to grow up in the town

GEERTGEN VAN HAARLEM (*c* 1465–1493), Dutch painter active in Haarlem He was surnamed "tot Sint Jans," as he lived with the knights of St John at Haarlem He is one of the most interesting Dutch artists of the 15th century and he is important, as he represents a school of which very few works have survived destruction According to Van Mander, who is the authority on what is known of his life, he was a pupil of Ouwater at Haarlem Neither the year of his birth nor of his death is known, but only that he was 28 years old when he died Durer, on seeing his work, is said to have exclaimed "Here is a born painter," but as Durer is not known to have visited Haarlem the truth of this story has been doubted Geertgen painted a large triptych for the high altar of the knights of St John The central panel with the "crucifixion" and one of the wings were destroyed in the religious troubles, but the other wing has been identified with the aid of Van Mander's description This wing is now in the Vienna gallery, sliced into two separate panels, front and back The front represents the dead Christ being mourned by His friends The pathos of the scene is expressed with deep feeling The influence of Rogier van der Weyden is seen in the Magdalen wringing her hands In the background is a realistic burial scene on Mount Calvary Here the artist broke away from the traditional symbolical assemblage of emblematic figures on the altarpieces of his time and felt his way towards the more vivid and dramatic style of the next generation of Dutch painters

The same is true of the other panel (the back of the wing) on which the emperor Julian the Apostate is causing the bones of St John the Baptist to be buried In the mid-distance of this panel is an admirable group of portraits of the knights of St John at Haarlem among whom the artist lived They are life-like studies of individual characters and seem to presage those great democratic portrait groups famous in Dutch paintings of the 17th century

A number of pictures are ascribed to him on stylistic grounds Among these is the "St John the Baptist" of the Berlin museum, where the pensive saint is sitting in beautiful park-like scenery In the same collection is "Virgin and Child" The Louvre contains the "Resurrection of Lazarus," the Amsterdam museum "The Virgin's Kindred" and the "Adoration of the Magi" The "Man of Sorrows" at Utrecht is a painful but wonderful picture; a triptych at Prague represents the "Adoration of the Magi" in the centre and "Donors and Saints" on the wings. It is distinguished for the original conception of some of its figures and for its animated background Another "Adoration of the Magi" is in the possession of Oscar Reinhart at Winterthur The National Gallery, London, has recently acquired one of the most attractive pictures by the master It represents "Nativity," a night scene, remarkable for its rendering of chiaroscuro.

See K van Mander, *Schilderboek;* Leo Balet, *Der Fruhhollander Geertgen* (1910), Sir Martin Conway, *The Van Eycks and Their Followers* (1921), M Friedlander, *Geertgen und Bosch* (1927)

GEESTEMÜNDE: *see* WESERMÜNDE

GEEZ. The name given to the language of an ancient nomadic Semitic race of Ethiopia *See* ETHIOPIA and SEMITIC LANGUAGES

GEFLE, a seaport of Sweden on an inlet of the Gulf of Bothnia, chief town of the district (*lan*) of Gefleborg, 112 m N N W of Stockholm by rail Pop (1928) 39,464 It is the chief port of the district of Kopparberg, with its iron and other mines and forests The exports consist principally of timber and wood-pulp, iron and steel, imports of coal, grain and machinery The harbour, which has two entrances about 20 ft deep, is usually ice-bound from January to April Large vessels generally load in the roads at Gråberg, 6 m distant There are slips and shipbuilding yards, and a manufacture of sail-cloth The town is an important industrial centre, having tobacco and textile mills, and breweries At Skutskar at the mouth of the Dal river are wood-pulp- and sawmills, dealing with the timber floated down the river. The principal buildings are a castle, founded by King John III (1568–1592), but rebuilt later, and a council-house erected by Gustavus III

GEGENBAUR, CARL (1826–1903), German anatomist, was born on Aug 21, 1826 at Wurzburg and was educated at the university there In 1855 he was appointed professor of anatomy at Jena, and in 1873 at Heidelberg, where he was also director of the Anatomical Institute until 1901 In his best known work, *Grundriss der vergleichenden Anatomie* (Leipzig, 1874, Eng trans 1878), Gegenbaur laid stress on the high value of comparative anatomy as the basis of the study of homologies A distinctive piece of work was effected by him in 1871 in supplementing the evidence adduced by Huxley in refutation of the theory of the origin of the skull from expanded vertebrae Huxley demonstrated that the skull is built up of cartilaginous pieces, Gegenbaur showed that "in the lowest (gristly) fishes, where hints of the original vertebrae might be most expected, the skull is an unsegmented gristly brain-box, and that in higher forms the vertebral nature of the skull cannot be maintained, since many of the bones, notably those along the top of the skull, arise in the skin" Other publications by Gegenbaur include a *Textbook of Human Anatomy* (Leipzig, 1883, new ed 1903), the *Epiglottis* (1892) and *Comparative Anatomy of the Vertebrates in relation to the Invertebrates* (Leipzig, 2 vols, 1898, 1901) In 1875 he founded the *Morphologisches Jahrbuch,* which he edited for many years In 1901 he published a short autobiography under the title *Erlebtes und Erstrebtes* Gegenbaur died at Heidelberg in 1903

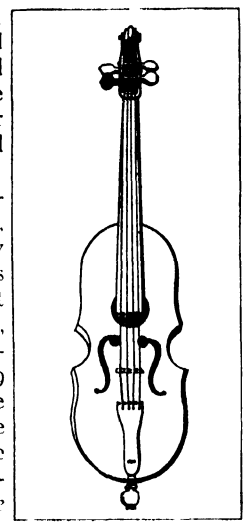
See Furbringer *Heidelberger Professoren aus dem 19ten Jahrhundert* (Heidelberg, 1903).

GEGENSCHEIN or counterglow, an extremely faint luminescence of the sky, seen opposite the direction of the sun Its faintness is such that it can be seen only by a practised eye under favourable conditions It is invisible during the greater part of June, July, December and January, owing to its being then blotted out by the superior light of the Milky Way It is also invisible during moonlight and near the horizon, and the neighbourhood of a bright star or planet may interfere with its recognition When none of these unfavourable conditions supervenes it may be seen at nearly any time when the air is clear and the depression of the sun below the horizon more than 20 degrees. (*See* ZODIACAL LIGHT.)

GEIBEL, EMANUEL (1815–1884), German poet, was born at Lübeck on Oct. 17, 1815, the son of a pastor in the city He studied theology at Bonn and Berlin, but his real interests lay not in theology but in classical and romance philology In 1838 he accepted a tutorship at Athens, where he remained until

1840. His first poems, *Zeitstimmen,* political poems directed against radicalism, appeared in 1841; a tragedy, *Konig Roderich,* in 1843 In the same year he received a pension from the king of Prussia, which he retained until his invitation to Munich by the king of Bavaria in 1851 as honorary professor at the university. Meanwhile he had produced *Konig Sigurds Brautfahrt* (1846), an epic, and *Juniuslieder* (1848, 33rd ed , 1901), lyrics which both in content and in poetic form showed a great advance on his early work A volume of *Neue Gedichte* (Munich 1857) mainly on classical subjects, was followed by the *Spatherbstblatter* (1877) His later years were spent in Lubeck, where he died on April 6, 1884 His works further include two tragedies, *Brunhild* (1858, 5th ed , 1890), and *Sophonisbe* (1869), and translations of French and Spanish popular poetry Beginning as a member of the group of political poets who heralded the revolution of 1848, Geibel became gradually conservative He was the chief poet to welcome the establishment of the empire in 1871 and was one of the early singers of German imperialism His strength lay not, however, in his political songs but in his purely lyric poetry, such as the fine cycle *Ada* and his still popular love-songs

Geibel's *Gesammelte Werke* were published in 8 vols (1883, 4th ed 1906), his *Gedichte* have gone through about 130 editions An excellent selection in one volume appeared in 1904 *See* also K Goedeke, *E Geibel* (1869), C C T Litzmann, *E Geibel, aus Erinnerungen, Briefen und Tagebuchern* (1887), and biographies by C Leimbach (2nd ed , 1894), K T. Gaedertz (1897) and Kohut (1915) *See* further F E A Geibel, *Der Briefwechsel von E. Geibel und P. Heyse* (1922)



BY COURTESY OF THE METROPOLITAN MUSEUM OF ART

AN ITALIAN TENOR GEIGE OF THE 16TH CENTURY

GEIGE, in modern German the violin, in mediaeval German the name applied to the first stringed instruments played with a bow, in contradistinction to those whose strings were plucked by fingers or plectrum such as the cithara, rotta, and fidula

GEIGER, ABRAHAM (1810–1874), Jewish theologian and orientalist, was born at Frankfort-on-Main on May 24, 1810, and educated at the universities of Heidelberg and Bonn In 1832 he went to Wiesbaden as rabbi of the synagogue, and in 1835 helped to found the *Zeitschrift fur judische Theologie* (1835–39 and 1842–47) From 1838 to 1863 he lived in Breslau, where he organized the reform movement in Judaism and wrote some of his most important works, including *Lehr- und Lesebuch zur Sprache der Mischna* (1845), *Studien* from Maimonides (1850), translation into German of the poems of Juda ha-Levi (1851), and *Urschrift und Übersetzungen der Bibel in ihrer Abhangigkeit von der innern Entwickelung des Judentums* (1857) In 1863 Geiger became head of the synagogue of Frankfort, and in 1870 he removed to Berlin, where, in addition to his duties as chief rabbi, he took the principal charge of the newly established seminary for Jewish science His later works included a history of Judaism, *Das Judentum und seine Geschichte* (1865–71) He died on Oct 23, 1874

See J Derenbourg in *Jud Zeitschrift,* xi 299–308, E Schrieber, *Abraham Geiger als Reformator des Judentums* (1880), art (with portrait) in *Jewish Encyclopaedia.*

GEIGER, WILHELM (1856–), German scholar, was born in Nuremberg on July 21, 1856. He became professor at Erlangen in 1891, and was professor of Indian and Iranian philology at Munich from 1920 to 1924 He edited the *Zeitschrift fur Buddhismus* and prepared, with E Kuhn, *Grundriss der Iranischen Philologie* (4 vols., 1895–1904) Other works are *Handbuch der Avestasprache* (1879); *Ostiranische Kultur im Altertum* (1882), *Ceylon, Tagebuchblatter und Reiseerinnerungen* (1898), *Litteratur und Sprache der Singhalesen* (1900); *Dipavamsa und Mahavamsa und die Entwicklung der geschichtlichen Ueberlieferung in Ceylon* (edited 1905); *Pali, Litteratur und Sprache* (1916), *Pali Dhamma* (1921); *Elementarbuch des Sanskrit* (3rd ed , 1923); and a translation of *Samyutta Nikaya* (Eng trans , 1924)

GEIJER, ERIK GUSTAF (1783–1847), Swedish historian and poet, was born at Ransater in Varmland, on Jan 12, 1783 He was educated at the University of Uppsala, and, after a short period of teaching in the university, entered the public record office at Stockholm There, with some friends, he founded the "Gothic Society," to whose organ *Iduna* he contributed a number of prose essays and of songs, which he set to music About the same time he issued a volume of hymns, of which several are inserted in the Swedish Psalter

Geijer became assistant to Erik M Fant, professor of history at Uppsala, and succeeded him in 1817 In 1824 he was elected a member of the Swedish Academy A single volume of a great projected work, *Svea Rikes Hafder,* a masterly critical examination of the sources of Sweden's legendary history, appeared in 1825 His *Svenska folkets historia* (3 vols , 1832–36, Eng trans. by J H Turner, 1845), a clear view of the political and social development of Sweden down to 1654 The acute critical insight, just thought, and finished historical art of these incomplete works of Geijer entitle him to a high place among Swedish historians His chief other historical and political writings are his *Teckning af Sveriges tillstand 1718–1772* (1838), and *Feodalism och republikanism, ett bidrag till Samhallsforfattningens historia* (1844) Geijer also edited, with the aid of J H Schroder, a continuation of Fant's *Scriptores rerum svecicarum medu aevi* (1818–28), and, by himself, Thomas Thorild's *Samlade skrifter* (1819–25), and *Konung Gustaf III's efterlemnade Papper* (4 vols , 1843–46) Failing health forced Geijer to resign his chair in 1846, after which he removed to Stockholm for the purpose of completing his *Svenska folkets historia,* and died there on April 23, 1847 His *Samlade skrifter* (13 vols , 1849–55, new ed , 1873–77) include a large number of philosophical and political essays contributed to reviews His poems were collected and published as *Skaldestycken* (Uppsala, 1835 and 1878)

For Geijer's biography, *see* his own *Minnen* (1834), which contains copious extracts from his letters and diaries, B E Malmstrom, *Minnestal ofver E G Geijer,* addressed to the Uppsala students (June 6, 1848), and printed among his *Tal och esthetiska afhandlingar* (1868), and *Grunddragen af Svenska vitterhetens hafder* (1866–68), and S A Hollander, *Minne af E G Geijer* (Örebro, 1869) *See* also lives of Geijer by J Hellstenius (1876), J Nickson (Odense, 1902) and J Landquist (1924)

GEIKIE, SIR ARCHIBALD (1835–1924), Scottish geologist, was born at Edinburgh on Dec 28, 1835 He was educated at the high school and university of Edinburgh, and in 1855 was appointed an assistant on the Geological survey His ability at once attracted the notice of his chief, Sir Roderick Murchison, with whom some of his earliest work was done on the complicated regions of the Highland schists, the small geological map of Scotland published in 1862 was their joint work, and a larger map was issued by Geikie in 1892 In 1863 he published his essay "On the Phenomena of the Glacial Drift of Scotland" (*Trans Geol Soc Glasgow*) in which the effects of ice action in that country were for the first time clearly and connectedly delineated His *Scenery of Scotland* (1865, 3rd ed , 1901), was, he claimed, "the first attempt to elucidate in some detail the history of the topography of a country" In the same year he was elected F R S At this time the Edinburgh school of geologists—prominent among them Sir Andrew Ramsay, with his *Physical Geology and Geography of Great Britain*—were maintaining the supreme importance of denudation in the configuration of land-surfaces, and particularly the erosion of valleys by the action of running water Geikie's book, based on extensive personal knowledge of the country, was an able contribution to the doctrines of the Edinburgh school, of which he himself soon began to rank as one of the leaders

In 1867, when a separate branch of the Geological Survey was established for Scotland, he was appointed director He was the first holder (1871) of the Murchison professorship of geology and mineralogy at Edinburgh These two appointments he held till 1881, when he succeeded Andrew Ramsay in the joint offices

of director-general of the Geological Survey of the United Kingdom and director of the museum of practical geology, London, from which he retired in February 1901 A feature of his tenure of office was the impetus given to microscopic petrography, a branch of geology to which he had devoted special study, by a splendid collection of sections of British rocks Later he wrote two important and interesting Survey Memoirs, *The Geology of Central and Western Fife and Kinross* (1900), and *The Geology of Eastern Fife* (1902)

In 1871 Geikie brought before the Geological Society of London an outline of the Tertiary volcanic history of Britain He travelled not only throughout Europe, but in western America to examine volcanic formations While the canyons of the Colorado confirmed his long-standing views on erosion, the eruptive regions of Wyoming, Montana and Utah supplied him with valuable data in explanation of volcanic phenomena The results of his further researches were given in his paper on "The History of Volcanic Action during the Tertiary Period in the British Isles," *Trans Roy. Soc Edin* (1888) His mature views on volcanic geology were stated in his presidential addresses to the Geological Society in 1891 and 1892, and afterwards in his book, *The Ancient Volcanoes of Great Britain* (1897). Other results of his travels are collected in his *Geological Sketches at Home and Abroad* (1882)

Geikie was president of the British Association in 1892 and of the Royal Society in 1909; he received the Order of Merit in 1914. He died near Haslemere, Surrey, on Nov 10, 1924 His experience as a field geologist resulted in an admirable text-book, *Outlines of Field Geology* (5th ed 1900) His *Text-Book* (1882, 4th ed. 1903), and *Class-Book* of geology are standard works

His other works include *Memoir of Edward Forbes* (with G Wilson), and memoirs of his old chiefs Sir R. I Murchison (1875) and Sir Andrew Crombie Ramsay (1895), *Founders of Geology* (lectures at Hopkins University 1897), *Geological Map of England and Wales, with Descriptive Notes* (1897), *Types of Scenery and their Influence on Literature* (Romanes lectures, 1898), *The Teaching of Geography* (1887), *Scottish Reminiscences* (1904), and *Landscape in History and other Essays* (1905)

GEIKIE, JAMES (1839–1915), Scottish geologist, younger brother of Sir Archibald Geikie, was born at Edinburgh on Aug 23, 1839 He was educated at the high school and university of Edinburgh. He served on the Geological Survey from 1861 until 1882, when he succeeded his brother as Murchison professor of geology and mineralogy at the university of Edinburgh He investigated the origin of surface-features, and the part played in their formation by glacial action His views are embodied in his chief work, *The Great Ice Age and its Relation to the Antiquity of Man* (1874, 3rd ed, 1894) He was elected F R S in 1875 He died in Edinburgh on March 1, 1915 James Geikie became the leader of the school that upholds the all-important action of landice, as against those geologists who assign chief importance to the work of pack-ice and icebergs Continuing this line of investigation in his *Prehistoric Europe* (1881), he maintained the hypothesis of five inter-Glacial periods in Great Britain, and argued that the palaeolithic deposits of the Pleistocene period were not post- but inter- or pre-Glacial

His works include: *Outlines of Geology* (1886, 3rd ed 1896), and *Structural and Field Geology* (1905)

GEILER (or GEYLER), VON KAISERSBERG, JOHANN (1445–1510), "the German Savonarola," was born at Schaffhausen on March 16, 1445, but in 1448 went to live at Kaisersberg in Upper Alsace He studied at Freiburg university where he afterwards lectured until 1478 when he accepted a call to the cathedral of Strasbourg There his sermons—bold, incisive, denunciatory, abounding in quaint illustrations and based on texts by no means confined to the Bible—won for him a well deserved fame Geiler died at Strasbourg on March 10, 1510

The genuineness of the numerous works ascribed to Geiler has been investigated by E Martin in the *Allgemeine deutsche Biographie* See also F W von Ammon, *Geyler's Leben, Lehren und Predigten* (1826), L Dacheux, *Un Réformateur catholique à la fin du XVe siècle*, J G *de K* (1876), R. Cruel, *Gesch. der deutschen Predigt* (1879), P de Lorenzi, *Geiler's ausgewahlte Schriften* (4 vols, 1881), T. M Lindsay, *History of the Reformation*, I (1906), and Herzog-Hauck, *Real-encyklopädie*, VI

GEISHA, the name of the professional dancing and singing girls of Japan (a Sino-Japanese word meaning "person of pleasing accomplishments"). The training of the true Geisha or singing girl, which includes lessons in dancing, begins often as early as her seventh year Her apprenticeship over, she contracts with her employer for a number of years, and is seldom able to reach independence except by marriage There is a capitation fee of two *yen* per month on the actual singing girls, and of one *ven* on the apprentices

See Jukichi Inouye, *Sketches of Tokyo Life*, Sir Ian Hamilton, *Staff Officer's Scrapbook.*

GEISLINGEN, a town in the republic of Wurttemberg, on the Thierbach, 38 m by rail E S E of Stuttgart Pop (1925) 13,762 It has shops for the carving and turning of ivory and wood, besides iron-works, machinery factories, glass-works and brewing The church of St Mary contains fine wood-carving Above the town lie the ruins of the castle of Helfenstein, which was destroyed in 1552 The town, which passed to Wurttemberg in 1810, has chalybeate springs

GEL, the name given by Graham (*q v*) to the coagulated precipitate from a *sol* or colloidal solution (*see* COLLOIDS)

GELA, a town of Sicily on the S coast, province of Caltanisetta, 74 m by rail and 41 m direct E S E of Girgenti Pop (1921) 25,603. The poorly built modern town stands on a sand-hill near the sea, with a fertile plain (the ancient *Campi Geloi*) to the north of it It has only an open roadstead Outside it on the east are scanty remains of a Doric temple (480–440 B C ?) which was still standing in the 18th century, of which a single pillar only remains (height about 26½ ft , lower diameter 5⅔ ft) Between it and the modern town the stylobate of a large and earlier temple was found This seems to have been constructed towards the end of the 7th century B C on the site of a still earlier edifice The stylobate measures 115 by 58 ft A large number of decorative terracottas were found Both buildings were probably dedicated successively to Athena On the west of the town, on the Capo Soprano, was the ancient necropolis, where many tombs of the Greek period have been discovered

The ancient city was founded by Cretan and Rhodian colonists in 691–690 B C , and itself founded Acragas (*see* AGRIGENTUM) in 582 B C It also had a treasure-house at Olympia The town took its name from the river to the east The Rhodian settlers called it Lindioi (*see* LINDUS) Gela enjoyed its greatest prosperity under Hippocrates (492–485 B C), whose dominion extended over a considerable part of the island Gelon seized the tyranny on his death, soon became master of Syracuse and transferred his capital thither with half the inhabitants of Gela, leaving his brother Hieron to rule over the rest Its prosperity returned, however, after the expulsion of Thrasybulus in 466 B C , but in 405 it was abandoned by Dionysius' order (*see* SYRACUSE) The inhabitants returned and rebuilt the town but it was only refortified in the time of Timoleon In 311 B C Agathocles put to death over 4,000 of its inhabitants; and finally, after its destruction by the Mamertines about 281 B C , Phintias of Agrigentum transferred the remainder to the new town of Phintias (now Licata, *q.v*) In Roman times they still kept the name of Gelenses or Geloi in their new abode. The modern town was known until recently as Terrasrova di Sicilia

Remains of a temple of Athena of the 6th cent B C with five terracottas have been found; while scanty remains of another, a century later (perhaps that of Apollo) are to be seen, and numerous tombs have been excavated (T A)

See the monograph by Orsi, *Monumenti dei Lincei, xvii* (1906), *Notizie degli Scavi*, 1907, Pareti in *Römische Mitteilungen*, 1910

GELADA, a large species of baboon, *Theropithecus gelada*, differing from the members of the genus *Papio* (*see* BABOON) by the nostrils being situated some distance from the tip of the muzzle In the heavy mantle of long brown hair covering the fore-quarters of the old males, with the exception of the bare chest, which is reddish flesh-colour, the gelada recalls the Arabian baboon (*Papio hamadryas*) The gelada inhabits the mountains of Abyssinia, where it descends in droves to pillage cultivated lands A second species, *T obscurus*, inhabits eastern Abyssinia

GELASIUS, the name of two popes

GELASIUS I, pope from 492 to 496, was the successor of Felix III. He confirmed the estrangement between the Eastern and Western churches by insisting on the removal of the name of Acacius, bishop of Constantinople, from the diptychs He is the author of *De duabus in Christo naturis adversus Eutychen et Nestorium.* A great number of his letters has also come down to us. His name has been attached to a *Liber Sacramentorum* anterior to that of St Gregory, but he can have composed only certain parts of it As to the so-called *Decretum Gelasii de libris recipiendis et non recipiendis,* it also is a compilation of documents anterior to Gelasius, and it is difficult to determine Gelasius's contributions to it At all events, as we know it, it is of Roman origin, and 6th-century or later. (L D)

GELASIUS II. (Giovanni Coniulo), pope from Jan 24, 1118, to Jan 29, 1119, was born at Gaeta of an illustrious family He became a monk of Monte Cassino, was taken to Rome by Urban II, and made chancellor and cardinal-deacon of Sta Maria in Cosmedin Shortly after his unanimous election to succeed Paschal II he was seized by Cencius Frangipane, a partisan of the emperor Henry V., but freed by a general uprising of the Romans in his behalf The emperor drove Gelasius from Rome in March, pronounced his election null and void, and set up Burdinus, archbishop of Braga, as antipope under the name of Gregory VIII Gelasius fled to Gaeta, where he was ordained priest on March 9, and on the following day received episcopal consecration He at once excommunicated Henry and the antipope and, under Norman protection, was able to return to Rome in July; but the disturbances of the imperialist party, especially of the Frangipani, who attacked the pope while celebrating mass in the church of St Prassede, compelled Gelasius to go once more into exile He set out for France, consecrating the cathedral of Pisa on the way, and arrived at Marseilles in October He was received with great enthusiasm at Avignon, Montpellier and other cities, held a synod at Vienne in Jan., 1119, and was planning to hold a general council to settle the investiture contest when he died at Cluny His successor was Calixtus II

His letters are in J P. Migne, *Patrol Lat* vol 163 The original life by Pandulf is in J M Watterich, *Pontif Roman vitae* (Leipzig, 1862), and there is an important digest of his bulls and official acts in Jaffé-Wattenbach, *Regesta pontif Roman* (1885–88)

See J Langen, *Geschichte der romischen Kirche von Gregor VII bis Innocenz III* (Bonn, 1893), F Gregorovius, *Rome in the Middle Ages,* vol 4, trans by Mrs G. W Hamilton (1896), A Wagner, *Die unteritalischen Normannen und das Papsttum, 1086–1150* (Breslau, 1885), W von Giesebrecht, *Geschichte der deutschen Kaiserzeit,* Bd III (Brunswick, 1890), G. Richter, *Annalen der deutschen Geschichte im Mittelalter,* III (Halle, 1898); H H Milman, *Latin Christianity,* vol. 4 (1899) (C. H H)

GELATI, a village in the Georgian S S R., 11 m east of the town of Kutais, on a rocky spur 705 ft above sea level in the valley of the Rion, which is growing in importance because of coal mines It was an ancient monastery and its principal church, a sandstone cathedral, dates from the end of the eleventh century, and contains the royal crown of the former Georgian kingdom of Imeretia, besides ancient mss, ecclesiological furniture, and fresco portraits of the kings of Imeretia

GELATIN, a familiar protein (*q v*); it is derived from substances in the supporting structures of vertebrate animals by boiling with water or dilute acids These precursors are known as "collagens," and belong to the class of proteins called "Scleroproteins" or "Albuminoids" They are characteristically deposited in long fibres in the tendons, cartilages, bones, skin and white connective tissue, for the purpose of supporting and padding the tissue They are insoluble in water or salt solution, hot or cold, and swell in dilute acids and alkalis, but do not appear to dissolve If hydrolysed gently by boiling in water, by means of high-pressure steam or by boiling with dilute acids, the collagen is converted to gelatin, some of which is further hydrolysed to products intermediate between gelatin and the amino-acids It is probable that the conversion of collagen to gelatin is not merely an hydration, since ammonia is evolved on heating collagen with water, but not on boiling gelatin

Preparation.—Gelatin occurs in commerce in varying degrees of purity, the purer form obtained from skins and bones (to which this article is restricted) is named gelatin; a preparation of great purity is "patent isinglass," while isinglass (*q v*) itself is a fish-gelatin; less pure forms constitute glue (*q v.*), and an aqueous solution appears in commerce as size

In the manufacture of gelatin the bones are degreased and steeped in dilute hydrochloric acid to remove the mineral matter, which together with the acid is removed by repeated washings with water The product is known as ossein Skin gelatin is limed to remove the albuminous and mucinous constituents This process has to be carefully controlled to minimize bacterial decomposition This is done by frequently turning the stock and also by replacing the liquor with fresh milk of lime The stock is then thoroughly washed with water to remove the lime, and subsequently treated with dilute hydrochloric or sulphurous acid to cause the maximum swelling, the latter acid is often used for its bleaching properties though seldom for food or photographic gelatin Sulphites are subsequently removed (in the preparation of edible gelatin) by oxidation to sulphates by means of hydrogen peroxide The hydrochloric acid used must be free from iron, which has an effect on the colour of the final product, and from arsenic

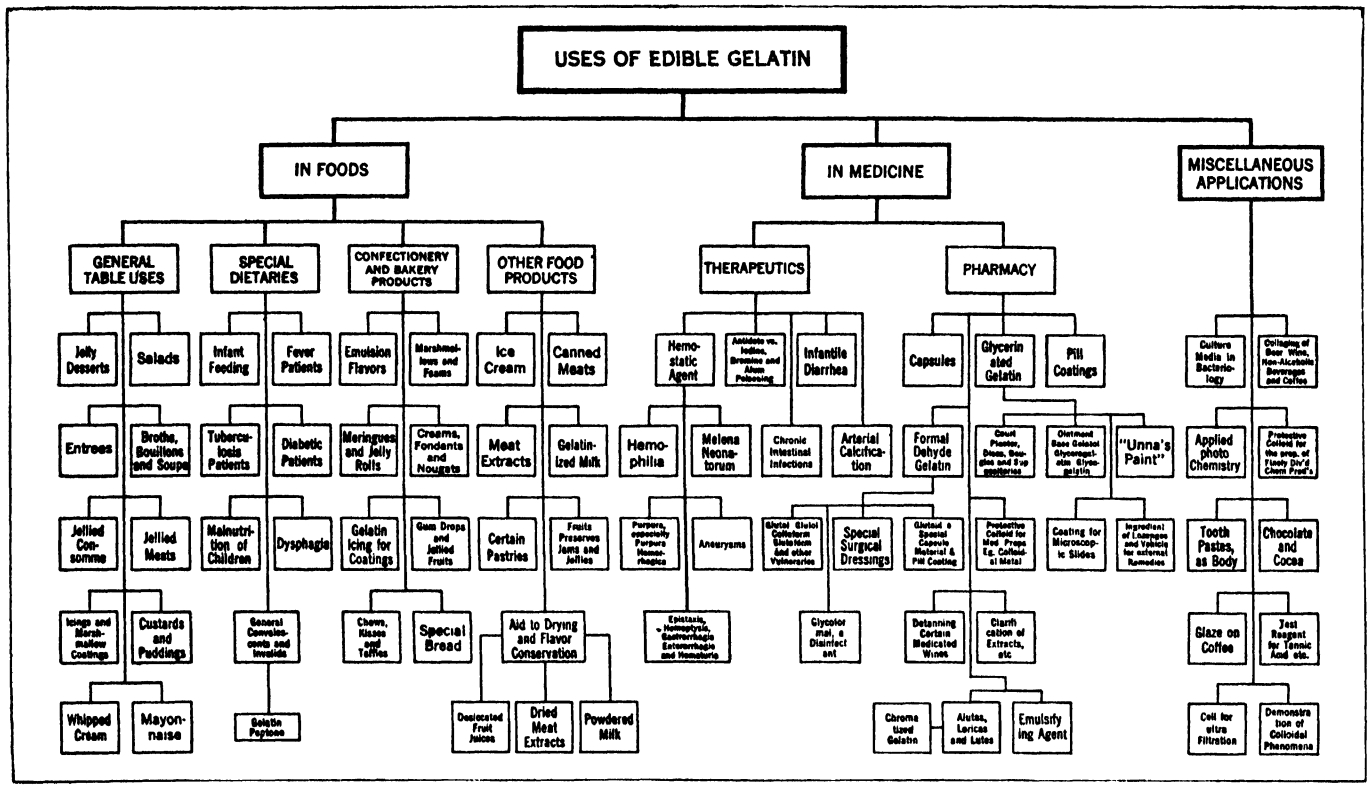
The "boiling" process has to be conducted with great care, otherwise the gelatin itself is decomposed, and distilled water is therefore used. The heating is best carried out in aluminium vessels, since copper and zinc offer danger of metallic contamination Generally the first heating is at about 60° C for some hours, or until the liquor has dissolved about 5% of its weight of gelatin This is drawn off and the second heating with a fresh volume of water is carried out at about 70° C The runnings are clarified, concentrated in vacuum pans, chilled and cut into slices which are dried by hot air The dried sheets can be further purified by soaking in dilute hydrochloric acid, to convert insoluble calcium phosphate to soluble calcium chloride, and then dialysing against a stream of distilled water till free from chlorides Methods designed to produce a specially pure product for scientific work are described by S B Schryver (1923–27)

The percentage composition of pure gelatin is very similar to that of the other proteins (*q v*) On the whole the nitrogen is rather higher (18%), and the sulphur very low (0 2% to 0 6%) The amino-acids obtained by complete hydrolysis are characterized by the high amounts of glycine, proline, oxyproline and the absence of tryptophane and tyrosine

Properties.—Gelatin is a nearly colourless, transparent, amorphous substance, flexible and horny when in the normal dry condition, in which state, however, it retains about 17% of water It swells to many times its normal volume when immersed in cold water, dilute alkalis and salt solutions The amount of swelling depends on the acidity, being least at the isoelectric point which is about p_H 4 7 (*See* HYDROGEN ION CONCENTRATION) The swelling increases on either side of this reaction, reaching a maximum at about p_H 2 6 and then decreasing to p_H 1 1 In solutions more acid than this the gelatin passes into solution On the alkaline side the swelling increases to about p_H 9 8 and then decreases slightly In solutions more alkaline than p_H 11 6 the gelatin dissolves The swelling at maximum acidity is about double that at maximum alkalinity Inorganic salts generally depress the swelling, the percentage reduction being greater with increasing strength of salt

A slight contraction of total volume accompanies swelling, and also a liberation of heat From this it follows that low temperatures favour the absorption of water by gelatin, whilst high temperatures favour the drying-out process When the swollen gelatin is heated to 35° C it goes into solution If this solution contains more than 1% of gelatin it sets to a firm jelly when allowed to stand at 10° C This is the most characteristic and important property of gelatin, and on this depends its great use as an adhesive, in the form of glue

Gelatin is insoluble in the usual organic solvents, such as ether, chloroform, benzene, and absolute alcohol The amount of alcohol required to precipitate gelatin from aqueous solution depends on the hydrogen ion concentration of the fluid and the temperature It is most readily precipitated at the isoelectric point Gelatin is completely precipitated from aqueous solution by the addition of



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GRAPH SHOWING THE USES OF EDIBLE GELATIN

an equal volume of an aqueous saturated solution of ammonium sulphate Potassium dichromate reacts with gelatin in the presence of light to produce a jelly which, on drying out, is insoluble This property is made use of in photography and photo-lithography Formaldehyde produces an insoluble condensation product with gelatin

Gelatin, like all other proteins and amino-acids, is an amphoteric substance, acting as a weak base in solutions more acid than the isoelectric point, and as a weak acid in solutions more alkaline Thus it will form gelatine chloride when treated with dilute hydrochloric acid This is more soluble and more ionized than gelatin itself. Also these acid salts carry a positive electric charge In solutions made alkaline to the isoelectric point by the addition of caustic soda or milk of lime, sodium or calcium gelatinates are formed, which are more soluble than gelatin and carry a negative electric charge It has been shown that at the isoelectric point, osmotic pressure, electrical conductivity and the lowering of the surface tension are at a minimum; whereas the viscosity, turbidity and precipitability by alcohol are at a maximum

Observations on the specific rotatory power of gelatin solutions at various temperatures by C R Smith (1919) have led him to the view that there are at least two substances in gelatin or two forms of the same substance One, "sol form A," is stable at 35° C and above, the other, the "gel form B," is stable at 15° and below Apparently 0 55 to 1 0% of the gel form B must be present for gelation to occur, below 15°, the gelatin being all in this form, a 0 55% solution will set At 30°, at least 10 grams of gelatin must be present in 100 c c in order that there may be 0 55–1 0 gram of the gel form present Above 35° all the gelatin is in the sol state and gelation does not occur at any concentration

Schryver and his colleagues have described experiments on purified gelatin which also indicate that at least two substances are present; previous to this a great deal of work was done by Field, Sheppard and Smith They find further that on heating gelatin with water intramolecular changes take place which result in a profound modification of the physical properties, but which are not accompanied by the degradation into lower products as with commercial gelatin It would seem, therefore, that gelatin behaves as a mixture of substances which may undergo reversible changes on heating and cooling, and also irreversible changes on prolonged heating in water

Uses of Gelatin.—As a food, in jellies and soups, it has considerable value, being readily digested and absorbed, but owing to the lack of certain essential amino-acids it can only partially replace other proteins in the diet As an emulsoid colloid, it has a protective action, inhibiting the precipitation of salts and the flocculation of other colloids For this reason it is sometimes added to cow's milk when used for infant feeding, to inhibit the formation of large curds of casein in the stomach It is also extensively used in the manufacture of ice-cream, to prevent the formation of large ice crystals, to maintain the permanency of the emulsion of milk and to give "body" to the material As an emulsifying agent it is used in the confectionery trade, in the preparation of such sweets as "marsh mallows" For the same reason it is employed in making spraying emulsions of insecticides and fungicides Pure gelatin is used extensively in the preparation of photographic plates, films and papers, for obtaining the precipitated silver salts in an extremely fine-grained suspension. In pharmaceutical preparations it is used for coating pills and making capsules. It is also used for making culture media for bacteriological work A new use for gelatin that is rapidly assuming importance is the adding of one quarter of 1% in cultural buttermilk to prevent wheying off, *i e*, the separation of the casein from the liquid

See R H Bogue, *The Chemistry and Technology of Gelatin and Glue* (1922) (S W C.)

GELDERLAND (*Guelders*), a province of Holland, bounded S by Rhenish Prussia and North Brabant, W by Utrecht and South Holland, N by the Zuider Zee, N E. by Overysel and S E by the Prussian province of Westphalia It has an area of 1,940 sq m and a pop (1926) of 798,580, the density per sq m being 411

The main portion of Gelderland north of the Rhine and the Old Ysel forms an extension of the province of Overysel, being composed of diluvial sand and gravel, covered with heaths and patches of fen South of this line, however, the soil consists of fertile river-clay The northern portion is divided by the New (or Gelders) Ysel into two distinct regions, namely, the Veluwe

("bad land") on the west, and the former countship of Zutphen on the east In this last division the ground slopes downwards from south-east to north-west (131 to 26 ft) and is intersected by several fertilizing streams which flow in the same direction to join the Ysel. The extreme eastern corner is occupied by older Tertiary loam, which is used for making bricks, and upon this and the river-banks are the most fertile spots, woods, cultivated land, pastures, towns and villages. The highlands of the Veluwe lying west of the Ysel really extend as far as the Crooked Rhine and the Vecht in the province of Utrecht, but are slightly detached from the Utrecht hills by the Gelders depression, which forms the boundary between the two provinces This extends from the Rhine along the Grift, the Luntersche Beek and the Eem to the Zuider Zee, and would still offer an outlet in this direction to the Rhine at high water if it were not for the river dikes. The two main ridges of the Veluwe hills (164 and 360 ft) extend from the neighbourhood of Arnhem north-west to Harderwyk and north to Hattem In the south they stretch along the banks of the Rhine, forming a strip made up of sandhills and trees, claylands and pastures All over the Veluwe are heaths, scantily cultivated, with fields of rye and buckwheat, cattle of inferior quality, and sheep, and a sparse population There is also a considerable cultivation of wood, especially of fir and copse, while tobacco plantations are found at Nykerk

The southern division of the province is watered by the three large rivers, the Rhine, the Waal and the Maas, and has a level clay soil, varied only by isolated hills and a sandy, wooded stretch between Nijmwegen and the southern border The region enclosed between the Rhine and the Waal and watered by the Linge is called the Betuwe ("good land"), and gave its name to the Germanic tribe of Batavians There is here a denser population, occupied in the cultivation of wheat, beetroot and fruit, the breeding of excellent cattle, shipping and industrial pursuits The principal centres of population, such as Zutphen, Arnhem (the chief town of the province), Nijmwegen and Tiel, as well as smaller old towns lie along the rivers (X)

History.—It was formerly a duchy of the empire, bounded by Friesland, Westphalia, Brabant, Holland and the Zuider Zee, part of which has become the province of Holland The territory of the later duchy of Gelderland formed part of the Frankish kingdom of Austrasia In 843, by the treaty of Verdun, it became part of Lotharingia (Lorraine), and in 879 was annexed to the kingdom of East Francia by the treaty of Mersen The nucleus of the later county and duchy was the district surrounding the town of Gelder or Gelre, lying between the Meuse and the Niers, and since 1715 included in Rhenish Prussia

There were in the 11th century a number of counts ruling in various parts of what was afterwards known as Gelderland Towards the close of that century Gerard of Wassenburg acquired a dominant position and is generally reckoned as the first hereditary count of Gelderland (d. 1117–18) His son, Gerard II. (d 1131), married Irmingardis, daughter and heiress of Otto, count of Zutphen, and their son, Henry I (d. 1182), inherited both countships His successors Otto I. (1182–1207) and Gerard III (1207–29) were lovers of peace and strong supporters of the Hohenstaufen emperors, through whose favour they were able to increase their territories by acquisitions in the districts of Veluwe and Betuwe Otto II (1229–71) became a person of so much importance that he was urged to be a candidate for the dignity of emperor, but he preferred to support the claims of his cousin, William II of Holland In return for the loan of a considerable sum of money William gave to him the city of Nijmwegen in pledge His son Reinald I (d 1326) married Irmingardis, heiress of Limburg, and in right of his wife laid claim to the duchy against Adolf of Berg, who had sold his rights to John I. of Brabant War followed, and on June 5, 1288, Reinald was defeated and taken prisoner at the battle of Woeringen and surrendered his claims to John of Brabant In 1310, Reinald received from the emperor Henry VII the exemption of his subjects from the liability to be sued before any court outside his jurisdiction, and in 1317 he was made a prince of the empire

Reinald II , his son (1326–43), was one of the foremost princes in the Netherlands of his day. He married (1) Sophia, heiress of Mechlin, and (2) in 1331 Eleanor, sister of Edward III. of England By purchase or conquest he added considerably to his territories He did much to improve the condition of the country, to foster trade, to promote the prosperity of the towns, and to maintain order and security in his lands by wise laws and firm administration In 1338 the title of duke was bestowed upon him by the emperor Louis the Bavarian, who at the same time granted to him the fief of East Friesland He died in 1343, leaving three daughters by his first marriage, and two sons, Reinald and Edward, by Eleanor of England His elder son was ten years of age, and succeeded to the duchy under the guardianship of his mother Eleanor. Declared of age two years later, Reinald III found himself involved in a struggle between two rival factions which only ended after his death in 1374, with the recognition as duke of his nephew William of Julich, son of his younger sister, Maria

Duke William was able, restless and adventurous. He took part in no less than five crusades with the Teutonic order against the heathen Lithuanians and Prussians. In 1393 he inherited the duchy of Julich, and died in 1402 He was succeeded by his brother, Reinald IV (d 1423), in the united sovereignty of Gelderland, Zutphen and Julich On his death, Gelderland passed to the young Arnold of Egmont, grandson of his sister Johanna, whose daughter Maria (d 1415) was wife of John, count of Egmont (d 1451) Arnold was recognized as duke in 1424 by the emperor Sigismund, but in the following year the emperor revoked his decision and bestowed the duchy upon Adolf of Berg Arnold in retaliation laid claim to the duchy of Julich, which had likewise been granted to Adolf by Sigismund, and a war followed which ended in Arnold retaining Gelderland and Zutphen, and Gerard, the son of Adolf (d 1437), being acknowledged as duke of Julich. To gain the support of the estates of Gelderland in this war, Arnold had made many concessions limiting the ducal prerogatives, and granting large powers to a council consisting of representatives of the nobles and the four chief cities, his extravagance and exactions led to continual conflicts, and in his later years a conspiracy was formed against him, headed by his wife and his son Adolf, which gave an opportunity of intervention to Charles the Bold of Burgundy For 92,000 golden gulden, Arnold sold the reversion of the duchy to Charles (1471) On Feb 23, 1473 Arnold died, and Charles became duke of Gelderland His succession was not unopposed Nijmwegen offered an heroic resistance and only fell after a long siege After Charles's death in 1477 Adolf was released from captivity in which he had been held, and placed himself at the head of a party in the powerful city of Ghent, which sought to settle the disputed succession by forcing a match between him and Mary, the heiress of Burgundy. On June 29, 1477, however, he was killed at the siege of Tournai; and Mary gave her hand to the archduke Maximilian. Catherine, Adolf's sister, made an attempt to assert the rights of his son, Charles, but by 1483 Maximilian had crushed all opposition and established himself as duke of Gelderland.

Charles of Egmont, however, did not surrender his claims, but with the aid of the French collected an army, and in the course of 1492 and 1493 succeeded in reconquering his inheritance In 1507 he invaded Holland and Brabant, captured Harderwijk and Bommel in 1511, threatened Amsterdam in 1512, and took Groningen It was, undoubtedly, a great and heroic achievement for the ruler of a petty state like Gelderland thus to assert and maintain his independence against the overwhelming power of the house of Austria It was not till 1528 that the emperor Charles V could force him to accept the compromise of the treaty of Gorichen, by which he received Gelderland and Zutphen for life as fiefs of the empire In 1534 the duke, who was childless, attempted to transfer the reversion of Gelderland to France, but was compelled by the estates in 1538 to appoint as his successor William V of Cleves (d 1592) Charles died the same year William, with the aid of the French, succeeded in maintaining his position in Gelderland for several years, but was forced to cede the duchy to Charles V. by the treaty of Venloo (Sept. 7, 1543).

Gelderland was now definitely amalgamated with the Habsburg dominions in the Netherlands, until the revolt of the Low Countries led to its partition In 1579 the northern and greater part, comprising the three "quarters" of Nijmwegen, Arnhem and Zutphen, joined the Union of Utrecht and became the province of Gelderland in the Dutch republic. Only the quarter of Roermonde remained subject to the crown of Spain, and was called Spanish Gelderland By the treaty of Utrecht (1715) this was ceded to Prussia with the exception of Venloo, which fell to the United Provinces, and Roermonde, which, with the remaining Spanish Netherlands, passed to Austria Of this, part was ceded to France at the peace of Basel in 1795, and the whole by the treaty of Lunéville in 1801, when it received the name of the department of the Roer. By the peace of Paris of 1814 the bulk of Gelderland was incorporated in the United Netherlands, the remainder falling to Prussia, where it forms the circle of Dusseldorf

The rise of the towns in Gelderland began in the 13th century, river commerce and markets being the chief cause of their prosperity, but they never attained to the importance of the larger cities in Holland and Utrecht, much less to that of the great Flemish municipalities. They differed also from the Flemish cities in the nature of their privileges and immunities, as they did not possess the rights of communes, but only those of "free cities" of the Rhenish type The power of the feudal lord over them was much greater. The states of Gelderland first became a considerable power in the land during the reign of Arnold of Egmont (1423–73). From this time the absolute authority of the sovereign in Gelderland was broken The states consisted of two members—the nobility and the towns. The towns were divided into four separate districts or "quarters" named after the chief town in each—Nijmwegen, Arnhem, Zutphen and Roermonde Each quarter had peculiar rights and customs, and their representatives met together in a separate assembly before taking part in the diet of the states. The nobility possessed great influence in Gelderland and retained it in the time of the republic (G E.)

GELDERN, a town in Rhenish Prussia, on the Niers, 28 m N.W. of Dusseldorf, at the junction of railways to Wesel and Cologne. Pop. (1925) 6,501. The town dates from about 1100 and was an important fortified place; until 1371 it was the residence of the counts and dukes of Gelderland Its fortifications were strengthened by Philip II. of Spain but they were razed by Frederick the Great, the town having been in the possession of Prussia since 1703. Its industries include the manufacture of metal ware, shoes, cigars and silk

GELIMER or **GEILAMIR** (*fl* 530–534), last king of the Vandals in Africa, a great-grandson of Gaiseric, succeeded when Hilderic was deposed in 530. Justinian invited him to allow the old king to remain sovereign in name and to content himself with the actual power; he was in reality desirous of an excuse for interference in Africa In 533 he sent against him a great expedition under Belisarius (*q.v.*). Gelimer was completely defeated, and in 534 taken prisoner. He was then permitted to settle in Galatia.

GELLERT, CHRISTIAN FÜRCHTEGOTT (1715–1760), German poet, born at Hainichen, Saxony, on July 4, 1715, the son of a pastor, studied at Leipzig, became privatdocent there in 1745, and in 1751 extraordinary professor He died at Leipzig on Dec. 13, 1769 Gellert's lovable personality endeared him to a wide circle of friends and readers His best work is to be found in the admirable *Fabeln und Erzählungen* (1746–48) for which he took La Fontaine as his model His *Geistliche Oden und Lieder* (1757), though in force and dignity they cannot compare with the older church hymns, were among the great religious poems of their time Some of them were set to music by Beethoven Gellert wrote a few comedies: *Die Betschwester* (1745), *Die kranke Frau* (1748), *Das Los in der Lotterie* (1748) and *Die zärtlichen Schwestern* (1748).

See Gellert's *Sämtliche Schriften* (first edition, 10 vols, 1769–74; last edition, 1867). *Sämtliche Fabeln und Erzahlungen* have been repeatedly reprinted. A selection of Gellert's poetry (with an excellent introduction) will be found in F. Muncker, *Die Bremer Beitrage* (Stuttgart, 1899). A translation by J A Murke, *Gellert's Fables and other Poems* (1851) For a further account of Gellert's life and work *see* lives by J. A. Cramer (Leipzig, 1744), H. Döring (Greiz, 1833), and H. O Nietschmann (2nd ed, Halle, 1901); also *Gellerts Tagebuch aus dem Jahre 1761* (2nd ed., Leipzig, 1863) and *Gellerts Briefwechsel mit Demoiselle Lucius* (Leipzig, 1823).

GELLERT or **KILLHART,** in Welsh traditional history, the dog of Llewellyn, prince of Wales. The dog, a greyhound, is left to guard the cradle in which the infant heir sleeps A wolf enters, and is about to attack the child, when Gellert flies at him. In the struggle the cradle is upset and the infant falls underneath. Gellert kills the wolf, but when Prince Llewellyn arrives and sees the empty cradle and blood all around, he thinks Gellert has killed the baby He at once stabs him, and then finds his son safe under the cradle and realizes the dog's bravery. Gellert is supposed to have been buried near the village of Beddgelert ("grave of Gellert"), Snowdon, where his tomb is pointed out to visitors The date of the incident is traditionally given as 1205. The story is only the Welsh version of a common tale which is traced to the Indian Panchatantra and perhaps as far back as 200 B C

See W A Clouston, *Popular Tales and Fictions* (1887); D E. Jenkins, *Beddgelert, its Facts, Fairies and Folklore* (Portmadoc, 1899).

GELLIUS, AULUS (*c.* A D 130–180), Latin author and grammarian, probably born at Rome. He studied grammar and rhetoric at Rome and philosophy at Athens, after which he returned to Rome, where he held a judicial office. His teachers and friends included many distinguished men—Sulpicius Apollinaris, Herodes Atticus and Fronto His only work, the *Noctes Atticae,* is compiled from a commonplace book, and comprises notes on grammar, geometry, philosophy, history and almost every other branch of knowledge The work, of which all but one book is extant, is valuable for the insight it affords into the life of those times, and for the numerous excerpts it contains from the works of lost ancient authors

Editio princeps (Rome, 1469), the best editions are those of Gronovius (1706) and M Hertz (1883–85; editio minor, 1886, revised by C. Hosius, 1903, with bibliography). There is a translation in English by W Beloe (1795), and in French by various hands (1896). *See* Sandys, *Hist Class Schol.,* i (1906), 210

GELLIVARA [GELLIVARE], a mining town of Sweden in the district (*län*) of Norrbotten, 815 m N by E of Stockholm by rail It lies in the well-nigh uninhabited region of Swedish Lapland, 43 m N. of the Arctic Circle It owes its importance to the iron mines in the mountain Malmberget 4½ m to the north, rising to 2,024 ft. above sea-level (830 ft above Gellivara town) During the dark winter months work proceeds by the aid of electric light In 1864 the mines were opened but abandoned in 1867 They were reopened in 1884 and a provisional railway built from Malmberget to Luleå at the head of the Gulf of Bothnia (127 m S S.E). In 1891 the Swedish Government bought the railway. The output of ore was insignificant until 1892, but since then it has increased considerably

GELNHAUSEN, a town in the Prussian province of Hesse-Nassau, on the Kinzig, 27 m E N E. of Frankfort-on-Main, on the railway to Bebra. Pop. (1925) 4,750 Gelnhausen became an imperial town in 1169, and here diets of the Empire were frequently held In 1803 the town became the property of Hesse-Cassel, and in 1866 passed to Prussia It is still surrounded by ancient walls and towers. On an island in the river are ruins of the palace built by Frederick I (Barbarossa) before 1170, and destroyed by the Swedes in the Thirty Years' War The beautiful Marien Kirche, with four spires (of which that on the transept is curiously crooked), was built in the 13th century, and restored in 1876–79; among other ancient buildings are the town-hall, the Fürstenhof (now administrative offices), and the Hexenthurm Indian-rubber goods and brushes are manufactured

GELON, son of Deinomenes, tyrant of Gela and Syracuse. On the death of Hippocrates, tyrant of Gela (491 B C.), Gelon, who had been his commander of cavalry, succeeded him, and in 485, his aid having been invoked by the Gamori (the oligarchical landed proprietors) of Syracuse who had been driven out by the populace, he seized the opportunity of making himself despot. From this time Gelon paid little attention to Gela, and devoted himself to the aggrandizement of Syracuse, which attained extraordinary wealth and influence When the Greeks solicited his aid



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PRECIOUS AND SEMI-PRECIOUS STONES

1, Turquoise, China; 2, turquoise, Egypt,[3]alexandrite in matrix, Takovaya, Urals, Russia; 4, garnet (pyrope), Gallup, New Mexico; 5 and 6, kunzite, Palo, San Diego County, Calif.; 7, tourmaline, Paris, Maine; 8, tourmaline (tricoloured), Minas Geraes, Brazil; 9 and 10, aquamarine, Minas Geraes, Brazil; 11 and 12, quartz amethyst, Ural Mountains, Asiatic Russia; 13 and 14, topaz, Minas Geraes, Brazil; 15 and 16, malachite Russia; 17, opal in ironstone, Queensland, Australia; 18, opal, New South Wales

against Xerxes, he refused it, since they would not give him command of the allied forces (Herodotus vii. 171). In the same year the Carthaginians invaded Sicily, but were totally defeated at Himera, the result of the victory being that Gelon became lord of all Sicily. After he had thus established his power, he made a show of resigning it; but his proposal was rejected by the multitude, and he reigned without opposition till his death (478).

See Herodotus vii.; Diod. Sic. xi. 20–38; also SICILY: *History*, and SYRACUSE.

GELSEMIUM, a drug consisting of the root of *Gelsemium nitidum,* a clinging shrub of the natural order Loganiaceae, having a milky juice, opposite, lanceolate, shining leaves, and axillary clusters of from one to five large, funnel-shaped very fragrant yellow flowers The fruit is composed of two separable jointed pods, containing numerous flat-winged seeds The stem often runs underground for a considerable distance, and indiscriminately with the root it is used in medicine. The plant is a native of the United States, growing on rich clay soil by the side of streams near the coast, from Virginia to the south of Florida In the United States it is commonly known as the wild, yellow, or Carolina jasmine, although in no way related to the true jasmine, which belong to the order Oleaceae It was first described in 1640 by John Parkinson, who grew it in his garden from seed sent by Tradescant from Virginia; at the present time it is but rarely seen, even in botanical gardens, in Great Britain



BY COURTESY OF THE ROYAL HORTICULTURAL SOCIETY

FLOWERING BRANCH OF THE VIRGINIA JASMINE, A SHRUB WHOSE ROOT YIELDS A DRUG USED IN MEDICINE

The drug contains a volatile oil and two potent alkaloids, gelseminine and gelsemine. Gelseminine is a yellowish, bitter substance, readily soluble in ether and alcohol. It is not employed therapeutically. Gelsemine has the formula, $C_{11}H_{10}NO_2$, and is a colourless, odourless, intensely bitter solid, which is insoluble in water, but readily forms a soluble hydrochloride The dose of this salt is from $\frac{1}{60}$th to $\frac{1}{20}$th of a grain. The British Pharmacopoeia contains a tincture of gelsemium, the dose of which is from five to 15 minims

The drug is essentially a nerve poison. It has no action on the skin and no marked action on the alimentary or circulatory systems Its action on the cerebrum is slight, consciousness being retained even after toxic doses, but there may be headache and giddiness. The drug rapidly causes failure of vision, diplopia, ptosis or falling of the upper eyelid, dilatation of the pupil, and a lowering of the intra-ocular tension This last action is doubtful The most marked action of the drug is upon the anterior cornua of grey matter in the spinal cord It can be shown by a process of experimental exclusion that to an arrest of function of these cells is due the paralysis of all the voluntary muscles of the body that follows the administration of gelsemium or gelsemine. Just before death the sensory part of the spinal cord is also paralysed, general anaesthesia resulting. Shortly after the administration of even a moderate dose respiration is slowed and ultimately the drug kills by its action on the respiratory centre in the medulla oblongata. In cases of poisoning the essential treatment is artificial respiration, which may be aided by the subcutaneous exhibition of strychnine.

Though the drug is still widely used, the rational indications for its employment are singularly rare and uncertain. The conditions in which it is most frequently employed are convulsions, bronchitis, severe and purposeless coughing, myalgia or muscular pain, neuralgia, and various vague forms of pain.

GELSENKIRCHEN, a town of Germany in the Prussian province of Westphalia, 27 m. W of Dortmund on the railway Duisburg-Hamm Pop (1925) 207,153 It has coal mines, iron furnaces, tin, steel and boiler works, and soap and chemical factories In 1903 various neighbouring industrial townships were incorporated with the town

GEM, a word applied in a wide sense to certain minerals which, by reason of their brilliancy, hardness, and rarity, are valued for personal decoration, it is extended to include pearl (Lat *gemma,* a bud—from the root *gen,* meaning "to produce"—or precious stone). In a restricted sense the term is applied only to precious stones after they have been cut and polished as jewels, whilst in their raw state the minerals are conveniently called "gem-stones" Sometimes, again, the term "gem" is used in a yet narrower sense, being restricted to engraved stones, like seals and cameos.

Confining attention here to the mineralogy and general properties of gems, it may be noted that the term "precious stone" is usually applied only to diamond, ruby, sapphire and emerald Other stones, such as opal, topaz, spinel, aquamarine, chrysoberyl, peridot, zircon, tourmaline, amethyst and moonstone, are included in the group "semi-precious stones," but the particular species in it may vary from time to time with changes in fashions In the trade, owing to the vastly superior hardness of diamond, dealers in diamonds are sharply distinguished from those in other stones, a firm practically never handling both sorts, and in consequence stones other than diamonds are grouped together and are known as "fancy stones"

Descriptions of the several gem-stones will be found under their respective headings, and the present article gives only a brief review of the general characters of the group

Crystalline Form and Cleavage.—Most precious stones occur crystallized, but the characteristic form is destroyed in cutting The crystal forms of the several stones are noticed under their respective headings, and the subject is discussed fully under CRYSTALLOGRAPHY A few substances used as ornamental stones, like opal, are amorphous or without crystalline form; whilst others, like the various stones of the chalcedony group, display no obvious crystal characters, but are seen under the microscope to possess a crystalline structure Gem-stones are frequently found in gravels or other detrital deposits, where they occur as rolled crystals or fragments of crystals, having survived owing to their superior density and hardness.

Many crystallized gem-stones possess the property of cleavage and tend to split parallel to planes intimately related to their atomic structure This property must not be confused with the "parting" shown, for instance, by corundum which is the result of repeated twinning, the stones tending to split along the planes separating individuals An easy cleavage, such as characterizes topaz, may render the fashioning of the stone difficult and produce incipient cracks in a cut stone, such flaws are called "feathers" The cutting of diamonds was very laborious until the discovery that the rough stone could easily be reduced by cleavage to an octahedron, owing to the use of high-speed cutting-discs in recent years, the practice of splitting diamonds has to some extent lessened The method of cutting gem-stones is described under LAPIDARY

Hardness.—A high degree of hardness is an essential property of a gem-stone, for however beautiful a mineral may be, it is useless to the jeweller unless it be hard enough to take a brilliant polish and to withstand the abrasion to which articles of personal adornment are necessarily subjected Paste imitations may be brilliant when new, but they soon become dull through rubbing or even chemical change of the surface Minerals are arranged on the following arbitrary scale of hardness, which is due to Mohs diamond 10, corundum (ruby, sapphire) 9, topaz 8, quartz 7, felspar 6, apatite 5, fluor 4, calcite 3, gypsum 2, talc 1 It is merely an order and has no arithmetical significance, thus diamond differs much more from corundum than does the latter from talc Chrysoberyl scratches topaz but is scratched by corundum, and is therefore said to have a degree of hardness 8½ A steel file will scratch anything with hardness below 7. The test of hardness must be used

with caution in order to avoid injuring the stone, it should preferably be used to attempt to scratch a known mineral, for instance a piece of quartz, and care must be taken to avoid breaking or splitting the stone.

Specific Gravity.—Gem-stones differ markedly among themselves in density or specific weight; and, although this is a character which does not directly affect their value for ornamental purposes, it furnishes by its constancy an important means of distinguishing one stone from another. Moreover, it is a character very easily determined and can be applied to cut stones without injury. The relative weightiness of a stone is called its specific gravity, and is often abbreviated as S G. The number given in the description of a mineral as S G. shows how many times the stone is heavier than an equal bulk of the standard with which it is compared, the standard being distilled water at 4° C. If, for example, the S G of diamond is said to be 3 5, it means that a diamond weighs 3½ times as much as a mass of water of the same bulk The various methods of determining specific gravity are described under DENSITY. The readiest method of testing precious stones, especially when cut, is to use dense liquids The most convenient of them is methyline iodide, with density 3 32, which may be mixed with benzol, with density 0 88. By pouring a little benzol on to methyline iodide in a tube and gently shaking it, a diffusion column is formed and stones of differing density will float at corresponding depths. Chips of known stones may be used as indicators. Methyline iodide readily separates the true from the false topaz (yellow quartz) as the latter floats in it For denser stones Retgers's salt, silver-thallium nitrate, may be used It melts above 75° C to a clear yellow liquid, miscible with water, with a density of 4·6

Absorption: Colour, Dichroism, Etc.—The beauty and consequent value of gems depend on the depth or the absence of colour Diamonds are prized according to their freedom from any trace of colour, especially yellow, except that a slight bluish shade is greatly appreciated; colourless stones are said to be of pure "water." Corundum, topaz and quartz provide water-clear stones, but the absence of "fire" hinders their use "Burnt" zircons have considerable fire and have been mistaken for diamonds The value of coloured stones depends on their translucency and depth of tint. The colour of most gem-stones is not an essential property of the mineral, but is due to some pigmentary matter often too minute in quantity for certain determination Thus corundum when pure is colourless, and the presence of various mineral substances is responsible for the red of ruby, the blue of sapphire, and the many other shades of corundum that occur The tinctorial matter is not always distributed uniformly throughout the stone, but may be arranged in separate layers or zones or even in irregular patches Sapphire, for instance, is often patchy, only one small piece of the stone being blue and the remainder yellow or white; the skilful lapidary arranges the blue patch on the culet so that, as all the emergent light traverses this portion, the effect is a uniformly blue stone. On the other hand, the remarkably variegated character of tourmaline is due to the complexity of its constitution which includes molecular groups exercising great tinctorial power The character of the pigment in the case of a stone is often not definitely known It by no means follows that the agent responsible for the colour of a piece of glass is capable of imparting the same tint to a natural stone: thus a glass of sapphire-blue may be obtained by the use of cobalt, but experience of synthetic stones has shown that cobalt will not diffuse without the addition of sufficient magnesia to produce a blue spinel and not a sapphire, and that a blue sapphire may be produced by the use of titanium. Probably ferric oxide causes a yellow, and ferrous oxide a bottle-green tint, and red is due to chromium, pink to lithium and manganese. Many colours fade on exposure of the stone to sunlight, pink being particularly fugitive.

Exposure to heat often alters the colour and, when it brings about an improvement in the appearance of the stone, the method is often employed; for instance, the beautiful pink topazes are the result of heating certain yellow stones, and again certain brownish zircons can be decolorized by heat, the stones then on account of their brilliance and "fire" closely resembling diamonds. Radium emanations have the power of imparting colour to certain species, such as diamond, kunzite and quartz; the change appears to result from the displacement of electrons within the atom, and the original colour may be restored by exposure to light or the ultra-violet rays, or by heating. The alteration in colour brought about by light or heat is due to the displacement of the constituent atoms without derangement of their relative positions; the example of topaz shows that the displacement may be relatively considerable, because of the relatively considerable increase in the refractivity and density.

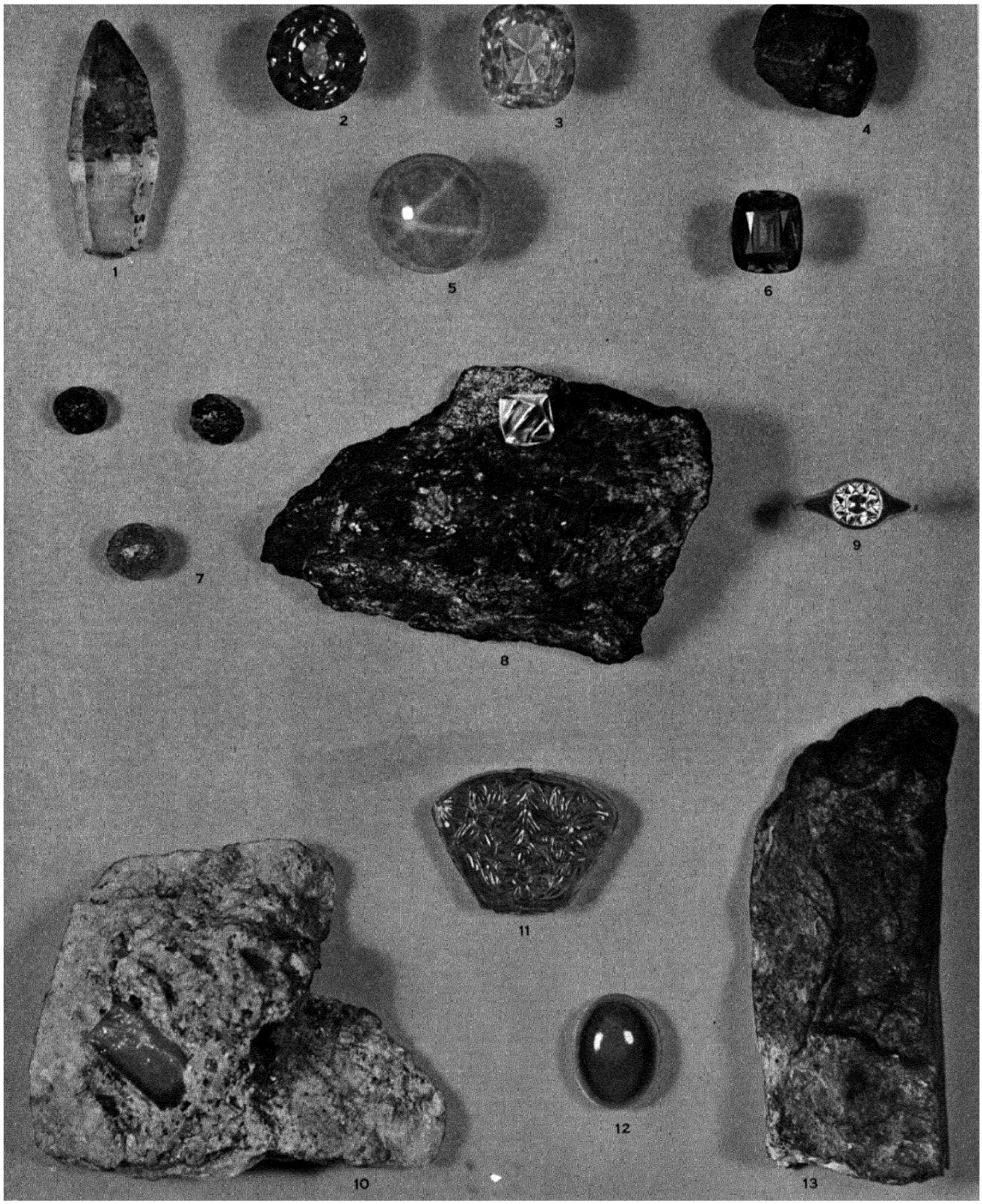
Inasmuch as the eye has not the power of analysis, the tint of a stone depends on the balance of the parts of the spectrum transmitted by it, and consequently the appearance of a stone in daylight and in artificial light may be different; thus many sapphires darken in artificial light; in alexandrite the yellow part of the spectrum is absorbed, and in consequence the colour is green by daylight and cherry-red by artificial light In certain zircons and in almandine-garnet, as was shown by Sir A. H Church, the absorbed portions in the spectrum are narrow, and these stones show characteristic absorption spectra; in the former instance the cause of the peculiar absorption is a minute trace of uranium, so that all zircons do not show this absorption

A doubly-refractive stone may exercise different absorption in the case of the two rays into which it splits up the light falling on it, and is then said to possess dichroism Sometimes the difference is so marked, as in the instance of tourmaline and kunzite, as to be discernible by the unaided eye, but generally a dichroiscope (*see* CRYSTALLOGRAPHY) must be used In the direction of single refraction (optic axis) no dichroism exists, and therefore a stone must be viewed in several directions Dichroism is a useful property for distinguishing between ruby and garnet, as the latter, being singly refractive, shows no dichroism

Lustre and Sheen.—The brilliancy of a cut stone depends upon the relative amount of light which is reflected from a surface and which itself depends on the refractivity and hardness of the stone. Diamond, being both very hard and highly refractive, has a lustre of its own, known as "adamantine"; zircon and demantoid approach it, but gem-stones generally have a "vitreous" lustre, like fractured glass

The presence of twin lamellae, fibres, or cleavage-cracks affects the appearance of the stone The asterism of star-ruby or star-sapphire is due to an arrangement of tubular cavities arranged at 60° in planes perpendicular to the crystallographical axis A similar arrangement of fibres parallel to a single direction produces chatoyancy; cat's-eyes, as such stones are called, are provided by chrysoberyl and quartz, and tiger's-eye is a silicified crocidolite Twin lamellae are responsible for the sheen of moonstone, and the peculiar iridescence of opal is caused by the interference of light within the stone.

Refraction.—As the optical properties of minerals are fully explained under CRYSTALLOGRAPHY little need be said here on this subject. In the "brilliant" form of cutting, the facets at the base of the stone are arranged so that the light refracted through a facet at the top returns in a nearly parallel direction but with lateral displacement so that it emerges through another facet In the case of diamond with the highest refractive index of any gem-stone (2 42) all the light is reflected at the base of a well-cut stone, and the same is very nearly true of zircon (the optically denser type, 1·93–1 98) and sphene (1 90–1 98), but as the refractivity decreases a larger proportion of the light escapes at the base. Since most gem-stones contain in their constitution one or more of the molecular groups—silica, alumina, magnesia or their isomorphous equivalents—the refractivity and specific gravity are closely related as was shown by Sir H. A. Miers, but with the introduction of other elements as in the case of diamond, sphene and topaz, the relation no longer holds. The refractive indices and the double refraction are important characters for the discrimination of gem-stones, and may be determined, except in the case of stones of very high refraction, by means of a total-reflectometer, for a faceted stone without its removal from the setting A convenient form of refractometer, which may be used for indices



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DIAMONDS AND OTHER HARD STONES

1, Sapphire, crystal, Ceylon; 2, sapphire, blue, Ceylon; 3, chrysoberyl, Ceylon; 4, ruby, Burma; 5, star sapphire, Ceylon; 6, ruby; 7, diamonds, natural round bort (white, grey, black); 8, diamond, crystal in blue ground matrix, Kimberley, S. Africa; 9, diamond, Brazil; 10, emerald in limestone, Muzo Mine, Colombia; 11, emerald, East Indian carving, Muzo Mine, Colombia; 12, jade (Jadeite) Mogaung, Burma; 13, jade (Nephrite), New Zealand

ranging from 1·300–1·800, has been devised by Dr G F Herbert Smith. Another instrument on the same principle but with longer focal length has recently been devised by Mr. B J Tully

Dispersion.—Whenever light is incident on one facet and emerges through another not parallel to the first it is split up into a spectrum, the angular width of which depends upon the dispersion of the stone, this being measured by the difference between the refractive indices for the extreme red and violet rays. This play of colour is known as "fire," and is especially characteristic of diamond, which combines large dispersion with high refraction Colourless zircon is not much inferior to diamond in "fire"; sphene and green garnet (demantoid) are even superior to it, but being coloured stones do not show it as conspicuously.

Chemical Composition.—With the exception of diamond, which is crystallized carbon, the gem-stones are composed of alumina or silica or a combination of them in varying proportions with or without other molecules Corundum (ruby, sapphire) is alumina, and quartz (rock-crystal, amethyst, etc) is silica; spinel and chrysoberyl are aluminates, beryllonite, apatite and turquoise are phosphates, and the remainder are silicates of varying complexity of constitution. In the examination of cut stones chemical tests are obviously impracticable The artificial production of certain gems, chiefly rubies and sapphires, by processes which yield products identical in composition and physical properties with natural stones is described in the article GEMS, ARTIFICIAL.

Gem-stones have been imitated not only by paste and other glassy substances but by composite stones called doublets and triplets In a doublet the front is real but the back paste, and in a triplet the front and back are real but the central section is paste, the purpose of which is to impart colour to the stone or to improve it By immersing such imitations in oil or water, the bounding surfaces may be detected, and if the stone be unmounted it may be immersed in boiling water, or in alcohol or chloroform, when it will fall to pieces owing to the dissolution of the binding cement

Nomenclature.—Before the days of mineralogy as a science the classification of gem-stones was vague and based almost solely on colour, which is the least reliable of all the physical characters, and the names which were used by early writers and mostly survive to this day, though not always with the same significance, are related to this character with possibly only one exception—diamond (*adiamentem*, unconquerable, in reference to its supposed resistance to a blow with a hammer). Thus emerald (*smaragdus*) was used generally for green, sapphire for blue, ruby (*ruber*) for red, topaz for yellow stones The earliest known lucid descriptions of stones are contained in the great work on natural history by the elder Pliny, a victim of the great eruption of Mt Vesuvius in A D 79 A study of them shows that many of the names though still surviving have a different significance; thus his sapphire is known to us as lapis lazuli, and his topaz is our peridot.

Superstitions.—In early days gem-stones were believed to possess many magic virtues and charms; thus emeralds were supposed to benefit the eyes and amethysts to prevent drunkenness The belief in lucky stones still lingers, and the prejudice against opals as a source of misfortune has not wholly disappeared

BIBLIOGRAPHY —The most comprehensive work on gem-stones is Prof Max Bauer's *Edelsteinkunde* (1909), the first edition of which was translated, with additions, by L J Spencer under the title *Precious Stones* (1904). A full account of the properties of gem-stones is given in G F Herbert Smith's *Gem-Stones and their distinctive characters* (4th ed 1923). Summaries of the subject are contained in Sir A. H. Church's *Precious Stones* (1913), which serves also as a guide to the collections in the Victoria and Albert museum, and W. F. P. McLintock's *Guide to the Collection of Gemstones in the Museum of Practical Geology, London* (1912). Certain aspects of gem-stones have been discussed by G. F. Kunz in *The curious lore of precious stones* (1913), *The magic of jewels and charms* (1915), *Shakespeare and precious stones* (1916). Information regarding finds and localities is included in *Mineral Resources*, published annually by the United States Geological Survey. Other recent books which may be consulted are J. Wodiska, *A book of Precious Stones* (1909); A. Wruck, *Die Geheimmisse der Edelsteine* (1911); A Eppler, *Die Schmuck-und Edelstein* (1912); C. Doelter, *Die farben der Mineralien insbesondere der Edelsteine* (1915); F. B. Wade, *A text-book of precious stones for jewellers and gem-loving public* (1918); A. E Fersman, *The coloured stones of Russia* (1921), *Precious and coloured stones of Russia* (in Russian, 1922), Rosenthal, *Au jardin des gemmes* (1922), T. C Wollaston, *Opal The gem of the Never-Never* (1924), C W Cooper, *The precious stones of the Bible* (1924); H Michel, *Die kunstlichen Edelsteine* (1926) (G. F H S)

GEMBLOUX, a town in the province of Namur, Belgium, 25 m. S E. of Brussels on the main line to Namur Pop (1925) about 5,000. Here on Jan. 31, 1578, Don John of Austria defeated the army of the provinces under Antony de Goignies. In 1860 the State institute of agriculture was founded here Gembloux is a busy railway centre with engine works.

GEM CUTTING: *see* LAPIDARY AND GEM CUTTING

GEMINI (The Twins, *i e*, Castor and Pollux), in astronomy, the third sign in the zodiac, denoted by the symbol II. By the Egyptians this constellation was symbolized as a couple of young kids, the Greeks altered this symbol to two children, variously said to be Castor and Pollux, Hercules and Apollo, or Triptolemus and Iasion, the Arabians used the symbol of a pair of peacocks Castor is a double star with a separation of nearly 6″ easily resolved with small telescopes; the period of revolution of the two components is 350 years. Each of these visual components is a spectroscopic binary, the periods being 9 2 days and 2 9 days respectively Another interesting star is ζ Geminorum, which is variable in a period of 10 15 days; it belongs to the Cepheid class of variables

GEMINIANI, FRANCESCO (*c* 1667–1762), Italian violinist, was a native of Lucca, and studied the violin under Lunati (Gobbo) and afterwards under Corelli He may also have had lessons in composition from Scarlatti In 1714 he arrived in London, where he found a patron in the earl of Essex In 1715 he played his violin concertos with Handel at the English court and later spent much time in Dublin, where he had a fine house in which he gave private concerts After visiting Paris and residing there for some time, he returned to England in 1755 On a visit to Dublin in 1761 a servant robbed him of a manuscript, an incident which is said to have hastened his death (Sept 17, 1762) Geminiani brought to England great improvements in the technique of violin-playing, and he handed down his method in the first book on the subject, his *Art of Playing the Violin*

GEMISTUS PLETHO [or PLETHON], **GEORGIUS** (*c* 1355–1450), Greek Platonic philosopher and pioneer of the revival of learning in Western Europe, was a Byzantine by birth, but settled at Mistra in the Peloponnese He changed his name to the equivalent Pletho ("the full"), perhaps owing to its similarity to that of his master Plato, whom he introduced to the West during his visit to Florence in 1439, as one of the deputies from Constantinople on occasion of the general council Cosimo de' Medici and Cardinal Bessarion were much impressed by him He endeavoured to promote the union of the Greek and Latin Churches, and founded a sect on the speculative mysticism of Neoplatonism He probably died before the capture of Constantinople. His treatises on the distinction between Plato and Aristotle appeared at Venice (1540), on the religion of Zoroaster (Paris, 1538); on the condition of the Peloponnese (ed A Ellissen in *Analekten der mittel- und neugriechischen Literatur*, iv), and the Νόμοι (ed C Alexandre, Paris, 1858) Many of his volumes of excerpts from ancient authors, and works on geography, music and other subjects exist in ms

See especially F. Schultze, *Geschichte der Philosophie der Renaissance* (1874), J A. Symonds, *The Renaissance in Italy* (1877), II H. F. Tozer, "A Byzantine Reformer," in *Journal of Hellenic Studies*, vii. (1886), chiefly on Pletho's scheme of political and social reform for the Peloponnese; W. Gass, *Gennadius und Pletho* (1844) Most of Pletho's works are in Migne, *Patrologia Graeca*, clx , for a complete list *see* Fabricius, *Bibliotheca Graeca* (ed Harles), xii

GEMOT: *see* SHIRE MOOT, VILLAGE COMMUNITIES, WITAN

GEMS, ARTIFICIAL, denote precious stones artificially made and having the chemical, physical and optical properties of natural gems. Of the precious stones, the diamond, emerald, ruby and sapphire have all been successfully synthesized Only the ruby and the sapphire, however, have outgrown the laboratory stage of the production and represent the principal products of the synthetic precious stone or artificial gem industry Artificial amethysts, garnets, tourmalines, etc., have not appealed to the industry because they are not valuable enough as natural products.

The pearl is almost altogether of animal origin Only the diamond, emerald, ruby and sapphire will be treated here The beauty of natural precious stones is due to their composition and cutting. Permanence of beauty is due to the hardness of the stones and to the fact that they are chemically inert. Extraneous conditions, such as custom and rareness may also affect their value.

The Diamond.—The transformation of the diamond to graphite or carbon has been accomplished frequently. The process has also been reversed and some few diamonds have been produced by various investigators. The work of Moissan is an interesting instance He developed his experiments from the analytical work of Friedel. The Devil's canyon in Arizona was once littered with meteorites Some of these were analyzed by Friedel Tiny diamonds were found embedded in the mass of iron. Moissan tried to reproduce the conditions of the fiery meteor In an electric furnace he placed a carbon crucible containing pure iron and carbon The carbon dissolved in the molten iron until a saturated solution was formed, and while the material was at white heat he plunged it in a bath of molten lead The sudden cooling caused tremendous internal pressure and the liquid carbon was crystallized into small diamonds One of these, weighing about 6 mg. (about $\frac{1}{30}$ of a carat), when burned in oxygen produced about 23 mg of carbon dioxide Theoretically, 22 mg. should have been produced. Up to 1928 synthetic diamonds had not been commercially produced although numerous experiments were in progress. The high dispersion of light gives to the diamond its so-called "play of fire." It reflects almost all the rays of light that strike its surface and give it the characteristic lustre known as adamantine.

The Emerald.—Chemically, the emerald is a metasilicate of aluminium and glucinum Hautefeuille and Perry, 1890, dissolved the constituents of the gem in their relative proportions in a bath of dimolybdate of lithium and, keeping the bath at 800° C for 15 days, succeeded in crystallizing out tiny emerald crystals A little chromic oxide was used to give the green colour These crystals were perfect, but too small, the largest being only 2 mm long by 1 mm wide and 1 mm thick. They were much more expensive than the natural product Beyond this successful laboratory attempt, no successful means have been found up to 1928 for producing the emerald on an industrial scale. Beryl, the natural metasilicate of glucinum and aluminium, is golden yellow in colour The emerald is identical with it save its green colour This difference is due to the presence of different impurities. Almost all the rays of light impinging upon the surface of an emerald enter it, and very few are reflected from its surface, very much as in the case of glass, and the emerald is not as optically dense as the diamond

The Ruby.—The ruby was the first of the precious stones to be synthesized on a commercial scale Chemically, it is the oxide of aluminium with a trace of chromic oxide, to which it owes its rich pigeon-blood colour. Corundum (Al_2O_3) is often free from the oxide of chromium and we have either a colourless stone or, if some other oxides are present, we may have a blue stone—the sapphire, or shades of green, smoky tinges, etc The effect of radium emanations on natural and synthetic rubies is shown in an experiment by F Bordas Using radium bromide of 1.800,000 activity he turned natural rubies into a brick red colour The synthetic stones were not affected. But the synthetic product is often ruined during manufacture by quantities of impurities that are so small they can scarcely be detected by analytical methods

An interesting attempt to crystallize aluminium oxide out of a molten bath was that of Fremy and Hautefeuille. The oxides of lead, aluminium and chromium were fused in a large crucible for about seven to eight days in a furnace used for glass making Masses of rubies from 30 to 40 kg were sometimes obtained, but among these not a ruby was found that was thick enough to be of any value as a gem. One of the crystallographic axes developed more than another, and only thin, laminated crystals were produced. Attempts to condense alumina vapour produced similarly imperfect gems Fremy and Verneuil carried on a series of experiments with ordinary sand crucibles for this purpose It was found that in the presence of vapour of potassium carbonate amorphous alumina would be changed into corundum Sand crucibles were filled with alumina, potassium carbonate and chromic oxide; mixed with fine charcoal, packed around a core composed of alumina and calcium fluoride and gently heated. The charcoal escaped as carbon dioxide and made the mass porous After eight days the largest stone produced was 4 to 5 mm. long and about 1 mm. thick, weighing 60 mg or about $\frac{1}{3}$ of a carat. These not only were too thin to be cut into gems, but lacked the beauty of the natural stone which appears to be made up of a series of layers. The light coming through these layers gives to the ruby its wealth of colour Rubies were made by a priest near Geneva, by fusing chips of natural rubies into stones. Verneuil succeeded in fusing the oxide of aluminium and developed the process to a point where rubies were made that were large in size, of good colour and at a speed sufficient to make an industry possible One workman can operate about ten furnaces producing 30 or more carats per hour per furnace

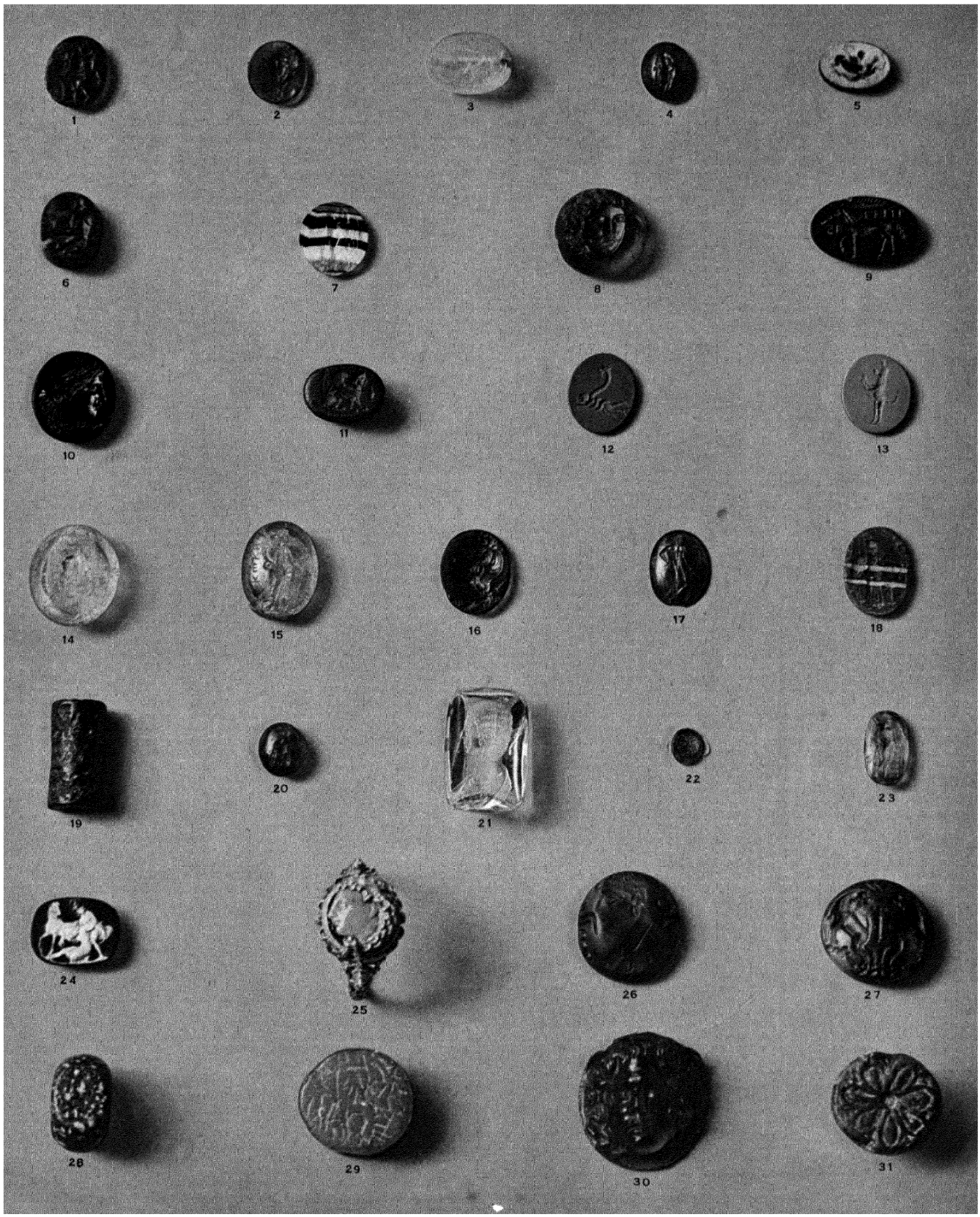
Rubies are made commercially by fusing alumina in the oxy-hydrogen flame and permitting the molten mass to solidify in the cooler zones of the flame A modified inverted oxy-hydrogen torch of Deville is used in modern practice. It produces a flame of many zones varying in temperature from 1,900° to 2,400° C. The torch consists of two concentric tubes the inner tube carries the oxygen, extends about a foot beyond the outer and has a cylindrical shaped top. In the lower portion of the torch, the outer or hydrogen-carrying tube extends an inch or two beyond the oxygen tube The ruby-forming powder is placed in a sieve bottom box which, in turn, is screwed into the cylindrical top of the oxygen tube. When the torch is lit a hammer is caused to knock periodically on the top of this box, and particles of alumina are thus blown into the flame In the beginning of the process, the flame is comparatively cold and just heats a rod that is placed to catch this powder As the powder continues to fall on this rod it forms a pyramid of fritted alumina The heat is gradually increased until the top of this pyramid becomes molten and a tiny stalk or "pin-head" begins to grow. At this stage the flame is made still hotter and the powder falls in molten drops upon this pin-head. Each succeeding drop falls upon a larger base until an unflawed pear-shaped, or so-called ruby boule, is produced.

This boule is one single crystal with the optical axes directly perpendicular to one another. When the stem of this boule is broken the stone breaks in two. Pure alumina is essential for this process The presence of even 0 0005 of 1% of a certain impurity jeopardize the industry, as this amount is sufficient absolutely to discolour the ruby, and produce a brick-red instead of the pigeon-blood stone. This impurity was found by Levin to be magnesium oxide Mg O The stone cut from a boule is physically and chemically identical to the natural ruby There is perhaps but one method of telling the synthetic from the natural stone In the natural stones the imperfections have flat bounding sides and are so-called negative crystals, the imperfections in the synthetic stones have round surfaces and are simply air bubbles which in many cases can be detected only by a powerful magnifying glass Both the natural and the synthetic stones are made up of a series of successive layers; the synthetic stone having curved layers, the natural product flat, parallel layers

The Sapphire.—Sapphire chips cannot be fused into reconstructed sapphires in a way similar to the making of synthetic rubies because the colour disappears. In some of the experiments of Deville and Carron with the ruby, blue patches were obtained, and it was believed by them that the sapphire owed its blue colour to a lower oxide of chromium Experimenters, however, failed to realize any blue colour by the use of some of the oxides of chromium. The cobalt oxides, which are used so extensively in ceramics to produce blue, cannot be retained in the corundum By the addition of materials, such as calcium oxide, blue stones are obtained, but are not genuine, synthetic sapphires Research was abandoned and then taken up again in 1909 by Verneuil and Levin. The sapphire owes its blue colour to the presence of the oxides of iron and titanium. Up to the time of the actual synthesizing of the sapphire, there existed no complete analysis showing

GEMS IN ART

PLATE I



BY COURTESY OF (1-18, 21-25, 27-31) METROPOLITAN MUSEUM OF ART, (19 AND 26) COLLECTION OF [illegible] COLLECTION OF W. G. BEATTIE ARRANGED BY MISS RICHTER

ANCIENT GEMS AND THEIR MATERIALS

1. Carnelian. 2. Sard. 3. Chalcedony. 4 Plasma. 5. Nicolo. 6. Moss agate. 7. Banded agate. 8. Peridot. 9. Heliotrope. 10. Black jasper. 11. Green jasper. 12. Red jasper. 13. Yellow jasper. 14. Rock crystal. 15 and 20. Amethyst. 16 and 17. Garnet. 18 and 30. Glass pastes. 19. Hematite. 21. Beryl. 22. Emerald. 23. Topaz. 24. Sardonyx. 25. Turquoise. 26. Lapis lazuli. 27. Onyx. 28. Porphyry. 29. Serpentine. 31. Steatite

1, ITALIC, 2D CENTURY B.C.; 2, 4, 5, 7, 8, 9, 12-18, 20, 21, 23, 28, ROMAN, 1ST CENTURY B.C. TO 2D CENTURY A.D.; 3, 6, 11, GREEK, 6TH-5TH CENTURY B.C.; 10, 22, 24, 18-19TH CENTURY A.D.; 19, HITTITE, 2D MILLENNIUM B.C.; 25, 30, HELLENISTIC, 3D-1ST CENTURY B.C.; 26, EPHTHALITE (NORTH INDIAN), 5TH-6TH CENTURY A.D.; 27, 29, 31 MINOAN, 3D-2D MILLENNIUM B.C.; 8, 24, 25, 30 ARE CAMEOS AND INTAGLIO SEALS

both of these oxides present in the natural gem. Titanium is widely distributed in the earth's crust. The titanium oxides grade away in colour from white to blue and purple.

The higher oxide of titanium, TiO_2, is the stable oxide in molten corundum and gives to the corundum a lavender colour. Pinkish stones and not blue stones were first obtained in the fusion of the iron oxide and titanium oxide with corundum. A greater quantity of iron oxide produced the necessary reduction of the titanium oxide and the true blue colour of the natural sapphire was finally obtained. The reaction is delicately balanced and prolonged heating will cause the blue colour to change back to pinkish. This explains why natural sapphire chips lose their colour when fused The blue corundum boule is identical with the natural stone and they are distinguished only with great difficulty by experts After fusion only part of the iron and titanium oxides are left A J. Moses found only traces of Fe_2O_3 and about 0·1 of 1% of TiO_2. The analysis of the natural products extant before the synthesis of the sapphire did not show the presence of titanium oxide

The synthetic ruby or sapphire like the unpolished natural stones require the lapidary's art to bring out their intrinsic qualities About 20,000,000 carats of rubies and 12,000,000 carats of sapphires are produced annually and the demand is growing.

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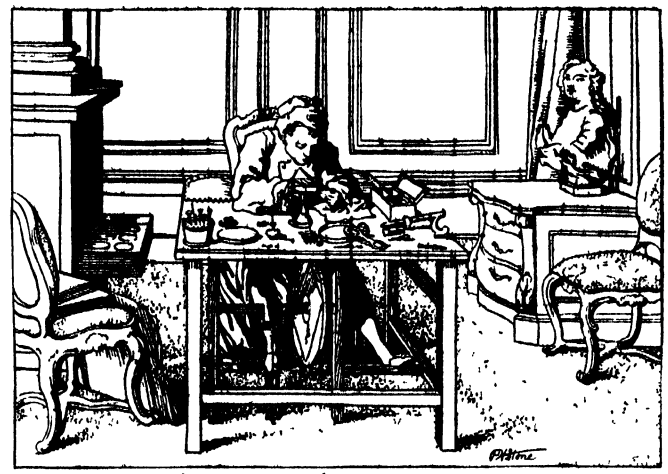
(I. H. L.)

GEMSBOK, an African antelope of the genus *Oryx* (*see* ANTELOPE; ORYX), also the German name for the chamois (*q v*)

GEMS IN ART. The word gem is used as a general term for precious and semi-precious stones especially when engraved with designs for sealing (intaglio) or for decoration (cameo) Such gems exist in large numbers from the early Sumerian period to the decline of the Roman civilization and again from the Renaissance to modern times They satisfy the aesthetic sense in many ways. The inherent beauty of the material, with its rich and varied colours, its lustre and brilliance, gives pleasure at first sight. The hard and durable quality of the stones has made for unusually good preservation, so that we can appreciate in many cases the artist's work in its original state—a rare opportunity in ancient art. Moreover, the smallness and preciousness of the gems invited exquisite workmanship, and in certain periods, when art was at a high level, the achievements in this field were very notable. The best ancient gem engravers combined minuteness and accuracy of detail with a largeness of style that is indeed remarkable. A gem engraving of this class possesses the nobility and dignity of a marble or bronze sculptural work, though it is often confined to the space of less than half a square inch.

The Technique of Gem Engraving.—Only soft stones and metals can be worked free hand with cutting tools; the harder stones require the wheel technique. This technique was known in Mesopotamia as early as *c* 4000–3000 B.C. (Plate II, 1), as well as to the Minoans in the middle Minoan III period (*c* 1800–1600 B.C., Plate II., 13). The method of work seems to have been similar to that in use to-day, to judge by the references we have in classical literature (*see* especially Pliny, *N H.* xxxvii, 76; xxxvii, 15; Theophrastus, *De lapidibus* I., 5; VII, 41), and an examination of the stones themselves (fig. 2 *A, B, C, D*) By this method the stones were worked with variously shaped drills ending in balls, discs, cylinders, etc (Plate VI., 1), which are made to rotate by the help of the wheel (fig. 1) Nowadays the stone to be engraved is fastened to a handle and held to the head of the



FROM MARIETTE, "GRAITÉ DES PIERRES GRAVÉES"

FIG 1.—A GEM ENGRAVER OF THE 18TH CENTURY AT WORK IN HIS SHOP SURROUNDED BY THE VARIOUS TOOLS OF HIS TRADE

rotating drill and moved as the work requires (Plate VI, 2) It has been suggested that the ancients reversed the process and held the stone stationary while the rotating tools were guided by the hand, as in modern dentistry The cutting is not actually done by the drills but by the powder which is rubbed on the stone with the drill This is nowadays diamond powder, mixed with oil, it was known also to the Romans (*see* Pliny, *N H* xxxvii, 15, and Manilius, *Astronomica* IV, 926), but in the period before Alexander emery powder was probably used The wheel used in our times is either worked by the foot (fig 1) or by an electric motor lathe. The former, though more cumbrous, has the advantage of giving the artist more direct control over the speed. On the gravestone of a gem cutter of the Roman empire found at Philadelphia in Asia Minor (fig. 2, *N*) a tool is represented which looks like the bow used by modern jewellers and which, by being drawn back and forth, could impart a rotating movement similar to that of the wheel But since we know that the rotating wheel was well known to the ancients in the making of pottery it is probable that they made use of it in gem engraving also After the cutting of the gem was complete the surface was often polished Such a polish was popular, especially among the Etruscans and in the later Greek and Roman periods For this purpose Naxian stone (*naxium*) was used, as Pliny informs us (*N H* xxxvi, 10).

We do not know definitely whether the ancient gem cutters made use of the magnifying glass but it is probable that they did The general principle of concentrating rays was known to Aristophanes (*Clouds,* 766 *seq*) Pliny several times mentions the use of balls of glass or crystal brought in contact with the rays of the sun to generate heat (*N.H.* xxxvi, 67 and xxxvii, 10), and Seneca speaks more specifically of this principle applied for magnifying objects (*Nat Quaest.* I., vi, 5).

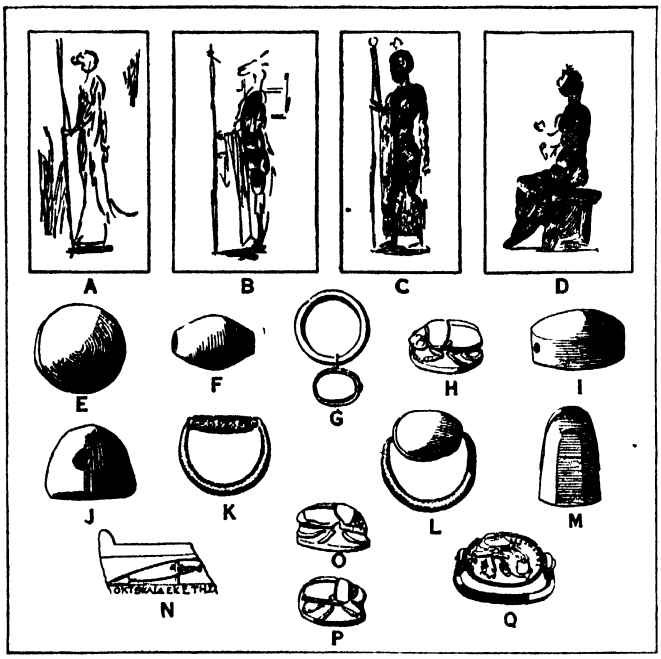
Moreover, two crystal lenses dating from about 1600–1200 B.C. have been found in Crete, and pieces of round glass in Egypt which may be early magnifying glasses

Beck, *Ant J.* VIII., 3, pp 327–330 (July 1928)

HISTORY

Oriental.—The art of engraving stones probably originated in south Mesopotamia There it attained a high degree of proficiency as early as the fourth millennium B C; *i.e.,* during the Elamite and Sumerian civilizations. The engravings were worked on stones mostly of cylindrical shape (Plate I, 19), suspended by a string and used as seals The materials were petrified shell and marble, and the subjects are chiefly heroes fighting animals,

deities with worshippers and decorative motives (Plate II, 1, 2). After the Akkadian invasion (*c.* 2800 B C.) the art of seal engraving reaches its greatest height, and semi-precious stones like rock crystal were cut in masterly fashion The mythical King Gilgamesh performing his great exploits is the favourite representation (Plate II, 3) Cuneiform inscriptions begin to appear After the decline of the Akkadian empire the representations become more and more conventionalized. Hematite gradually



BY COURTESY OF "REPORT OF THE IMPERIAL COMMISSION OF ARCHAEOLOGY" (PARIS, 1865); FURTWANGLER, "ANTIKE GEMMEN", RICHTER, "CATALOGUE OF ENGRAVED GEMS", AND WALTERS, "CATALOGUE OF ENGLISH GEMS AND CAMEOS IN THE BRITISH MUSEUM"

FIG 2 —SPECIMENS OF GEM ENGRAVER'S ART THROUGHOUT 2 500 YEARS
A, B, C, D.—Four-sided stone with unfinished engravings; E, F —Minoan stone forms—lentoid and glandular; G —Ring with pendant, H —Scarab; I.—Scaraboid; J.—Dome; K, L —Swivel rings; M —Cone form; N —Part of a grave stone of a gem engraver; O —Greek scarab; P —Etruscan scarab, Q —Heron and grasshopper, signed "Dexamenos"

becomes the prevailing material The most frequent subjects are the "Introduction Scene"—a seated goddess towards whom a second deity leads a worshipper, the Gilgamesh legend, and other mythical representations (Plate II, 4) During the Amorite dynasty (*c* 2100–1800), to which belonged the famous King Hamurabi, we are again in a highly artistic period, but probably of short duration The representations are mostly the same as during the preceding epoch, and the use of cuneiform inscriptions becomes important (Plate II, 5), until in the Kassite period (*c* 1800) it constitutes the most conspicuous feature (Plate II, 7)

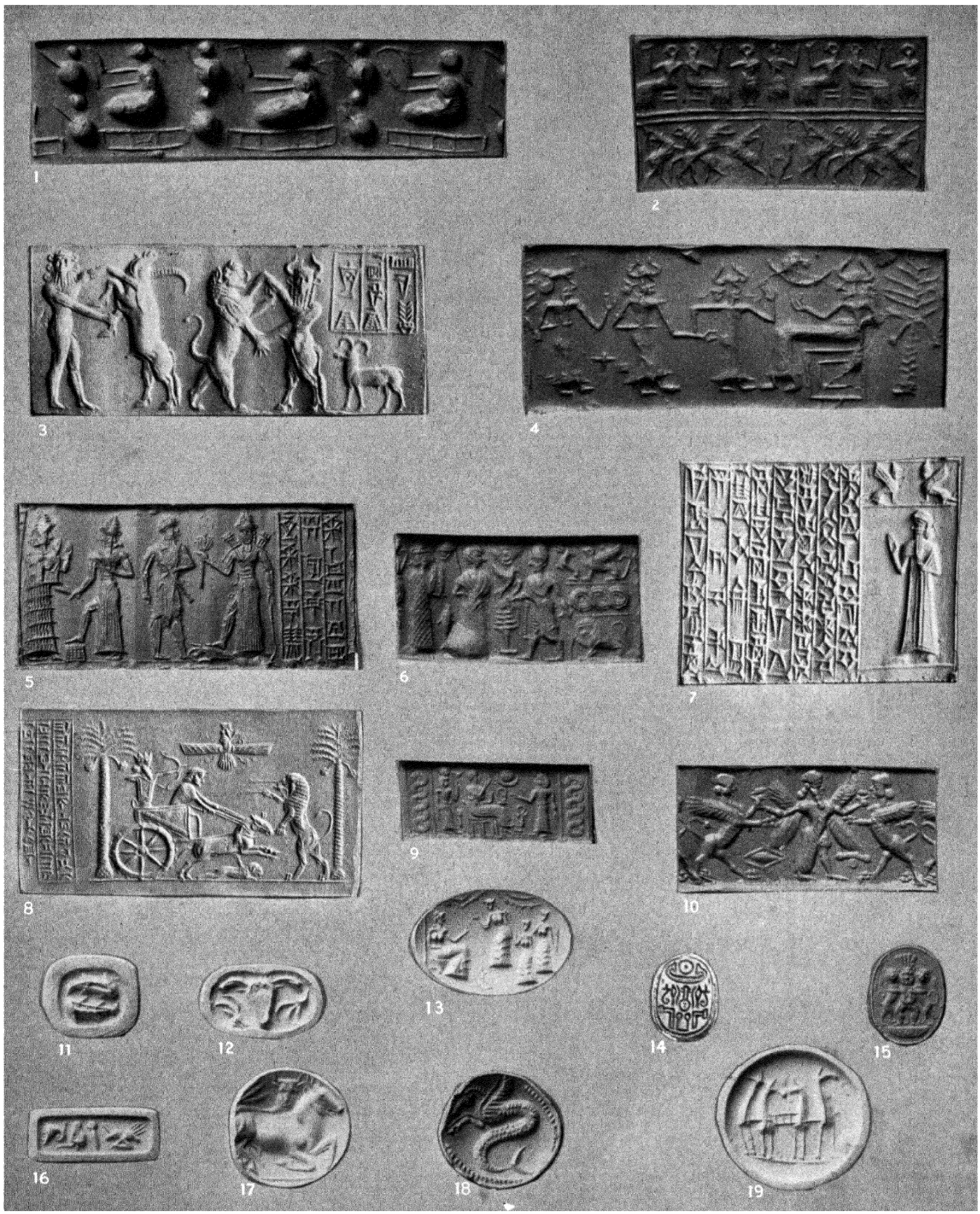
After the downfall of the Amorites in Babylonia, southern Mesopotamia no longer played an important part politically, serving only as a cultural centre The other oriental countries which now came into prominence naturally profited by the older civilization, and the Hittites (second millennium B C), the Assyrians (first half of first millennium B C) and other peoples of Asia Minor all became conversant with the art of gem engraving. They carried on the southern Mesopotamian tradition with some contributions of their own (Plate II., 6, 9, 10). The favourite subjects are adoration scenes and heraldic groupings of deities and animals Decorative motives are popular. The cylinder form remains in vogue, but conical and dome-shaped seals with a flat base for the intaglio are the most popular (fig 2, *J, M*). The coloured quartzes are the favourite material When the power of Assyria gave way to that of Persia, the Persian gem engravers followed in the footsteps of their predecessors both in technique and style; but the favourite theme now becomes the exploits of the great king of Persia (Plate II, 8).

Egypt.—The Egyptians early adopted the art of engraving, employing first the cylinder form, then, from about the 9th dynasty on, the scarab or beetle and kindred shapes As subjects for their engravings they used chiefly symbols, script and ornaments (Plate II., 17), only occasionally pictorial scenes Though historically, therefore, these scarabs are of great importance—especially as they have been found in great numbers and form a continuous series—the artistic value is frequently secondary. The great majority lack the interest of subject treatment, though the finish of their execution is remarkable. The commonest material is *faience,* but the coloured quartzes—carnelian, amethyst, jasper, etc, are also employed.

Crete.—From the earliest times we find Greece treading an independent path influenced but not conditioned by her oriental neighbours In Crete gem engraving occupied an important place. The stones of the early Minoan period (*c* 3500–2200 B C) show a great variety of shapes—including cylindrical, pyramidal, conoid, quadrilateral and three-sided rounded beads—and are engraved with rude pictographs, consisting of primitive renderings of human beings, animals, ships and floral and linear patterns (Plate II, 11) It is clearly an experimental stage without traditional forms. The stone is invariably of a soft variety, *i e*, steatite of different colours worked by hand. As time went on—during the first and second middle Minoan periods (*c.* 2000–1800 B C)—the three-sided elongated bead became the standardized shape and the pictographs were transformed into less rude, more conventionalized forms (Plate II, 12) Several symbols now generally occur together, showing that from mere ideographic meaning they had acquired a phonographic value as syllables or letters In other words, the primitive pictographs have evolved into hieroglyphs. The material still remains the soft steatite During the middle Minoan third period (*c* 1800–1600 B C) the hieroglyphic script reached its full development, the symbols appearing in highly systematized form, executed often with great nicety (Plate II., 13). The stones are now no longer steatite but hard varieties, such as carnelian, chalcedony and green jasper They are worked with the wheel, this technique having been learned from the Orient

In the next period (late Minoan, *c* 1600–1100) we note a great change The Minoan written language has finally evolved into a linear script (Plate II, 14) and concurrently it disappears from the seal stones In its stead we find naturalistic designs—animals, cult and sacrificial subjects (Plate II, 15), deities and demons, hunting and war scenes, *i.e*, the stock subjects of Cretan art, executed with an amazing *élan* and vivacity The stones are now regularly the hard quartzes, of lentoid and glandular forms (fig 2, *E, F*) Similar engraved gems as well as gold rings with engraved bezels have been found at Mycenae and other places within the range of Cretan influence Towards the end of the late Minoan period the art deteriorated The soft steatite again took the place of the harder stones, and the subjects became merely conventionalized representations Gradually there was established the geometric style in which linear designs were engraved by hand on soft stones of the prevalent oriental forms (Plate II, 18) In the 7th century B C a revival in artistic conceptions is noticeable The use of hard stones worked by the wheel was reintroduced and the designs were largely borrowed from Eastern motives (Plate II, 16) And this was the prelude to several centuries of a flourishing output, lasting throughout the classical civilizations

Greece.—The study of Greek and Roman gems is the study of classical art in miniature, for the gems reflect faithfully the styles of the various periods to which they belong, so that they represent an accurate picture of the development, the prime and the decadence of classical art In the gems of the 6th and early 5th century B C the dainty charm of archaic Greek art finds a happy expression The chief forms are the scarab and the scaraboid (fig 2, *H, I*) regularly set in swivel rings (fig 2, *K, L, Q*). The subjects are the same as in other branches of archaic art. At the beginning of the period the human figure in kneeling posture is the most popular, but soon a greater variety was attempted. Gods and goddesses are comparatively rare, but Herakles is a favourite, and various demons, the Silenus, the Siren and the Sphinx are also common. Among the figures without mythological significance, the commonest are warriors, archers, athletes and horsemen, and among the animals the lion, bull, boar, deer, ram, cock and horse (Plate III, 1–4, 6, 8 and IV, 1–3). The coloured



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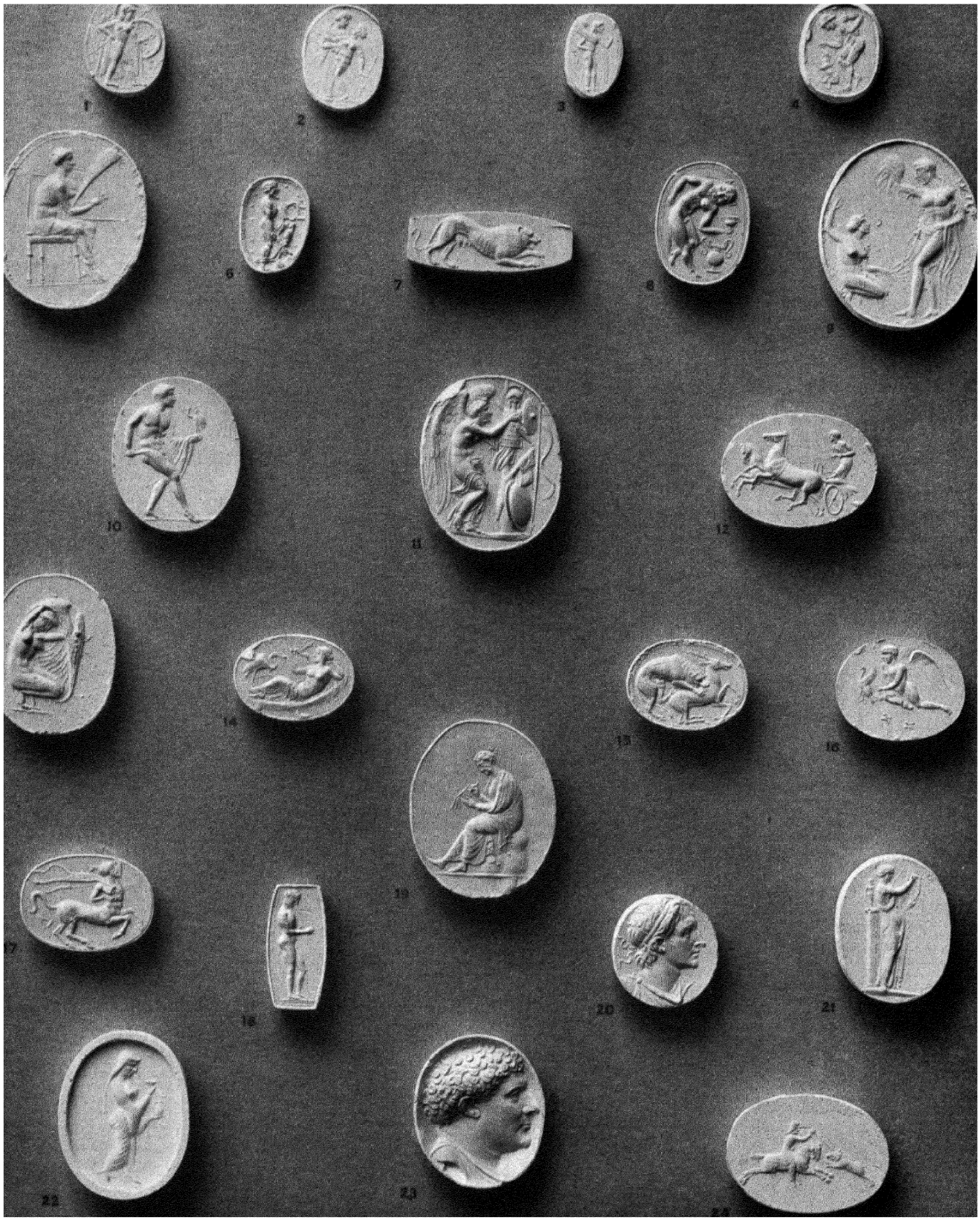
ORIENTAL, CRETAN AND OTHER GEMS, FROM 4000–500 B.C. (PLASTER IMPRESSIONS, EXCEPT FIG. 14)

1. Elamite, 4th millennium; marble. 2. Sumerian, 4th millennium; shell. 3. Akkadian, 1st half of 3rd millennium. 4. Sumero-Akkadian, 2nd half of 3rd millennium; marble. 5. Amorite, *c.* 2100–1800; hematite. 6. Hittite, North Syrian, *c* 1400–1000; hematite. 7. Kassite, *c.* 1800; rock crystal. 8. Persian seal of Darius, *c.* 500; chalcedony. 9. Hittite, *c.* 1400–1000, showing Egyptian influence; hematite. 10. Assyrian, *c* 700; carnelian. 11. Early Minoan, *c.* 3500–2200; serpentine. 12. Middle Minoan, I. and II.; serpentine. 13. Late Minoan, I.–II.; red jasper. 14. Egyptian scarab, 13th dynasty; glazed steatite. 15. Graeco-Phoenician scarab, Bes with lions; green jasper. 16. Middle Minoan, III.; chalcedony. 17. Late Minoan, I.–II.; onyx. 18. Island gem, sea horse; steatite. 19. Geometric stone, chariot; steatite.

GEMS IN ART



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ARCHAIC GREEK, HELLENISTIC AND GRAECO-PERSIAN GEMS, V. AND VI. CENTURIES B.C. (PLASTER IMPRESSIONS)

1. **Athena.** Chalcedony, late 6th century. 2. **Hades and Persephone.** Chalcedony, *c.* 460. 3. **Winged figure.** Carnelian, early 5th century. 4. **Youth and dog.** Chalcedony, early 5th century. 5. **Woman playing the harp.** Rock crystal, 2nd half of 5th century. 6. **Man playing the kithara.** Steatite, signed by Syries, *c.* 520–500. 7. **Lioness.** Banded agate, 2nd half of 5th century. 8. **Satyr dancing.** Agate, late 6th century. 9. **Youth and woman.** Burnt carnelian, 2nd half of 5th century. 10. **Diomede.** Chalcedony, 1st half of 4th century. 11. **Nikê with trophy.** Chalcedony, signed by Onatas, 2nd half of 5th century. 12. **Two-horse chariot.** Chalcedony, *c.* 400. 13. **Woman passing chiton over-head.** Lapis lazuli, late 5th century. 14. **Woman with bird.** Chalcedony, 2nd half of 5th century. 15. **Lion seizing deer.** Rock crystal, late 4th century. 16. **Eros with goose.** Chalcedony, *c.* 400. 17. **Cheiron wounded.** Chalcedony, 2nd half of 5th century. 18. **Statue of a victorious boxer.** Banded agate, late 5th century. 19. **Girl writing.** Chalcedony, late 5th century. 20. **Portrait of Alexander.** Carnelian, Hellenistic. 21. **Muse with lyre.** Yellow glass paste. Hellenistic. 22. **Graeco-Persian; Persian lady.** Chalcedony, 2nd half 5th century. 23. **Portrait of Philetairos** Chalcedony sprinkled with jasper, **Hellenistic.** 24. **Graeco-Persian; Horseman** spearing boar. Chalcedony, 2nd half 5th century

uartzes, such as the carnelian, chalcedony and agate, are the chief ıaterials used.

The second half of the 5th and the early 4th centuries mark nother climax ın the history of Greek gem engraving We find ıe same conception of serene beauty in the minute products of ıe gem-cutters as in the contemporary statues. The favourite ıape employed is no longer the scarab but the scaraboid (fig. 2,), generally large and thick, and perforated to be worn on a ıivel (fig. 2, *L*) or as a pendant (fig. 2, *G*). With regard to the hoice of subjects the chief theme is now the daily life of the eople, especially of the women. A woman taking a bath, making ıusic, playing with animals, etc , are all favourite representations; ıimals are likewise common; mythological subjects are less opular The favourite deities are Aphrodite, Eros and Nîke Plate III , 5, 9, 10–19). By far the commonest stone of this eriod is the chalcedony Less frequent are the carnelian, agate, ock crystal, jasper and lapis lazuli

The ınscriptions which occur on Greek gems form an interest-ıg study. They generally give the name of the owner, often only ıe beginning of his name being recorded Occasionally they refer) the people represented or they contain a greeting. Sometimes he name of the artist is given Of the latter the most prominent re Epimenes (Plate IV , 8) and Dexamenos (fig. 2, *Q* and Plate V., 5) Their works rank among the best which have been pro-uced in Greek gem-cutting.

The Greek gems of the Hellenistic period about 323–30 B C eflect the somewhat heterogeneous styles of contemporary sculp-ıre; but there are not many notable representations. A great hange takes place ın the shape of the stones Instead of the per-orated scarabs and scaraboids the unperforated ringstone, gen-rally flat on one side and convex on the other, becomes the ccepted form The stones are often of considerable size and the ırge rings ın which they are mounted are not uncommonly pre-erved. The favourite stones are the hyacinth, garnet, beryl, opaz, amethyst, rock crystal, carnelian, sard, agate and sardonyx, ıany of them introduced into the Greek world from the East fter the conquests of Alexander the Great Glass, as a substitute or more precious material, is often used Among the subjects epresented the most ımportant is the portrait, which now acquires reat popularity (Plate III , 20, 23) Scenes from daily life and ıythology both occur (Plate III , 21)

A great technical ınnovation introduced in this period is the ameo, in which the representation instead of being engraved ın he surface of the gem is carved in relief (Plate V , 15) It is herefore the converse of the intaglio These cameos naturally did ot serve as seals, as did the intaglio, but were used purely for ıstruments and jewellery For such work the coloured quartzes ere generally employed, their various layers being skilfully and ffectively utilized, but imitations ın glass paste also occur (Plate , 30)

Graeco-Phoenician and Graeco-Persian Gems.—Another lass of gems ın which the influence of archaic Greek art is trongly shown is that of the Graeco-Phoenician scarabs, chiefly ound in the Carthaginian cemeteries of Sardinia (Plate II , 19) The stones there discovered show that during the 6th century .C. Phoenician art was strongly subjected to Egyptian influence, ut from the end of that century both the Greek style and Greek ubjects were adopted This archaic Greek style persevered in he Phoenician stones throughout the 5th century and into the th, long after a freer style had been introduced in Greece itself —a phenomenon with which we are familiar from Carthaginian oins The shape of stone is regularly the scarab and the favourite naterial green jasper. The representations consist chiefly of the avourite Greek types of youths and men, and of mythological reatures. Fantastic combinations of heads and masks probably ıad an apotropaic significance.

The Graeco-Persian gems illustrate the influence of Greek art n the East. In Persia the gems of purely Persian style (Plate I ,) are followed in the second half of the 5th and the first half of he 4th century by gems in which Persian and Greek elements ommingled. They were evidently made by Greeks for Persians. The subjects are taken from the daily life of the Persian nobles, preferably contests of Persians and Greeks, or hunting scenes (Plate III., 24), or single figures of Persian nobles or ladies (Plate III , 22) Animals are also favourite subjects. These representations are executed in a broad, spirited style, chiefly on chalcedony stones of scaraboid form. A rectangular shape with one faceted side is also popular.

Etruria.—Etruscan gems make their appearance toward the end of the 6th century B C and remain ın vogue until the 4th They closely copy Greek styles, forms and subjects (Plate V., 1–3) At times their execution is excellent, but there is always a certain dryness and stiffness which serve to distinguish even their best products from pure Greek work The shape is invariably that of the scarab, worked often with minute care, while to the Greek artist it was of secondary interest (compare fig 2, *O* and *P*). Moreover, the edge of the base on which the beetle stands, which in the Greek examples is left plain, is ornamented ın the Etruscan gems, except ın the earliest period and in the more careless speci-mens. By far the commonest material is the carnelian The subjects chosen are chiefly taken from Greek mythology Homeric and Theban heroes predominate (Peleus, Achilles, Odysseus, Ajax, Tydeus and Kapaneus). Inscriptions sometimes occur; but they do not, as in the Greek gems, give the name of the owner or of the artist but of the figure represented

At the end of the 5th century another class of scarab becomes prevalent, lasting until the beginning of the 3rd century B C. It is not confined to Etruria but occurs also elsewhere ın Italy The distinguishing characteristic is that it is roughly worked with the round drill (Plate V., 4), evidently merely for decorative effect, which is heightened by the brilliant polish Herakles and Silenus are the popular subjects.

Roman Gems.—The Etruscan scarabs are superseded in Italy ın the 3rd and 2nd centuries B C by ringstones ın which we can distinguish two styles, according as they imitate Etruscan (Plate V , 5) or Hellenistic art (Plate V , 6). There are no great artistic achievements among them but they are nevertheless of interest ın that they form an important source of knowledge for the Roman art of the earlier republican period. In the 1st century B C the two styles became merged, with Greek elements predominating (Plate V , 7) and growing gradually into the classicist style of the Augustan age

Engraved gems enjoyed a great popularity in Rome during the late republican and early imperial periods We know this not only from the large number of examples which have survived but also from literary sources Gem-collecting became a passionate pur-suit. Wealthy men vied with one another ın procuring fine speci-mens and paid enormous prices for them The keenness of this rivalry can be gauged by the story that the senator Nonius was exiled from Rome because he refused to give a certain gem (val-ued at 20,000 sesterces) to Mark Antony Public-spirited men, then as nowadays, after having formed their collections would de-posit them in the temples for all to enjoy Scaurus, the son-in-law of Sulla, is said to have been the first Roman to have a collection of gems Julius Caesar was an eager and discriminating collector and deposited as many as six separate collections in the temple of Venus Genetrix The style of the representations is that of the classicist art of the early imperial period which we encounter on other contemporary products. Its dominant characteristic is a quiet, cold elegance The subjects have a wide range comprising mythological and every-day themes, including portraits of dis-tinguished men, copies and adaptations of famous statues, symbols and *grylloi*—fantastic combinations of heads and figures, prob-ably with superstitious import (Plate V., 8–13) The prevalent form is throughout the ringstone The variety of stones used is large, for at this time of Roman world dominion and increased commercial facilities they could be obtained without difficulty from all parts of the empire. The commonest are the carnelian, sard, sardonyx, chalcedony and amethyst; especially fine engravings are often found on garnets, hyacinths, beryls, topazes and peridots, more rarely on emeralds and sapphires The nicolo and red jasper, which occurred only occasionally in former periods, now enjoyed great popularity. The Roman enthusiasm for this wealth of beau-tiful stones can be gauged from the remarks of Pliny (*N H.*

xxxvii., 1) who declared that some gems are considered "beyond any price and even beyond human estimation, so that to many men one gem suffices for the contemplation of all nature."

Cameos continued in use throughout this period, chiefly of sardonyx, onyx and glass paste (Plate V., 15). The favourite subjects are portraits and mythological scenes Among the former are valuable representations of emperors and princes.

Signatures of artists are found not infrequently both on the intaglios and cameos In fact, by far the majority of ancient gem-cutters known to us belong to early imperial times The most distinguished artist was Dioskourides, of whom we know that he made the imperial seal-ring of Augustus (Pliny *N H* xxxvii, 50 and 73) Other well-known names are Gnaios (Plate V, 12), Aspasios, Eutyches (Plate V., 13), Aulos, Apollonios, Agathangelos (Plate IV, 16) (*See* GREEK ART; ROMAN ART.)

Late Roman Period.—By the 2nd century A D glyptic art was on the decline Of the large number of gems of that period which have survived very few have any artistic value The majority show hasty, careless workmanship and the representations are lifeless and monotonous (Plate V., 14). The shape of the gems is always the ringstone and the materials are very much the same as those in use during the preceding period Nicolo and jasper now become specially common, probably on account of supposed magical properties

The same deterioration is noticeable in the early Christian (Plate V., 22) and Gnostic gems (Plate V., 21). A gem now became a talisman with long, often unintelligible formulae. The symbolism is largely associated with Mithraic worship. The name Abraxas (or Abrasax) occurs with great frequency (Plate V, 21). The commonest materials are hematite and jasper

More important artistically are the Sassanian gems (3rd to 7th century A D) which indeed represent the last important product of gem engraving in the ancient world. The representations are a mixture of oriental traditions and late Roman forms. Especially fine are some of the portraits (Plate V, 20)

In north India the Ephthalites (white Huns) established a civilization about A.D. 475 which lasted until about A.D. 550. That they too practised the art of gem engraving is shown by a recently discovered stone with the portrait of an Indian king (Plate I, 26)

Post-classical Times.—In post-classical times there are two epochs in which the art of gem engraving again flourished, the Renaissance and the 18th and early 19th centuries. The artists of both periods borrowed freely from the antique. Those of the Renaissance were too individual to keep very closely to the ancient spirit, and Renaissance works are therefore seldom difficult to distinguish from ancient gems (Plate V, 16). The gem engravers of the 18th century, on the other hand, had little inspiration of their own, and consciously tried to copy ancient work as exactly as possible. And though at first this copying was done purely out of admiration for the antique, it soon developed with unscrupulous people into an extensive output of forgeries. At times it is extremely difficult to tell definitely whether a certain piece is ancient or a faithful copy. Mostly, however, the copyist betrayed himself by a slight innovation characteristic of the spirit of his own time rather than that of the antique (Plate V, 18), and in a large number of cases, notably in the famous Poniatowski gems (Plate V, 17, 19), the spirit and composition are so far removed from ancient work that few people would nowadays be deceived by them.

An interesting feature of the gems of this period is presented by the inscriptions which often appear and give the signatures of the artist or would-be artist For besides signing their own names, often in Greek or Roman letters, it became the practice to sign the name of a famous ancient artist Generally such forged inscriptions are easily detected, but sometimes they are cut with great care and present a difficult problem Moreover, at times genuine ancient gems are supplied with forged signatures. The best-known gem-cutters of this period are the famous Natter, the three Pichlers, Marchant and Burch.

In modern times the art has a certain limited vogue, not comparable, however, with the great periods we have described

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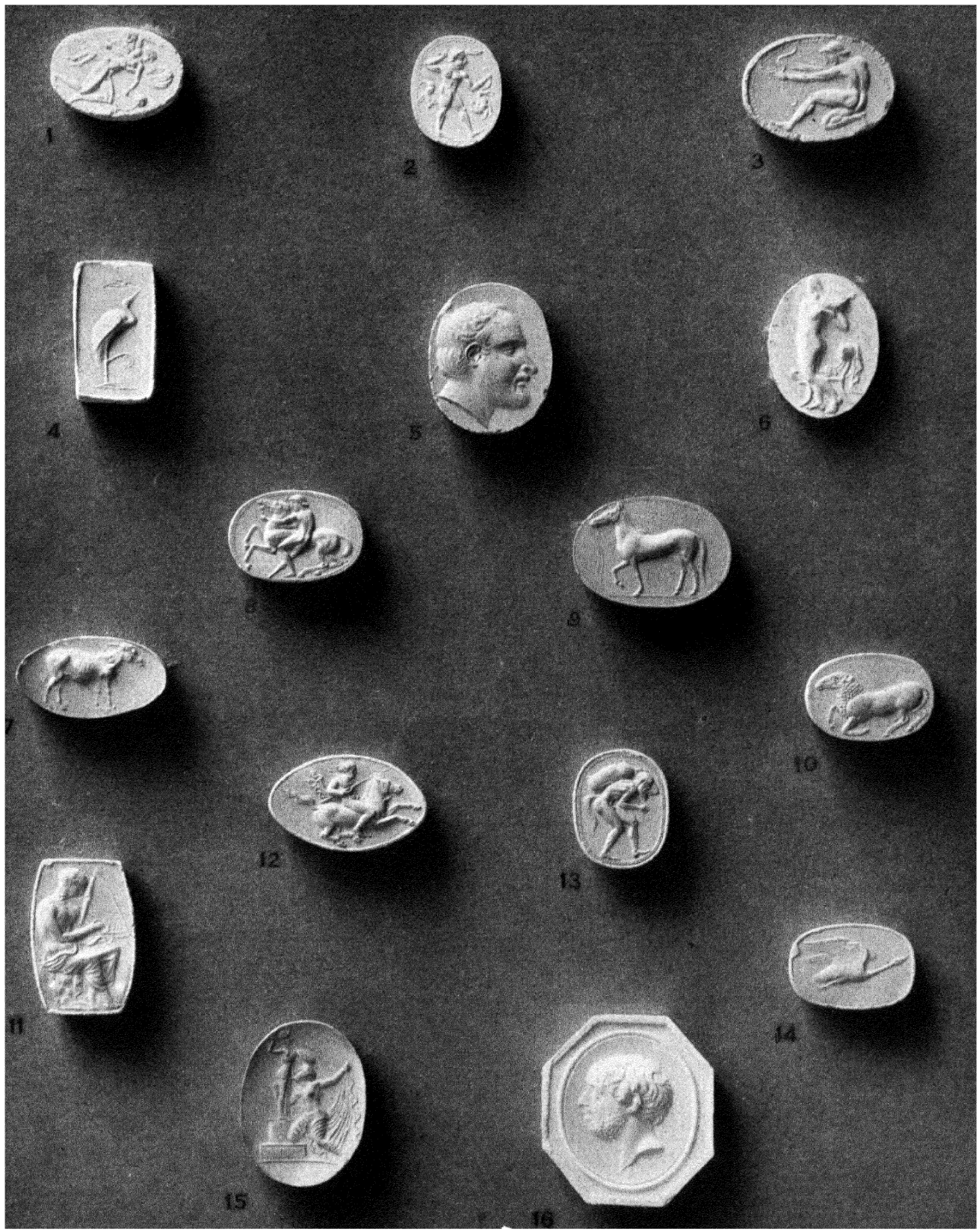
GENE. The word gene (Gr. γένος, race) has come to be used, more particularly in the United States, as the equivalent of the word gen The latter was first coined by Johannsen (1909) to signify the unit in inheritance. As a prefix, gen appears in such words as genetic and genealogical, but used by itself it stands for a purely hypothetical unit in inheritance. In England the word "factor" is more frequently used, but factor has also a wider significance, gene is equivalent to genetic factor The word is used almost exclusively in Mendelian literature, and has come to have a more specific application to the elementary unit carried by chromosomes. The functional significance of the gene in development, in determining the character of the individual, is the subject at present of much speculation, and diverse views have been expressed as to how the genes are related to the characters for which they are, in a sense, the sponsors in the germinal material

The assumption of fundamental units in heredity is a familiar procedure in biological literature Herbert Spencer postulated physiological units out of which the body is built, somewhat as are crystals from molecules of a salt in solution. Darwin's theory of pangensis called for "gemmules," supposed to be specific particles set free from all parts of the body, which uniting with similar particles in the eggs and sperm-cells render the inheritance of acquired characters possible. Haeckel used the word "plastidule" for the ultimate particles of the protoplasm De Vries postulated intracellular pangenes, which, being set free from the nucleus, determine the character of the cell but do not pass beyond the cell boundaries Weismann invented an elaborate system of hierarchies of elements consisting of biophors (the simplest) determinants, ids and idants (chromosomes). The determinants were supposed to be sorted out during the earlier embryonic cell-divisions in an orderly fashion, each cell finally getting a particular kind that determined its functional behaviour. None of Weismann's units were supposed to pass beyond the limits of the cell In all these earlier hypotheses the units were purely fictitious in the sense that they were devised to carry out certain imaginary processes. To the units were assigned arbitrarily such properties as the particular end in view required.

The idea of units in Mendelian work has a different derivation. The results of experimental breeding have shown that when certain contrasted characters are brought together in a hybrid (F_1),



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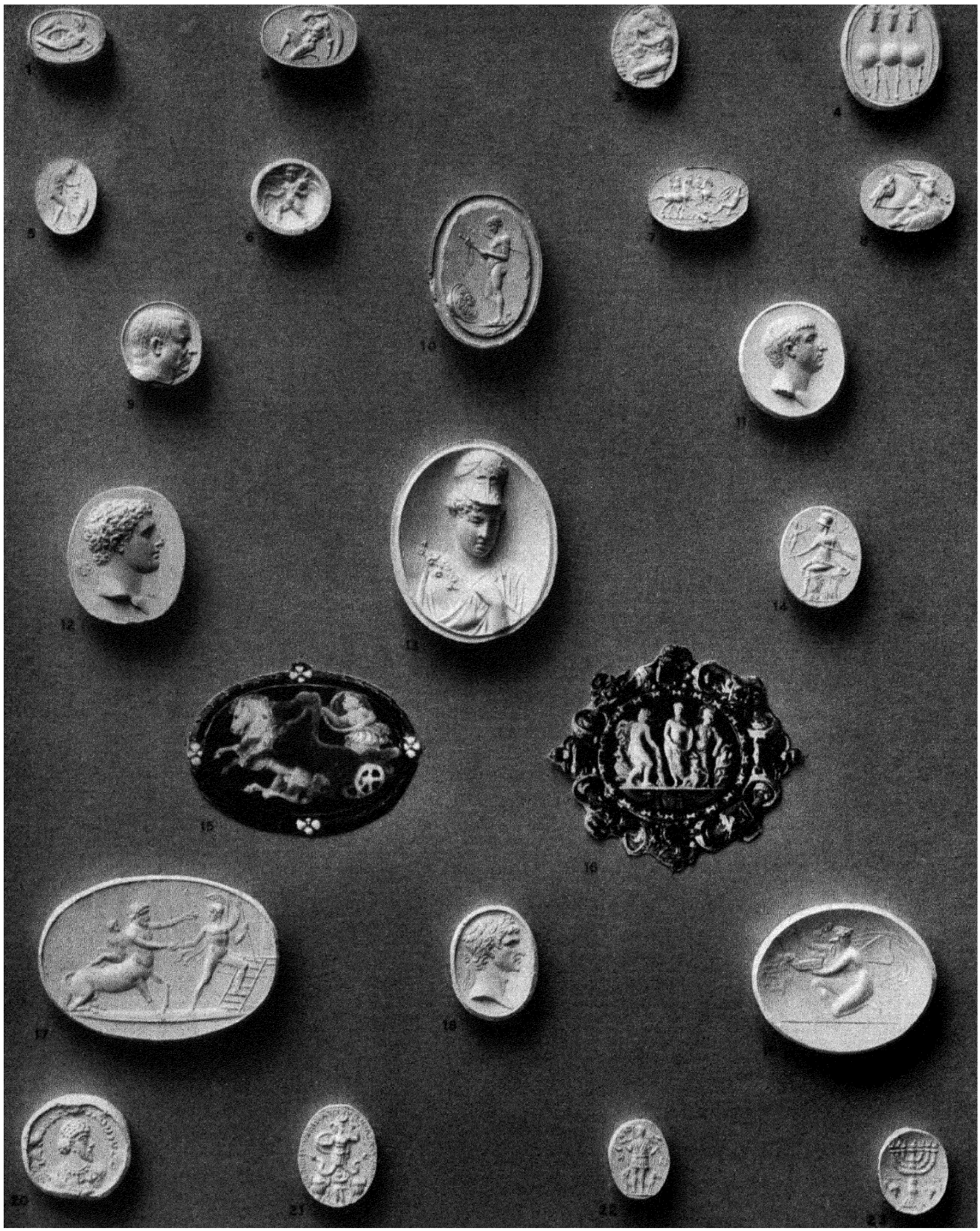
GREEK AND ROMAN GEMS, V. TO I. CENTURY B.C. (ENLARGED 1:1½, FROM PLASTER IMPRESSIONS)

1–15. GREEK: 1. Eros and girl. Carnelian; early 5th century. 2. Herakles. Carnelian; early 5th century. 3. Archer. Chalcedony; *c.* 500. 4. Heron. Chalcedony; 3rd quarter of 5th century. 5. Portrait signed by Dexamenos. Yellow jasper; 3rd quarter of 5th century. 6. Dancer. Gold ring; middle 5th century. 7. Donkey. Gold ring, early 4th century. 8. Youth with horse. Chalcedony; signed by Epimenes, *c.* 500. 9. Race horse walking. Chalcedony; 2nd half of 5th century. 10. Ewe. Chalcedony; 5th century. 11. Man playing lyre. Burnt sard; 5th century. 12. Horseman. Gold ring; 4th century. 13. Silenus with wine skin. Sard; 2nd half of 5th century. 14. Wild goose. Banded onyx; 2nd half of 5th century. 15. Cassandra. Sard; 4th century. 16. ROMAN. Portrait of Sextus Pompeius. Carnelian; 35 B.C.

GEMS IN ART



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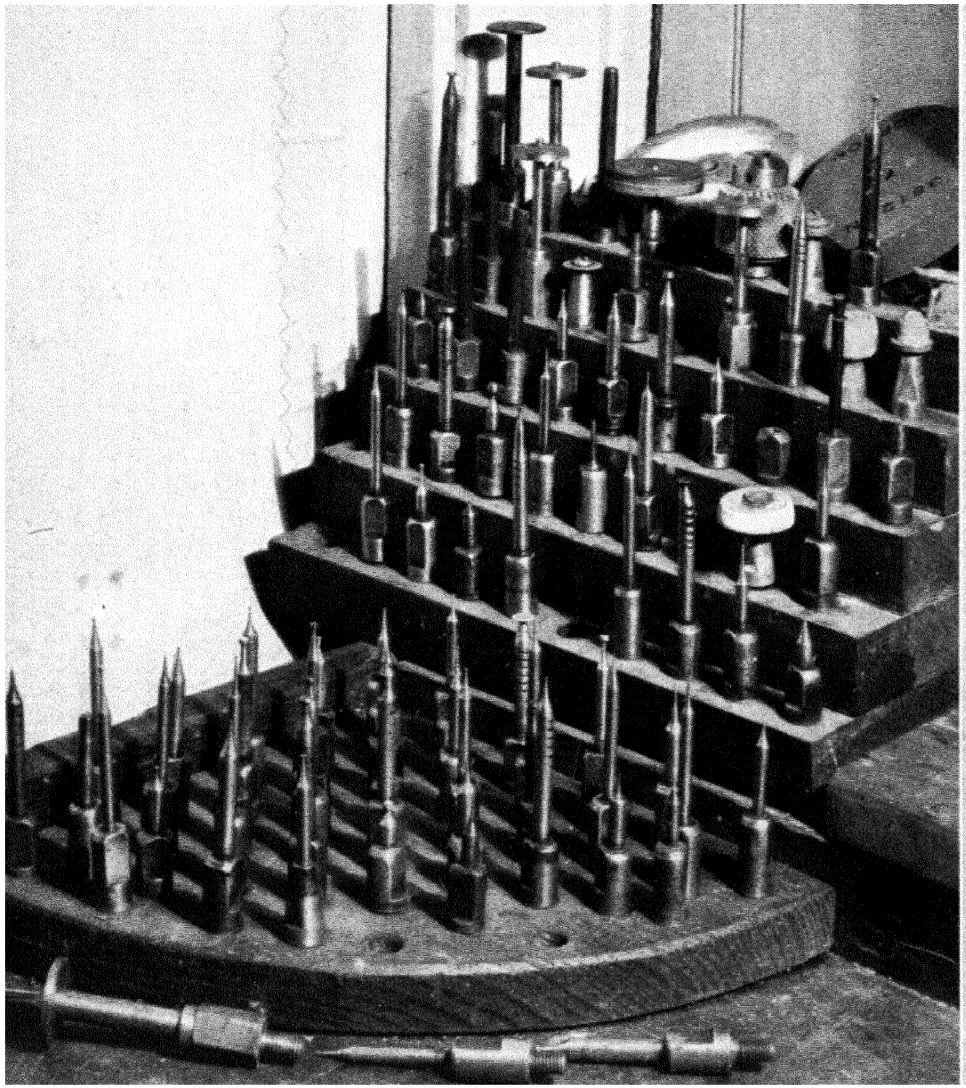
EXAMPLES OF GEMS, V. CENTURY B.C. TO XIX. CENTURY A.D.

(FROM PLASTER IMPRESSIONS EXCEPT FIGS. 15 AND 16)

1–4. ETRUSCAN, V.–IV. CENTURY B.C.: 1. Athlete pouring sand on his thigh. Sard. 2. Achilles. Carnelian. 3. Herakles and Nemean lion. Banded agate. 4. Three horses. Carnelian. **5–7. ITALIC, III.–I. CENTURY B.C.:** 5. Man working on prow of ship. Carnelian. 6 Eros. Brown glass paste. 7. Two Dioskouroi at battle of Regillus. Carnelian. **ROMAN, I. CENTURY B.C.–I. CENTURY A.D.: 8–13.** 8 Gryllos. Carnelian. 9. Portrait. Chalcedony. 10. Theseus. Sard. 11. Portrait. Carnelian. 12. Head of Herakles, signed Gnaios. Blue beryl. 13. Bust of Athena, signed by Eutyches. Rock crystal. **LATE ROMAN, II. CENTURY A.D.:** 14. Roma holding a victory. Red jasper. **15–16. CAMEOS:** 15. Aurora, Roman. Sardonyx. 16. Juno, Venus and Pallas. Renaissance, 16th century A.D. 17 19. **XVIII. AND XIX. CENTURIES:** 17. Jason and Cheiron, inscribed Kronos. Carnelian. 18. Nerva. Carnelian. 19. Psyche, inscribed Gnaios. Amethyst. 20 22. **MISCELLANEOUS:** 20. Sassanian; portrait. Carnelian. 21. Gnostic; Abraxas Heliotrope. 22. Early Christian; the Good Shepherd. Jasper. 23. Early Christian, Seven-branched candlestick. Carnelian





TECHNIQUE OF MODERN GEM ENGRAVING

1. Drills and chucks used with machines in modern gem-engraving. The cutting is done, not by the drills, but by the powder (diamond dust mixed with oil) which is rubbed on the stone with the drill

2. An engraver at work on a seal. The stone to be engraved is fastened to a handle. It is held to the head of the rotating drill and moved as the work requires

the two original characters appear in the next generation (F_2), in definite proportions. Mendel pointed out that these numerical relations could be understood if for any one pair it is assumed that the reproductive cells of the first two parents that were crossed each introduced into the hybrid an element representative of the character in question. He further assumed that these elements are sorted out in the germ-cells of the hybrid (without having contaminated each other) in such a way that each germ-cell (egg or sperm) carries one or the other of these elements Chance fertilization of any egg by any sperm will give the numerical ratios found in the next (F_2) generation. No special functions or characteristics are assigned to these elements (genes) other than their power to divide, or at least to reproduce themselves and each to retain in the hybrid its specificity All later work in genetics rests on these Mendelian postulates, but in the further development of the subject evidence has been found that makes it possible to locate the genes in the chromosomes and even to determine their relation there with respect to one another For example, in the vinegar (or fruit) fly, *Drosophila melanogaster*, which has been more thoroughly examined than any other form, it has been found that the genes are inherited in great groups. They are said to be linked together There are as many of these linkage groups as there are chromosome pairs. The members of one group usually remain united, but there may be occasional interchanges between the members of a group, always in an orderly fashion (crossing over). Such interchanges take place only between like linkage groups, *i e*, between each group derived from the father with that from the mother—never between different linkage groups Crossing over has made it possible to determine the sequence of the genes within each group, and to get a rough measure of their distances apart, on the assumption that this distance apart determines the chance of crossing over between them. The mapping of the genes on this assumption has made it possible to predict accurately the behaviour of the genes in any known situation.

The localization of the genes in the chromosomes (which are material bodies easily visible under the microscope) has undoubtedly led to the conception of the genes as material particles lying in a single line in each chromosome. Whether they are so conceived or not does not affect the theory that the characters of the individual have representatives in the chromosomes that permit formulation of definite laws of heredity.

There is some further evidence concerning the relation of the genes of characters that is significant While it is true that our knowledge concerning the gene has been determined by following the reappearance of single contrasted pairs of characters from one generation to the next, nevertheless there is abundant evidence that each gene may affect many characters at the same time, a study of any pair of which will lead to the same result. The genes then are thought of as fundamentally different from Weismann's determinants In fact, there is reason to infer that every gene contributes to every part of the body, affecting some parts more than others, and the latter are only those that are picked out for convenience in studying heredity As a corollary to this view there is the further inference, based on sufficient evidence, that the character of the individual is the result of a definite balance (or interaction) between the activities of the genes If this balance is changed the end result is affected. This is most evident in the case of sex determination where the female is the result of one kind of balance and the male of another in animals and plants with separate sexes Alterations in this balance, if not too extreme, may give rise to intersexes that stand in certain respects between the typical males and females The balance also carries with it the tacit assumption of a normal environment If the environment is altered the end result may be different Thus in certain hermaphroditic plants, and perhaps also in animals, it is possible to suppress the development of one set of sexual organs by changing the outside influences (light, temperature, etc) It is more questionable whether in the higher animals with separate sexes it is possible to change one sex into the other by alteration in the environment, although it has been demonstrated that by changing the internal environment (especially by altering the relation of the endocrine substances produced by the gonad or other glands having internal secretions), it is possible to change the secondary sexual organs of one sex into those of the other.

(T. H. M)

GENEALOGY, a pedigree or list of ancestors, or the study of family history (from the Gr. *γένος*, family, and *λόγος*, theory)

Biblical Genealogies.—The aims and methods of ancient genealogists require to be carefully considered before the value of the numerous ancestral lists in the Bible can be properly estimated Many of the old "genealogies," like those of Greece, have arisen from the desire to explain the origin of the various groups which they include The subdivision of tribes, their relation to each other, the intermingling of populations and the like are thus frequently represented in the form of genealogies The "sons" of a "father" often stand for the branches of a family as they existed at some one period, and since in course of time tribal relations would vary, lists will present discrepancies Many of the Biblical names are nothing more than personifications of nations, tribes, towns, etc., grouped together to convey some idea of the bond by which they were believed to be connected. Thus we find among the "sons" of Japhet. (the nations) Gomer, Javan, Tubal; Canaan "begat" Sidon and Heth; the "sons" of Ishmael include the well-known tribes Kedar and Jetur; Jacob, or the synonym Israel, personifies the "children of Israel" The recognition of this usage often furnishes an ethnological interpretation to those genealogical stories which obviously do not relate to persons, but to tribes or peoples personified The Edomites and Israelites are regarded as "brothers" and since Esau (Edom) was born before Jacob (Israel) it would appear that the Edomites were held to be the older nation The union of two clans is expressed as a marriage, or the wife is the territory which is dominated by the husband (tribe), *see* CALEB If the woman is not of noble blood, but is a handmaiden or concubine, her children are naturally not upon the same footing as those of the wife; consequently the descendants of Ishmael, the son of Hagar (Sarah's maid), are inferior to Isaac and his descendants, whilst the children of Keturah, Abraham's concubine, are still lower—from the Israelite point of view This application of the terms of relationship is characteristic of the Semites The "father" of the Rechabites is their head or founder and a common bond, not necessarily physical, unites all "sons," whether they are "sons of the prophets" (members of prophetic guilds) or "sons of Belial" (worthless men)

Every case has to be judged upon its own merits, and allowance made both for the ambition of the weaker to claim or to strengthen an alliance with the stronger, and for the desire of clans or individuals to magnify the greatness of their ancestry The first step must always be the careful comparison of related lists in order to test the consistency of the tradition Next, these must be critically studied in the light of all available historical material, though indeed such evidence is not necessarily conclusive Finally, (*a*) literary criticism must be employed to determine if possible the dates of such lists, since obviously a contemporary register is more trustworthy than one which is centuries later; (*b*) a critical estimate of the character of the names and of their use in various periods of Old Testament history is of importance in estimating the antiquity of the list—for example, many of the names in Chronicles attributed to the time of David are indubitably exilic or post-exilic, and (*c*) principles of ordinary historical probability are as necessary here as in dealing with the genealogies of other ancient peoples, and attention must be paid to such features as fluctuation in the number of links, representation of theories inconsistent with the growth of national life, schemes of relationship not in accordance with sociological conditions, etc G B Gray's *Hebrew Proper Names* (1896), with his article in the *Expositor* (Sept 1897), pp 173–190, should be consulted for the application and range of Hebrew names in O T genealogies and lists

The Biblical genealogies commence with "the generations of the heaven and earth," and by a process of elimination pass from Adam and Eve by successive steps to Jacob and to his sons (the tribes), and finally to the subdivisions of each tribe According to this theory every Israelite could trace back his descent to Jacob, the common father of the whole nation Such a scheme, however,

is full of manifest improbabilities It demands that every tribe and every clan should have been a homogeneous group which had preserved its unity from the earliest times, that family records extending back for several centuries were in existence, and that such a tribe as Simeon was able to maintain its independence in spite of the tradition that it lost its autonomy in very early times (Gen. xlix 7). The whole conception of the unity of the tribes cannot be referred to a date previous to the time of David, and in the older writings a David or a Jeroboam was sufficiently described as the son of Jesse or of Nebat The genealogical zeal as represented in the Old Testament is chiefly of later growth, and the exceptions are due to interpolation (Josh vii 1 18, contrast *v* 24), or to the desire to modify or qualify an older notice This, in the case of Saul (1 Sam ix 1), has led to textual corruption, a list of such a length as his should have reached back to one of the "sons" of Benjamin (*cf e g* Gen xlvi 21), else it were purposeless The genealogies, too, are often inconsistent amongst themselves and in contradiction to their object They show, for example, that the population of southern Judah, so far from being "Israelite" was half-Edomite (*see* JUDAH), and several of the clans in this district bear names which indicate their original affinity with Midian or Edom Moreover, there was a free intermixture of races, and many cities had a Canaanite (*i e* pre-Israelite) population which must have been gradually absorbed by the Israelites (*cf* Judg i) That spirit of religious exclusiveness which marked later Judaism did not become prominent before the Deuteronomic reformation and it is under its influence that the writings begin to emphasize the importance of maintaining the purity of Israelite blood, although by this time the fusion was complete (*see* Judg iii 6) and for practical purposes a distinction between Canaanites and Israelites within the borders of Palestine could scarcely be discerned

Many of the genealogical data are intricate Thus, the interpretation of Gen xxxiv is particularly obscure (*see* LEVITES *ad fin*; SIMEON). As regards the sons of Jacob, it is difficult to explain their division among the four wives of Jacob, viz (*a*) the sons of Leah are Reuben, Simeon, Levi and Judah (S Palestine), Issachar and Zebulun (in the north), and Dinah (associated with Shechem), (*b*) of Leah's maid Zilpah, Gad and Asher (E and N Palestine); (*c*) of Rachel, Joseph (Manasseh and Ephraim, *i e*, central Palestine) and Benjamin, (*d*) of Rachel's maid Bilhah, Dan and Naphtali (N Palestine) It has been urged that (*b*) and (*d*) stood upon a lower footing than the rest, or were of later origin; or that Bilhah points to an old clan associated with Reuben (Gen xxxv 22) or Edom (Bilhan, Gen xxxvi 27), whilst Zilpah represents an Aramaean strain Tradition may have combined distinct schemes, and the belief that the wives were Aramaean at least coincides with the circumstance that Aramaean elements predominated in certain of the twelve tribes The number "twelve" is artificial and can be obtained only by counting Manasseh and Ephraim as one or by omitting Levi, and a careful study of Old Testament history makes it extremely difficult to recover the tribes as historical units. *See*, on these points, the articles on the several tribes, B Luther, *Zeit d alttest Wissens* (1901), pp 1 *sqq*; G B Gray, *Expositor* (March 1902), pp 225–240, and in *Ency Bib*, art "Tribes", and H W Hogg's thorough treatment of the tribes in the last-mentioned work

The ideal of purity of descent shows itself conspicuously in portions of Deuteronomic law (Deut vii 1–3, xxiii 2–8), and in the reforms of Nehemiah and Ezra The desire to prove the continuity of the race, enforced by the experience of the exile, gave the impetus to genealogical zeal, and many of the extant lists proceed from this age when the true historical succession of names was a memory of the past. This applies with special force to the lists in Chronicles which present finished schemes of the Levitical divisions by the side of earlier attempts, with consequent confusion and contradiction. Thus the immediate ancestors of Ethan appear in the time of Hezekiah (2 Chron. xxix. 12), but he with Asaiah and Heman are contemporaries of David, and their genealogies from Levi downwards contain a very unequal number of links (1 Chron vi) By another application of genealogical method the account of the institution of priests and Levites by David (1 Chron xxiv) presents many names which belong solely to post-exilic days, thus suggesting that the scribes desired to show that the honourable families of their time were not unknown centuries previously Everywhere we find the results of much skill and labour, often in accordance with definite theories, but a thorough investigation reveals their weakness and often quite incidentally furnishes valuable evidence of another nature.

The intricate Levitical genealogies betray the result of successive genealogists who sought to give effect to the development of the hierarchal system The climax is reached when all Levites are traced back to Gershon, Kehath and Merari, to which are ascribed respectively Asaph, Heman and Ethan (or Jeduthun) The last two were not originally Levites in the later accepted sense of the term (*see* 1 Kings iv 31) To Kehath is reckoned an important subdivision descended from Korah, but in 2 Chron xx 19 the two are distinct groups, and Korah's name is that of an Edomite clan (Gen xxxvi 5, 14, 18) related to Caleb, and thus included among the descendants of Judah (1 Chron ii 43) Cases of adjustment, redistribution and "Levitizing" of individuals are frequent There are traces of varying divisions both of the singers (Neh xi 17) and of the Levites (Num xxvi 58; Ezr ii 40, iii 9, 1 Chron xv 5–10, xxiii), and it is noteworthy that in the case of the latter we have mention of such families as Hebroni (Hebronite), Libni (from Libnah)—ethnics of south Judaean towns In fact, a significant number of Levitical names find their analogy in the lists of names belonging to Judah, Simeon and even Edom, or are closely connected with the family of Moses; *e g* Mushi (*i e*, Mosaite), Gershon and Eleazar (*cf* Gershom and Eliezer, sons of Moses) The Levites bear a class-name, and the genealogies show that many of them were connected with the minor clans and families of South Palestine which included among them Moses and his kin Hence, it is not unnatural that Obed-edom, for example, obviously a southerner, should have been reckoned later as a Levite, and the work ascribed by the chronicler's history to the closing years of David's life may be influenced by the tradition that it was through him these mixed populations first attained importance

In the time of Josephus every priest was supposed to be able to prove his descent, and perhaps from the time of Ezra downwards lists were carefully kept But when Anna is called an Asherite (Luke ii 36), or Paul a Benjamite (Rom xi 1), family tradition was probably the sole support to the claim, although the tribal feeling had not become entirely extinct The genealogies of Jesus prefixed to two of the gospels are intended to prove that He was a son of David But not that alone, for in Matt i He is traced back to Abraham the father of the Jews, whilst in Luke iii He, as the second Adam, is traced back to the first man The two lists are hopelessly inconsistent, not because one of them follows the line of Mary, but because they represent independent attempts That in Matthew is characteristically arranged in three series of fourteen generations each through the kings of Judah, whilst Luke's passes through an almost unknown son of David; in spite of this, however, both converge in the person of Zerubbabel

See further, A C Hervey, *Genealogies of Our Lord;* H von Soden, *Ency. Bib* ii col 1666 *sqq*, B W Bacon, Hastings' *Dict Bib*, ii pp 138 *seq*. On the subject generally *see* J. F M'Lennan's *Studies* (2nd ser, ch ix, "fabricated genealogies"), S A Cook, *Ency Bib* ii col 1657 *sqq* (with references), W R. Smith, *Kinship and Marriage* (2nd ed, especially ch i) (S A C)

Modern.—Two forces have combined to give genealogy its importance during the period of modern history· the laws of inheritance, particularly those which govern the descent of real estate, and the desire to assert the privileges of a hereditary aristocracy But it is long before genealogies are found in the possession of private families The succession of kings and princes is in the chronicle book; the line of the founders and patrons of abbeys is recorded by the monks with curious embellishment of legend But the famous suit of Scrope against Grosvenor will illustrate the late appearance of private genealogies in England In 1385 Sir Richard Scrope, lord of Bolton, displaying his banner in the host that invaded Scotland, found that his arms of a golden bend in a blue field were borne by a knight of the Chester palatinate, one Sir Robert Grosvenor He carried the dispute to a court of chivalry, whose decision in his favour was confirmed on appeal

to the king Grosvenor asserted that he derived his right from an ancestor, Sir Gilbert Grosvenor, who had come over with the Conqueror, while an intervening claimant, a Cornish squire named Thomas Carminowe, boasted that his own ancestors had borne the like arms since the days of King Arthur's Round Table. It is remarkable that in support of the false statements made by the claimants no written genealogy is produced. The evidence of tombs and monuments and the reports of ancient men are advanced, but no pedigree is exhibited in a case which hangs upon genealogy It is possible that the art of pedigree-making had its first impulse in England from the many genealogies constructed to make men familiar with the claims of Edward III. to the crown of France, a second crop of such royal pedigrees being raised in later generations during the contests of York and Lancaster But it is not until after the close of the middle ages that genealogies multiply in men's houses and are collected into volumes The mediaeval baron, knight or squire, although proud of the nobility of his race, was content to let it rest upon legend handed down the generations The exact line of his descent was sought only when it was demanded for a plea in the king's courts to support his title to his lands

From the first the work of the genealogist in England had that taint of inaccuracy tempered with forgery from which it has not yet been cleansed The mediaeval kings, like the Welsh gentry of later ages, traced their lines to the household of Eden garden, while lesser men, even as early as the 14th century, eagerly asserted their descent from a companion of the Conqueror Yet beside these false imaginations we find the law courts, whose business was often a clash of pedigrees, dealing with genealogies centuries long which, constructed as it would seem from worthy evidences, will often bear the test of modern criticism

Genealogies in great plenty are found in manuscripts and printed volumes from the 16th century onward Remarkable among these are the descents recorded in the Visitation Books of the heralds, who, armed with commissions from the crown, the first of which was issued in 20 Hen VIII, perambulated the English counties, viewing arms and registering pedigrees The notes in their register books range from the simple registration of a man's name and arms to entries of pedigrees many generations long To the heralds these visitations were rare opportunities of obtaining fees from the visited, and the value of the pedigrees registered is notably unequal Although it has always been the boast of the College of Arms that Visitation records may be produced as evidence in the law courts, few of these officially recorded genealogies are wholly trustworthy Many of the officers of arms who recorded them were, even by the testimony of their comrades, of indifferent character, and even when the visiting herald was an honourable and industrious man he had little time to spare for the investigation of any single genealogy Deeds and evidences in private hands may have been hastily examined in some instances—indeed, a herald's summons invites their production—and monuments were often viewed in the churches, but for the most part men's memories and the hearsay of the country-side made the backbone of the pedigree The further the pedigree is carried beyond the memory of living men the less trustworthy does it become The principal visitations took place in the reigns of Elizabeth, James I, Charles I and Charles II No commission has been issued since the accession of William and Mary, but from that time onwards large numbers of genealogies have been recorded in the registers of the College of Arms, the modern ones being compiled with a care which contrasts remarkably with the unsupported statements of the Tudor heralds

Outside the doors of the College of Arms genealogy has now been for some centuries a favourite study of antiquaries, whose researches have been of the utmost value to the historian, the topographer and the biographer County histories, following the example of Dugdale's Warwickshire folios, have given much space to the elucidation of genealogies and to the amassing of material from which they may be constructed Dugdale's great work on the English baronage heads another host of works occupied with the genealogy of English noble families, and the second edition of "G.E C 's" *Complete Peerage* shows the mighty advance of the modern critical spirit Nevertheless, the 20th century has not yet seen the abandoning of all the genealogical fables nourished by the Elizabethan pedigree-mongers, and the ancestry of many noble houses as recorded in popular works of reference is still derived from mythical forefathers Thus the dukes of Norfolk, who, by their office of earl marshal are patrons of the heralds, are provided with a 10th century Hereward for an ancestor, the dukes of Bedford, descendants of a 15th century burgess of Weymouth, are traced to the knightly house of Russell of Kingston Russell, and the dukes of Westminster to the mythical Gilbert le Grosvenor who "came over in the train of the Conqueror"

Genealogical research has, however, made great advance during the last generation The critical spirit shown in such works as Round's *Studies in Peerage and Family History* (1901) has assailed with effective ridicule the methods of dishonest pedigree-makers Much raw material of genealogy has been made available for all by the publication of parish registers, marriage-licence allegations, monumental inscriptions and the like, and above all by the mass of evidences contained in the volumes issued by the Public Record Office

Within a small space it is impossible to set forth in detail the methods by which an English genealogy may be traced But those who are setting out upon the task may be warned at the outset to avoid guesswork based upon the possession of a surname which may be shared by a dozen families between whom is no tie of kinship A man whose family name is Howard may be presumed to descend from an ancestor for whom Howard was a personal name: it may not be presumed that this ancestor was he in whom the dukes of Norfolk have their origin A genealogy should not be allowed to stray from facts which can be supported by evidence A man may know that his grandfather was John Stiles who died in 1850 at the age of fifty-five It does not follow that this John is identical with the John Stiles who is found as baptized in 1795 at Blackacre, the son of William Stiles But if John the grandfather names in his letters a sister named Isabel Nokes, while the will of William Stiles gives legacies to his son and daughter John Stiles and Isabel Nokes, we may agree that reasonable proof has been given of the added generation A new pedigree should begin with the carefully tested statements of living members of a family The next step should be to collate such family records as Bible entries, letters and diaries, and inscriptions on mourning rings, with monumental inscriptions of acknowledged members of the family From such beginnings the genealogist will continue his search through the registers of parishes with which the family has been connected, wills and administrations registered in the various probate courts form, with parish registers, the backbone of most middle-class family histories Court rolls of manors in which members of the family were tenants give, when existing and accessible, proofs which may carry back a line, however obscure, through many descents When these have been exhausted the records of legal proceedings, and notably those of the court of chancery, may be searched Few English households have been able in the past to avoid an appeal to the chancery court, and the bill and answer of a chancery plaintiff and defendant will often tell the story of a family quarrel in which a score of kinsfolk are involved, the pleadings may contain the material for a family tree of many branching generations Coram Rege and De Banco rolls may even, in the course of a dispute over a knight's fee or a manor carry a pedigree to the Conquest of England, although such good fortune can hardly be expected by the searcher out of an undistinguished line In proving a genealogy it must be remembered that in the descent of an estate in land must be sought the best evidence for a pedigree

At the present time the study of genealogy grows rapidly in English estimation It is no less popular in America, where societies and private persons have of late years published a vast number of genealogies, many of which combine the results of laborious research in American records with extravagant and unfounded claims concerning the European origin of the families dealt with A family with the surname of Cuthbert has been known to hail St Cuthbert of Lindisfarne as its progenitor, and one surnamed Eberhardt has incorporated in its pedigree such German princes of old

times as were found to have Eberhardt for a Christian name.

Genealogy in modern France has, with a few honourable exceptions, fallen into the hands of the popular pedigree-makers, whose concern is to gratify the vanity of their employers Italy likewise has not yet shaken off the influence of those venal genealogists who, three hundred years ago, sold pedigrees cheaply to all comers But much laborious genealogical inquiry had been made in Germany since the days of Hubner, and even in Russia there was some attempt to apply modern standards of criticism to the chronicles of the swarming descendants of the blood of Rurik

In no way is the gap made by the dark ages between ancient and modern history more marked than by the fact that no European family makes a serious claim to bridge it with its genealogy. The unsupported claim of the Roman house of Massimo to a descent from Fabius Maximus is respectable beside such legends as that which made Lévis-Mirepoix head of the priestly tribe of Levi, but even the boast of such remote ancestry has now become rare. The ancient sovereign houses of Europe are, for the most part, content to attach themselves to some ancestor who, when the mist that followed the fall of the Western empire begins to lift, is seen rallying with his sword some group of spearmen.

BIBLIOGRAPHY.—Genealogical works have been published in such abundance that the bibliographies of the subject are already substantial volumes Amongst the earlier books from the press may be noted Benvenuto de San Georgio's *Montisferrati marchionum et principum regiae propagium successionumque series* (1515), Pingonius's *Arbor gentilitiae Sabaudiae Saxoniaeque domus* (1521), Gebweiler's *Epitome regu ac vetustissimi ortus Caroli V. et Ferdinandi I., omniumque archiducum Austriae et comitum Habsburgiensium* (1527), Meyer's work on the counts of Flanders (1531), and Du Boulay's genealogies of the dukes of Lorraine (1547) Later in the same century Reineck of Helmstadt put forth many works having a wider genealogical scope, and we may cite Henninges's *Genealogiae Saxonicae* (1587) and *Theatrum genealogicum* (1598), and Reusner's *Opus genealogicum catholicum* (1589–1592) For the politically inconvenient falseness of François de Rosières's *Stemmata Lotharingiae ac Barri ducum* (1580), wherein the dukes of Lorraine were deduced from the line of Charlemagne, the author was sent to the Bastille by the *parlement* of Paris and his book suppressed.

The 17th century saw the production in England of Dugdale's great *Baronage* (1675–1676), a work which still holds a respectable place by reason of its citation of authorities, and of Sandford's history of the royal house In the same century André Duchesne, the historian of the Montmorencys, Pierre d'Hozier, the chronicler of the house of La Rochefoucauld, Rittershusius, Imhoff, Spener, Lohmeier and many others contribute to the body of continental genealogies Pierre de Guibours, known as Père Anselme de Ste Marie, published in 1674 the first edition of his magnificent *Histoire généalogique de la maison royale de France, des pairs, grands officiers de la couronne et de la maison du roy et des anciens barons du royaume.* Of this encyclopaedic work a third and complete edition appeared in 1726–1733 A modern edition under the editorship of M Potier de Courcy began to be issued in 1873, but remains incomplete Among 18th-century work Johann Hubner's *Bibliotheca genealogica* (1729) and *Genealogische Tabellen* (1725–1733), with Lenzen's commentary on the latter work (*c* 1756), may be signalized, with Gatterer's *Handbuch der Genealogie* (1761) and his *Abriss der Genealogie* (1788), the latter an early manual on the science of genealogy Hergott's *Genealogia diplomatica augustae gentis Habsburgicae* (1737) is the imperial genealogy compiled by the emperor's own historiographer

Modern peerages in England may be said to date from that of Arthur Collins, whose one-volume first edition was published in 1709 The fifth edition appeared in 1778, in eight volumes, to be republished in 1812 by Sir Egerton Brydges, the "Baptist Hatton" of Disraeli's novel, who corrected many legendary pedigrees, besides inserting his own forged descent from a common ancestor with the dukes of Chandos From this work and from the Irish peerage of Lodge (as re-edited by Archdall) most of the later peerages have quarried their material With these may be named the baronetages of Wotton and Betham Of modern popular peerages and baronetages that of Burke has been published since 1822 in many editions and now appears yearly Most important for the historian are the *Complete Peerage* of G E C[ockayne] (2nd ed, 1910), and the *Complete Baronetage* of the same author The *Peerage of Scotland* (1769) of Sir Robert Douglas of Glenbervie came to a second edition in 1813, edited by J P Wood, and the whole work has been revised and re-edited by Sir James Balfour Paul (1904, etc) Of the popular manuals of English untitled families, Burke's *Genealogical and Heraldic Dictionary of the Commoners* (1833–1838) is now brought up to date from time to time and reissued as the *Landed Gentry*

Lists of pedigrees in English printed works are supplied by Marshall's *Genealogist's Guide* (1903), while pedigrees in the manuscript collections of the British Museum are indexed in the list of R Sims (1849) Valuable genealogical material will be found in such periodicals as the *Genealogist*, the *Herald and Genealogist*, the *Topographer and Genealogist*, *Collectanea topographica et genealogica*, *Miscellanea genealogica et heraldica* and the *Ancestor* In Germany the *Deutscher Herold* is the organ of the Berlin Heraldic and Genealogical Society. The *Nederlandsche Leeuw* is a similar publication in the Low Countries.

Modern criticism of the older genealogical methods will be found in J H Round's *Peerage and Pedigree*, 2 vols. (London, 1910), and in other volumes by the same author The Harleian Society has published many volumes of the Herald's Visitations; and the British Record Society's publications, supplying a key to a vast mass of wills, chancery suits and marriage licences, are of still greater importance. The *Victoria History of the Counties of England* includes genealogies of the ancient English county families still among the land-owning classes. English pedigrees of the age before the Conquest are collected in W. G. Searle's *Anglo-Saxon Bishops, Kings and Nobles* (1899).

Genealogical dictionaries of noble French families include Victor de Saint Allais's *Nobiliaire universel* (21 vols, 1872–1877) and Aubert de la Chenaye-Desbois' *Dictionnaire de la noblesse* (15 vols, 1863–1876) A sumptuous work on the genealogy and heraldry of the ancient duchy of Savoy by Count Amedée de Foras began to appear in 1863 Spain has Lopez de Haro's *Nobiliario genealogico de los reyes y titulos de España* Italy has the *Teatro araldico* of Tettoni and Saladini (1841–1848), Litta's *Famiglie celebri* and an *Annuario della nobilità*. Such annuals are now published more or less intermittently in many European countries Finland has a *Ridderscap och Adels Kalender*, Belgium the *Annuaire de la noblesse*, the Dutch Netherlands an *Adelsboek*, Denmark the *Adels-Garbog* and Russia had the *Annuaire* of Ermerin But chief of all such publications is the ancient *Almanach de Gotha*, containing the modern kinship of royal and princely houses, and now accompanied by volumes dealing with the houses of German and Austrian counts and barons, and with houses ennobled in modern times by patent A useful modern reference book for students of history is Stokvis's *Manuel d'histoire et de généalogie de tous les états du globe* (1888–1893) The best manual for the English genealogist is Walter Rye's *Records and Record Searching* (1897), while an ill-arranged but valuable bibliography of English and foreign works on the subject is that of George Gatfield (1892) **(O. B.)**

GENÉE, ADELINE (*c* 1882–), Danish dancer, one of the last exponents of the classic style of dancing, was born at Aarhus, Jutland, and began to study her steps with her aunt, Antonia Zimmermann, when a child She began her formal studies at eight years old After appearing in Berlin, Copenhagen and Paris, she came to London The precision and technical perfection of her dancing made her a great favourite with the London public For many seasons she was *première danseuse* at the Empire, London She appeared in America in 1908–13 She married Frank S N Isitt Since 1916 her appearances have been mainly restricted to charitable performances

GENERAL, a term which, from its pointing to all or most of the members of a class, the whole of an area, etc, as opposed to "particular" or to "local," is hence used in various shades of meaning for that which is prevalent, usual, widespread, or miscellaneous, indefinite, vague (Lat *generalis*, of or relating to a *genus*, kind or class) It has been added to the titles of various officials, military officers and others, thus the head of a religious order is the "superior-general," more usually the "general," and we find the same combination in such offices as that of "accountant-general," "postmaster-general," "attorney-" or "solicitor-general," and many others, the additional word implying that the official in question is of superior rank, as having a wider authority or sphere of activity This is the use that accounts for the application of the term, as a substantive, to a military officer of superior rank, a "general officer," or "general," who commands or administers bodies of troops larger than a regiment, or consisting of more than one arm of the service (*see* also OFFICERS) It was towards the end of the 16th century that the word began to be used in its present sense as a noun, and in the armies of the time the "general" was commander-in-chief, the "lieutenant-general" commander of the horse and second in command of the army, and the "major-general" (strictly "sergeant-major-general") commander of the foot and chief of the staff Field marshals, who have now the highest rank, were formerly subordinate to the general officers These titles—general, lieutenant-general and major-general—are still applied in most armies to the first, second and third grades of general officer It may be noted that during the 17th century "general" was not confined to a commanding

officer of an army, and was also equivalent to "admiral"; thus when under the Protectorate the office of lord high admiral was put into commission, the three first commissioners, Blake, Edward Popham and Richard Deane, were styled "generals at sea"

GENERAL AVERAGE: *see* AVERAGE.

GENERAL ELECTRIC COMPANY, LTD. (1) A British joint stock company, covers in its operations the entire field of electrical engineering, from the equipment of the largest generating stations, power transmission systems, railway electrifications and the like down to lamps, bells and the small electrical accessories used in domestic service

The foundations of the present company were laid in 1886 with a small London establishment for the supply of electrical apparatus With electric lighting a commercial success, a new department was established, and the "G.E C," as it is familiarly known, has developed In the early eighteen-nineties the lamp works, the source of Osram lamps, were incorporated, followed by glass works for the conversion of the raw material at Leamington

In 1900 42 acres of land were purchased at Witton, Birmingham, for the erection of works for the making of dynamos, motors, conduit tubes, etc, followed soon after by the purchase of a further 63 acres, partly for works extensions and partly for a housing estate for the employees The arc-lamp carbon works established at this time on this site, the only one of its kind in Great Britain, subsequently played an important part in the World War

While the war was in progress the G E C made further extensions in many directions, chiefly at the instance of the Government and in 1928 was a self-contained enterprise, covering every department of electrical manufacture and reaching out to all areas In addition to the administrative departments at Kingsway, there were 21 home branches, numerous branches overseas, and agencies in all the principal markets of the world The nominal capital of the company was nearly £10,000,000, of which some £6,000,000 was share capital, and the remainder debentures The profits in 1927 exceeded £1,000,000 (X)

(2) A United States electrical manufacturing concern created in 1892, and incorporated in New York under a special act of the legislature, Chapter 323, Laws of 1892, as amended by Chapter 181, Laws of 1922, State of New York Its principal office is at Schenectady, N Y

On Jan 1, 1893, the outstanding capital stock of the company was about $35,000,000 and at the beginning of 1928 had grown to $223,000,000 In 36 years annual sales increased from $12,000,000 to $312,000,000 The value of its manufacturing plants increased from $4,000,000 to $200 000,000 and manufacturing floor space from 400,000 to more than 25,000,000 sq ft, while the number of employés grew from 4,000 to 73,000 These figures do not include associated companies, which are represented by an investment of slightly more than $90,000,000

In the United States the company has 24 main manufacturing plants, is represented by distributors in 103 cities and has sales offices in all important centres The Canadian General Electric Co, Ltd, operates throughout the Dominion of Canada The export and foreign business is conducted by the International General Electric Co, Inc, which is represented throughout the world

The General Electric company maintains fully a dozen laboratories, including the well known research laboratory at Schenectady, N Y General Electric and its associated companies design, manufacture and sell almost every form of apparatus and device for the generation, transmission, distribution, control, measurement and consumption of electric energy

The General Electric company has had three presidents the late Charles A. Coffin, E Wilbur Rice, Jr, and Gerard Swope There have been three chairmen of the board· H McK Twombly, Charles A Coffin and Owen D Young (G Sw)

GENERAL MOTORS CORPORATION, organized Oct 13, 1916 to succeed a company with a similar name formed Sept 16, 1908, for the purpose of manufacturing automotive equipment, is an operating organization owning the assets of manufacturing operations which are designated as divisions It also owns a large part or all of the stock of a number of subsidiary and affiliated companies directly connected with its activities Its products include Chevrolet, Pontiac, Oldsmobile, Oakland, Buick, La Salle and Cadillac motor cars, Fisher bodies, Delco-Light electric plants, and Frigidaire automatic refrigerators, also Hyatt roller bearings, New Departure ball bearings, Klaxon horns, Harrison radiators, Delco-Remy starting systems, guide lamps and Lovejoy hydraulic shock absorbers, Jaxon rims, AC spark plugs, speedometers, air cleaners and oil filters, Brown-Lipe-Chapin differential gears, Jacox steering gears and Inland steering wheels, General Motors trucks, Yellow cabs and coaches Its outstanding stock issues as of Sept 30, 1928, consisted of $134,916,000 in preferred and debenture stock, par value $100 and $435,000,000 in common stock, par value $25 a share There were no bonds

The plants of the corporation are located in more than 50 cities in the United States and abroad in which were built 1,562,748 cars in 1927 The cars are sold by 18,000 dealers in over 100 countries The wholesale value in 1927 of its exports exceeded $170,000,000. During 1924 it made one in every six cars made in the United States and Canada; in 1925 one in every five, in 1926 one in every four and in 1927 almost one in every two The total net sales of the corporation in 1927 aggregated $1,269,519,673; on its payrolls there were in that year 200,000 employees receiving more than $300,000,000 in wages

(A. P. Sl)

GENERAL STRIKE. The strike weapon (or stoppage of work, in the sense of withdrawal of labour) is usually employed for the purpose of securing an improvement in working conditions, it is often used to resist reductions of wages or addition to working hours, though in such a dispute the stoppage is usually a "lock-out" Many strikes are confined to individual factories or workshops Others extend to towns or areas; and some to industries on a national scale, like coal mining or cotton manufacture If all industries combined in stoppage that would form a national or general strike, but in practice no country has ever had, in the strictly comprehensive sense, a general strike At best, stoppages have varied greatly in range and effect And the broad experience of two centuries in Great Britain is roughly similar to that of practically all the industrial countries of the world

It indicates that there is no easily identified body of theory or practice bearing on the general strike In their *History of Trades Unionism,* Mr and Mrs Sidney Webb noted three different methods which during that period the trade unions had adopted for enforcing the common rules they wished to have adopted in the conditions of employment (1) mutual insurance, (2) legal enactment, and (3) after 1824, collective bargaining In the last 20 or 30 years, up to 1914, both the great strikes and the gradual changes of the period have been regarded as of less importance than the series of legal decisions of the House of Lords as final court of appeal

Towards the end of the first quarter of last century there was considerable industrial strife, it included an almost general lockout in Glasgow, a strong combination of seamen on the north-east coast, and the enforcement of many by-laws by the Dublin trades, then better organized than others in Great Britain Joseph Hume and Francis Place pleaded for moderation They warned the unions of the danger of reaction But ship-owning interests, among others, at that time generally hostile to unionism, pressed for parliamentary inquiry into the conduct of workmen and the effect of recent legislation Many of the employers suggested the complete abolition of trade unionism, others would have made even friendly societies impossible

A more definite form of strike action is traceable in the revolutionary period or that of the new unionism between 1829 and 1842 Appreciating the weakness of isolated action, or effort on a purely craft basis, many trade union leaders attempted to form national societies of all trades, they also urged that all manual workers should belong to one comprehensive organization When a six months' strike at Hyde, near Manchester, failed, there was immediate support for the view that no local union could succeed against a combination of employers Succeeding conferences advocated central executives for different industries, and in the case of the cotton spinners a grand general council of the United King-

dom was established, although the records of its representative character as covering the three kingdoms are incomplete From such projects emerged the greater ambition of the trades union, that is, a national association representative of all classes of wage-earners whose large-scale organizations would be able to face considerable strain both in strike and lock-out But such machinery was at this point impressive only on paper; the employers were generally victorious, and the admittedly prejudiced report of Nassau Senior supplied fresh material for the opponents of trade unionism, particularly in arguments regarding restraint of trade Ultimately the Grand National Consolidated Trades Union (1833–34, *see* ROBERT OWEN) collapsed, and not even an increasing economic prosperity brought success to strikes promoted in the interests of better conditions of labour In the summer of 1834 federal organizations were plainly in process of disintegration, later, the membership turned in part to consideration of Owenite social reform Nor did the considerable industrial dislocation of 1842 merit the description of a general strike Much of the activity of the period was bound up with Chartist agitation, at one point the trade union movement was almost submerged in political effort But many trade union leaders came to disapprove of this economic-political association, and when, in that year, the Chartist executive at Manchester called for a general strike to obtain the charter, local trade union officials were active in persuading their members to avoid both the meetings and the resolutions

Decline of the General Strike Idea.—In the next quarter of a century there was much gradual building up of large amalgamated societies of skilled artisans, with centralized administration, friendly society benefits, and substitution of industrial diplomacy for the cruder methods of class warfare Between 1843 and 1860 trade unions were regarded as largely successful in achieving their more limited aims, in any event, of the aggressive policy of 1830–34 little remained Strikes were deprecated, there was practically no trace of argument in favour of a general cessation of work At a national conference in 1845 trade unionists declared their support of a new method of trade union activity in conciliation or arbitration So quickly, however, did circumstances change in the trade depression of 1845 that the next two years were remarkable for reduction of wages, strikes and lock-outs (or turn-outs) in many branches of industry Generally speaking, these stoppages proved disastrous for the workers, there was much complaint regarding the weakness of their central executives and committees In the midst of this dislocation representative trade unionists were constantly urging the importance of timely words with the employers in the interest of pacific settlement The weapon of the strike, in the sense of declaring war on the employers, was during these years of crisis taken away from many of the local branches, a local lodge had usually to submit its demand to a vote of the whole body of members throughout Great Britain, a procedure which involved delay and gave central committees an opportunity to work for peace. But Mr and Mrs Webb emphasize the fact that although most of the executive committees were from 1845 always setting their faces against strikes, that did not imply the abandonment of an energetic trade policy. This period, and succeeding periods, like their predecessors, included a bewildering variety of movements for organization on a national basis, usually ending in failure, minor or local stoppages, threats of general lock-out in the whole industry, as in the case of the engineering trade, and the growth and progress of large national trade societies like the Amalgamated Society of Engineers From 1857 there was another period of strife As before, the weakness of trade union organization was plain, in the 1859–60 strikes the masons alone of the building trades were regarded as effectively organized into a single society extending throughout England

Most of the authorities regard the distinctive policy of the Junta, the committee which largely regulated union policy from 1860–70, as the combination of extreme caution in trade matters and energetic agitation for political reforms About this period permanent trades councils appear in the leading industrial centres, an important step in the consolidation of the trade union movement In early times every important strike had been supported by committees of sympathizers in other trade societies; they collected subscriptions and rendered other assistance The London trades council began in a strike committee, the earlier and purely emergency committee gave way by 1860 to permanent councils in many of the large centres of population In June 1866 delegates representing all the leading trade unions met at Sheffield to devise a method of defence against the constant use of the lock-out The conference does not appear to have decided what constituted a lock-out as distinguished from a strike, there was certainly much friction among the individual organizations The royal commission which investigated trade union problems at this period presented an inconclusive and inconsistent report Succeeding years were full of similar sectional activity The miners and cotton operatives achieved certain victories in legislation, trade unions had on occasion the support of several organs of the press; in some parts of the country stoppages for specific objects were successful, but throughout all this effort important organizations were regularly emphasizing the futility of the strike weapon That attitude is particularly true of the central executive of the Amalgamated Society of Engineers In tendering evidence to the royal commission in 1867 it remarked that all strikes were a complete waste of money, not only in relation to the workmen but also to the employers The period 1873–74 is regarded as one of the high water marks in trade union history; but the immediately succeeding years include strikes on a large scale The conflict in the cotton industry in 1878 ended in failure for the workmen Almost immediately a general collapse of trade union forces began, it proved to be impossible to resist reductions in wages and increases in hours Conflicting policy within the unions led to considerable weakness, their general machinery was clearly inadequate, and attempts at federation achieved only limited success

The General Strike of 1926.—Such ebb and flow, characteristic of the remainder of the 19th century and of the first part of the present century until the outbreak of the World War, produced no definite theory or practice of the general strike Certain stoppages were more comprehensive than others, the measure of support accorded by trade unions to their colleagues in the industries affected varied very considerably, and for the crisis of 1926 there was no effective preparation or precedent That stoppage has been described by the general council of the trades union congress as a "national" rather than a "general" strike Pending the report of a royal commission appointed to enquire into the condition of coal-mining the British Government in 1925 gave temporary subsidy, amounting to £23,000,000 in all, for the purpose of enabling the industry to tide over the intervening period The detailed report of the general council of the congress summarizing events leading to the stoppage definitely suggests that the Miners' Federation of Great Britain, following the breakdown of negotiations, committed the future conduct of the dispute to the general council Of great importance, this point is clearly stated in a letter of May 1, 1926 to the prime minister and signed by the acting secretary of the trades union congress Early on May 3, 1926, the Government intimated that in their belief no solution of the difficulties in the coal industry which was both practicable and honourable to all concerned could be reached except by acceptance of the report of the royal commission Prior to the continuance of the negotiations the Government called for the repudiation of a certain strike action (in the *Daily Mail* buildings), together with immediate and unconditional withdrawal of the instructions for a general strike The T U C general council pleaded that the action on the part of the members of the *Daily Mail* staff had been taken entirely without their authority The trade unions had made no preparations for a stoppage on a large scale, and at once protested against Government's suggestions

It was urged that the Government were in this case less mediators than a directly interested party, even before the negotiations broke down In the opinion of the general council the position adopted by the Government in their ultimatum left only two alternatives, (1) the capitulation of the Government or (2) the termination of the strike by a process of attrition By the general council the first was regarded as unlikely, in view of the national resources over which the Government had control The second

was an alternative which the general council could not contemplate, on the ground that it would disorganize the trade union movement, completely establish reactionary elements in the country, and kill any possibility of getting fair consideration of the miners' case. By this time the national strike, as it afterwards was described by the T U C, or general strike as it was described by others, was in progress Informal meetings with Sir Herbert Samuel, who had acted as chairman of the royal commission, produced a formula which was recommended by the trades union congress for the acceptance of the Miners' Federation Its proposals commended themselves to the council, but were rejected by the miners; and, finally appreciating that the deadlock was complete, the general council decided to issue notices terminating the strike They pleaded that in view of all the facts known to them they felt it to be in accordance with the instructions they had received from the conference of trade union executives that the strike should be terminated with the maximum of advantage both to the miners and to the other trade unions, on that ground it was important that a decision should be reached while the unions remained strong and disciplined On the other hand, the miners rejected the Samuel memorandum, regarded by the general council of the trades union congress as an equitable basis for settlement, on the other, the general council pleaded its responsibility to trade unionism in general, contending that it could not follow the miners' executive in a policy of mere negation, that such a course would permit the splendid response of the sympathetic strike to disappear in process of attrition, bring the unions to bankruptcy, undermine the morale of their membership, destroy their capacity to resist attempts which might be made to impose adverse conditions, and to discriminate against the membership when the industries directly engaged in the strike resumed operations This decision to end the strike was unanimous, and some months later the policy of the general council was approved by an overwhelming majority in a conference of trade union executives called to hold the "inquest" on the strike

Why the 1926 Strike Failed.—Broadly speaking, the events of 1926 suggest that the difficulties of organizing a successful general strike are almost overwhelming In Great Britain at least 15,000,000 people are definitely engaged in industrial and commercial pursuits But trade union organization covered little more than 5,000,000 at the time of the strike, of that 5,000,000, 1,500,000 are estimated to have taken part, plus rather more than 1,000,000 in the coal-mining industry not at work The aggregate response was small, even among people to be regarded as sympathetic The direct cost to the State, placed in a supplementary estimate at £433,000, was far below what the maintenance of essential services was regarded as certain to involve, the volume of voluntary assistance was remarkable The indirect cost is more difficult to measure, but £50,000,000 or £60,000,000 has been suggested For industry as a whole the loss was undoubtedly much more substantial But such loss does not involve immediate pressure on the community, the advantage to the strikers for purely strike purposes is therefore much reduced On the other hand, the resources of the unions are speedily exhausted The general strike cost the National Union of Railwaymen at least £1,000,000. In addition to assistance rendered directly by other unions the trades union congress was able to allocate from subscriptions more than £63,000 to the Miners' Federation To a special fund promoted for the Miners' Federation, more than £93,000 was contributed Impressive as these sums were, they were small in comparison with the need At the end of 1925 the total membership of British trade unions was 4,447,818, the preliminary figures for 1926, the year of crisis, showed a loss of 300,000 Moreover, the general strike involved the heaviest expenditure in dispute pay ever experienced by registered trade unions in any one year In consequence, their funds were reduced from £12,750,000 to a little more than £8,500,000 Only in 1921, when they disbursed £7,000,000 in unemployment pay, have trade unions suffered such inroads on their resources.

Although the printing and allied trades ceased work, the Government and private effort were able to organize a press service which speedily reached a considerable section of the people, compared with the publications in the interests of the strike it had an undeniable advantage Tens of thousands of volunteers facilitated food trains, lorries, and kindred provision, the milk pool in Hyde Park covered the metropolitan area and actually showed a profit of £73,000 at the end of the stoppage Special constabulary were increased from 98,000 to 226,000, nearly half a million volunteers were enrolled; and increasing transport provision was further augmented by Admiralty resources in the carriage of mails and other urgent traffic Naval ratings secured the operation of electricity works in important centres, including 28 power stations in London By May 10, more than 3,600 trains were running; considerable numbers of men had returned to work; a day later, Woolwich arsenal employees decided to return, and men engaged in the shipbuilding and engineering trades, who had been called out, made only partial response British financial strength was fully maintained; and there was no suggestion of panic All the facts indicate that a strike on a national scale is now exceedingly difficult to maintain, chiefly because (1) there is no guarantee of more than very limited response to the strike call by the workers themselves, (2) the remarkable growth of motor and other transport proves that alternative service, chiefly of voluntary character, can be readily mobilized; (3) essential services, such as gas, water and electricity, can be covered by Admiralty and War Office resources, at all events in the larger centres of population, and (4) there is nowhere that complete paralysis of effort which, in all theory of the general strike, has always been regarded as essential to its speedy success Economic alternatives are now such that even a much larger stoppage than that of 1926 could be worn down in comparatively short time, especially as the strain on the resources of the unions would be immediately much greater than that of those of the State And since leading transport unions on the conclusion of the strike signed agreements undertaking not to call a stoppage in future before negotiation with the railway companies and other employers, as well as the fact that the Trades Disputes Act of 1927 is now on the Statute Book, any large scale strike is now apparently remote (*See* DIRECT ACTION)

(W GR)

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The General Strike in the United States and Canada.—The trade union movement in the United States and Canada has neither used nor advocated the general strike Organized labour, numbering 3,500,000 members among 30,000,000 wage earners, lacks the numerical strength needed for effective general strike action Structurally the trade union movement is unadapted to the use of such a weapon Each of the 107 unions loosely affiliated in the American Federation of Labour jealously preserves the right to independent action Railroad unions, essential in a general strike movement, are not even affiliated with the A F of L

In revolt against this particularism, the Industrial Workers of the World was formed by socialists and syndicalists in 1905 to advance concepts of industrial unionism and the general strike This organization failed to achieve the effective industrial organization necessary as the basis for a general strike

Nevertheless during the war and immediately after, general strike propaganda penetrated deeply into western American unions The Seattle general strike of 60,000 workers called Feb 6, 1919 by the city labour council, was ended Feb 11 without obtaining its objective of helping shipyard workers on strike to gain wage increases The Winnipeg strike called May 15, 1919 by the city central body in support of metal trades unionists striking for recognition and wage increases, lasted six weeks and involved 25,000 workers Even civil servants joined the walkout and the

police force was discharged for strike sympathies

National union officials counselled against these strikes and in many cases where contracts had been violated, ordered their members back to work Following failure of these two walkouts, the general strike fell into disfavour and consequent industrial depression made the weapon impracticable

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GENERATION, the act of procreation or begetting, hence any one of the various methods by which plants, animals or substances are produced (Lat *generare*). The subject may be divided into the following branches, viz (1) the first origin of life and living beings, (2) non-sexual or agamic reproduction, and (3) gamic or sexual reproduction For the first two of these branches *see* ABIOGENESIS, BIOGENESIS and PARTHENOGENESIS, for the third and more extensive division, including (1) the formation and fecundation of the ovum, and (2) the development of the embryo in different animals, *see* REPRODUCTION and EMBRYOLOGY

GENERATIONS, ALTERNATION OF. The alternating phases—particularly the sexual and asexual changes—which take place in successive generations of animals and plants In plants gamotophytes alternate with sporophytes, the latter being asexual, this phenomenon being found in all plants except certain lower forms in which sporophytes are absent It is well exemplified in mosses and ferns Among animals the alternation of generations takes several forms The broods of butterflies and moths differ in colour at certain seasons In flat worms or trematodes, and insects such as *Phylloxera*, heterogenesis—the succession of a parthenogetically produced generation by a dioecious—takes place *See* REPRODUCTION, BRYOPHYTA, PTERIDOPHYTA, GYMNOSPERMS, PROTOZOA, COELENTERATA, PLATYHELMINTHES, ANNELIDA

GENERATOR: *see* ELECTRIC GENERATOR

GENESIS, the name of the first book in the Bible, derives its title from the Septuagint rendering of ch ii. 4 It is the first of the five books (the Pentateuch), or, with the inclusion of Joshua, of the six (the Hexateuch), which cover the history of the Hebrews to their occupation of Canaan The "genesis" or "becoming" (*i.e.*, coming into being) of history begins with records of antediluvian times the creation of the world, of the first pair of human beings, and the origin of sin (i–iii), the civilization and moral degeneration of mankind, the history of man to the time of Noah (iv–vi 8), the flood (vi 9–ix), the confusion of languages and the divisions of the human race (x–xi) Turning next to the descendants of Shem, the book deals with Abraham (xii–xxv 18), Isaac and Jacob (xxv 19–xxxv), the "fathers" of the tribes of Israel, and concludes with the personal history of Joseph, and the descent of his father Jacob (or Israel) and his brethren into the land of Egypt (xxxvii–l) The book of Genesis, as a whole, is closely connected with the subsequent oppression of the sons of Israel, the revelation of Yahweh the God of their fathers (Ex iii, 6, 15 *seq*, vi 2–8), the "exodus" of the Israelites to the land promised to their fathers (Ex xiii 5, Deut i 8, xxvi 3 *sqq*, xxxiv 4) and its conquest (Josh i 6, xxiv); *cf* also the summaries Neh ix 7 *sqq*, Ps cv 6 *sqq* For an analysis of the contents *see* the commentaries

Its Compositeness.—Only on the assumption that the book of Genesis is a composite work is it possible to explain the duplication of events, the varying use of the divine names *Yahweh* and *Elōhīm*, the linguistic and stylistic differences, the internal intricacies of the subject matter, and the differing standpoints as regards tradition, chronology, morals and religion The cumulative effect of the whole evidence is too strong to be withstood, and already in the 17th century it was recognized that the book was of composite origin Immense labour has been spent upon the critical analysis of the contents, but it is only since the work of Graf (1866) and Wellhausen (1878) that a literary hypothesis has been found which explains the most obvious intricacies The Graf-Wellhausen literary theory has gained the assent of almost all trained and unbiased biblical scholars; it has not been shaken by the more recent light from external evidence, and no alternative theory has as yet been produced. According to this, Genesis is a post-exilic work composed of a post-exilic priestly source (P) and non-priestly earlier sources which differ markedly from P in language, style and religious standpoint, but much less markedly from one and another. These sources can be traced elsewhere in the Pentateuch and Joshua, and P itself is related to the post-exilic works Chronicles, Ezra and Nehemiah. In its *present* form Genesis is an indispensable portion of the biblical history, and consequently its literary growth cannot be viewed apart from that of the books which follow On internal grounds it appears that the Pentateuch and Joshua, as they now read, virtually come in between an older history by "Deuteronomic" compilers (easily recognizable in Judges and Kings), and the later treatment of the monarchy in Chronicles, where the influence of the circle which produced P and the present Mosaic legislation is quite discernible There have been stages where earlier extant sources have been cut down, adjusted or revised by compilers who have incorporated fresh material, and it is the later compilers of Genesis who have made the book a fairly knit whole The technical investigation of the *literary* problems (especially the extent of the earlier sources) is a work of great complexity, and, for ordinary purposes, it is more important to obtain a preliminary appreciation of the general features of the contents of Genesis

Value.—That the records of the pre-historic ages in Gen i–xi are at complete variance with modern science and archaeological research is unquestionable But although it is impossible to regard them any longer either as genuine history or as subjects for an allegorical interpretation (which would prove the accuracy of *any* record) they are of distinct value as human documents They reflect the ideas and thoughts of the Hebrews, they illustrate their conceptions of God and the universe, and they furnish material for a comparison of the moral development of the Hebrews with that of other early races Some of the traditions are closely akin to those current in ancient Babylonia, but a careful and impartial comparison at once illustrates in a striking manner the relative moral and spiritual superiority of our writers On these subjects *see* COSMOGONY; DELUGE, PARADISE; and HEBREW RELIGION

The records of the patriarchal age, xii–l are very variously estimated, although the great majority of scholars agree that they are not contemporary and that they cannot be used *as they stand*, for pre-Mosaic times Apart from the ordinary arguments of historical criticism, it is to be noticed that external evidence does not support the assumption that the records preserve genuine pre-Mosaic history There are no grounds for any arbitrary distinction between the "pre-historic" pre-Abrahamic age and the later age External evidence, which recognizes no universal deluge and no dispersal of mankind in the third millennium B C, throws its own light upon the opening centuries of the second. It has revealed conditions which are not reflected in Genesis, and important facts upon which the book is silent—unless, indeed, in Gen, xiv, there is a passing allusion to the great Babylonian monarch Khammurabi in the name Amraphel (*see* article ABRAHAM). A perusal of modern attempts to recover historical facts or historical outline from the book will show how very inadequate the material proves to be, and the reconstructions will be found to depend upon an interpretation of the narratives which is often liberal and not rarely precarious, and to imply such reshaping and rewriting of the presumed facts that the cautious reader can place little reliance on them Whatever future research may bring, it cannot remove the *internal* peculiarities which combine to show that Genesis preserves, not literal history, but popular traditions of the past External evidence has proved the antiquity of various elements, but not that of the form or context in which they now appear; and the difference is an important one We have now a background upon which to view the book, and, on the one hand, it has become obvious that the records preserve (as is only to be expected) oriental customs, beliefs and modes of thought But it has not been demonstrated that these are exclusively pre-Mosaic On the other hand, a better acquaintance

with the ancient political, sociological and religious conditions has made it increasingly difficult to interpret the records as a whole literally, or even to find a place in pre-Mosaic Palestine for the lives of the patriarchs as they are depicted. Nevertheless though one cannot look to Genesis for the history of the early part of the second millennium B.C., the study of what was thought of the past, proves in this, as in many other cases, to be more instructive than the facts of the past, and it is distinctly more important for the biblical student and the theologian to understand the thought of the ages immediately preceding the foundation of Judaism in the 5th century B C. than the actual history of many centuries earlier

Characteristics.—A noteworthy feature is the frequent *personification* of peoples, tribes or clans (*See* GENEALOGY) Midian (*i e*, the Midianites) is a son of Abraham; Canaan is a son of Ham (ix 22), and Cush the son of Ham is the father of Raamah and grandfather of the famous S Arabian State Sheba and the traders of Dedan (x 6 *sq*, *cf* Ezek xxvii 20–22) Bethuel the father of Rebekah is the brother of the tribal names Uz and Buz (xxii 21 *seq*, *cf* Jer xxv 20, 23). Jacob is otherwise known as Israel and becomes the father of the tribes of Israel; Joseph is the father of Ephraim and Manasseh, and incidents in the life of Judah lead to the birth of Perez and Zerah, Judaean clans This personification is entirely natural to the oriental, and though "primitive" is not necessarily an ancient trait (*cf* 1 Chron iv 10) It gives rise to what may be termed the "prophetical interpretation of history" (S R Driver *Genesis*, p 111), where the character, fortunes or history of the apparent individual are practically descriptive of the people or tribe which, according to tradition, is named after or descended from him The utterance of Noah over Canaan, Shem and Japheth (ix 25 *seq*), of Isaac over Esau and Jacob (xxvii), of Jacob over his sons (xlix) or grandsons (xlviii), would have no meaning for Israelites unless they had some connection with and interest for contemporary life and thought Herein lies the force of the description of the wild and independent Ishmael (xvi 12), the "father" of certain well-known tribes (xxv 13–15); or the contrast between the skilful hunter Esau and the quiet and respectable Jacob (xxv 27), and between the tiller Cain who becomes the typical nomad and the pastoral Abel (iv 1–15) The interest of the struggles between Jacob and Esau lay, not in the history of individuals of the distant past, but in the fact that the names actually represented Israel and its near rival Edom These features are in entire accordance with oriental usage and give expression to current belief, existing relationships, or to a poetical foreshadowing of historical vicissitudes But in the effort to understand them as they were originally understood, it is very obvious that this method of interpretation can be pressed too far It would be precarious to insist that the entrances into Palestine of Abraham and Jacob (or Israel) typified two distinct immigrations The separation of Abraham from Lot (*cf* Lotan, an Edomite name), of Isaac from Hagar-Ishmael, or of Jacob from Esau-Edom scarcely points to the relative antiquity of the origin of these non-Israelite peoples who, to judge from the evidence, were closely related Or, if the "sons" of Jacob had Aramaean mothers, to prove that those which are derived from the wives were upon a higher level than the "sons" of the concubines is more difficult than to allow that certain of the tribes must have contained some element of Aramaean blood (*cf* 1 Chron vii 14, and *see* ASHER; GAD, MANASSEH, TRIBE OF) Some names are clearly not those of known clans or tribes (*e g*, Abraham, Isaac), and many of the details of the narratives obviously have no natural ethnological meaning Stories of heroic ancestors and of tribal eponyms intermingle; personal, tribal and national traits are interwoven The entrance of Jacob or Israel with his sons suggests that of the children of Israel The story of Simeon and Levi at Shechem is clearly not that of two individuals, sons of the patriarch Israel; in fact the story actually uses the term "wrought folly in Israel" (*cf.* Jud xx 6, 10), and the individual Shechem, the son of Hamor, cannot be separated from the city, the scene of the incidents Yet Jacob's life with Laban has many purely individual traits And, further, there intervenes a remarkable passage with an account of his conflict with the divine being who fears the dawn and is unwilling to reveal his name. In a few verses the "wrestling" ('-b-k) of Jacob (*yă'ăkōb*) is associated with the Jabbok (*yabbōk*); his "striving" explains his name Israel, at Peniel he sees "the face of God," and when touched on his vulnerable spot (the hollow of the thigh) he is lamed, hence "the children of Israel eat not the sinew of the hip which is upon the hollow of the thigh unto this day" (xxxii. 24–32) Other examples of the fusion of different features can be readily found Three divine beings appear to Abraham at the sacred tree of Hebron, and when the birth of Isaac (from sāhak, "laugh") is foretold, the account of Sarah's behaviour is merely a popular and trivial story suggested by the child's name (xviii 12–15; *see* also xvii 17, xxi 6, 9) An extremely fine passage then describes the patriarch's intercession for Sodom and Gomorrah, and the narrative passes on to the catastrophe which explains the Dead Sea and its desert region and has parallels elsewhere (*e g*, the Greek legend of Zeus and Hermes in Phrygia) Lot escapes to Zoar, the name gives rise to the pun on the "little" city (xix 20), and his wife, on looking back, becomes one of those pillars of salt which still invite speculation Finally the names of his children Moab and Ammon are explained by an incident when he is a cave-dweller on a mountain

To primitive minds which speculated upon the "why and wherefore" of what they saw around them, the narratives of Genesis afforded an answer. They preserve, in fact, some of the popular philosophy and belief of the Hebrews They furnish what must have been a satisfactory origin of the names Edom, Moab and Ammon, Mahanaim and Succoth, Bethel, Beersheba, etc They explain why Shechem, Bethel and Beersheba were ancient sanctuaries (*see* further below), why the serpent writhes along the ground (iii 14); and why the hip sinew might not be eaten (xxxii 32) To these and a hundred other questions the national and tribal stories (of which no doubt only a few have survived, and of which other forms, earlier or later, more crude or more refined, were doubtless current) furnish an evidently adequate answer Myth and legend, fact and fiction, the common stock of oral tradition, have been handed down, and thus constitute one of the most valuable sources for popular Hebrew thought

The book is not to be judged from any one-sided estimate of its contents By the side of much that seems trivial, and even non-moral (for the patriarchs themselves are not saints) it is noteworthy how frequently the narratives are didactic The characteristic sense of collective responsibility, which appears more incidentally in xx 7, is treated with striking intensity in a passage (xviii 23–33) which uses the legend of Sodom and Gomorrah as a vehicle for the statement of a familiar problem (*cf* Ezek xviii , Ps lxxiii , Job) It will be observed that interviews with divine beings presented as little difficulty to the primitive minds of old as to the modern native, even the idea of intercourse of supernatural beings with mortals (vi 1–4) is to-day equally intelligible The modern untutored native has a not dissimilar undeveloped and childlike attitude towards the divine, a naive theology and a simple cultus The most circumstantial tales are told of imaginary figures, and the most incredible details clothe the lives of the historical heroes of the past So abundant is the testimony of modern travellers to the extent of which Eastern custom and thought elucidate the interpretation of the Bible, that it is very important to notice those features which illustrate Genesis "The oriental," writes S I Curtiss (*Bibl Sacra*, Jan 1901, pp 103 *sqq*), "is least of all a scientific historian He is the prince of story-tellers, narratives, real and imaginative, spring from his lips, which are the truest portraiture of composite rather than individual oriental life, though narrated under forms of individual experience." There are, therefore, many fundamental facts which combine to show that the critical student cannot isolate the book from oriental life and thought, its uniqueness lies in the manner in which the material has been shaped and the use to which it has been put

Questions of Date.—The Book of Jubilees (not later than *c* 100 B C) presents the history in another form It retains some of the canonical matter, often with considerable reshaping, it omits

many details (especially those to which exception could be taken), and adds much that is novel. The chronological system of the latest source in Genesis becomes an elaborate reckoning of heavenly origin. Written under the obvious influence of *later* religious aims, it is especially valuable because one can readily compare the two methods of presenting the old traditions The Book of Jubilees (*q.v.*) also enables the student to test the arguments based upon any study restricted to Genesis alone. Thus it shows that the "primitive" features of Genesis afford a criterion which is sociological rather than chronological This is often ignored For example, the conveyance of the field of Machpelah (xxiii) is conspicuous for the absence of any reference to a written contract in contrast to the "business" methods in Jer xxxii This does not prove that Gen xxiii is early, because writing was used in Palestine about 1400 B C, and, on the other hand, the more simple forms of agreement are still familiar after the time of Jeremiah (*e g*, Ruth, Proverbs) Similarly, no safe argument can be based upon the institution of blood-revenge in Gen iv, when one observes the undeveloped conditions among the Trachonites of the time of Herod the Great (Josephus, *Ant* xvi 9, 1), or the varying usages among modern tribes In the Book of Jubilees there is the same kind of personification, there are fresh examples of the "prophetical interpretation of history," and by the side of the older "primitive" thought are ideas which can only belong to this later period In each case we have merely a selection of current traditional lore For example, Gen vi 1–4 mentions the marriage of divine beings with the daughters of men and the birth of Nephilim or giants (*cf* Num xiii 33) Later allusions to this myth (*e g*, Baruch iii. 26–28, Book of Enoch vi. *sqq*, 2 Peter ii 4, etc) are not based upon this passage· the fragment itself is all that remains of a more complete written myth Old myths underlie the account of the Creation and the garden of Eden, and traces of other versions or forms appear elsewhere in the Old Testament Again, the Old Testament throws no light upon the redemption of Abraham (Is xxix 22), although the Targums and other sources profess to be well-informed The isolated reference to Jacob's conquest of Shechem in Gen xlviii 22 must have belonged to another context, and later writings give in a later and thoroughly incredible form allied traditions In Hosea xii 4, Jacob's wrestling is mentioned before the scene at Bethel (Gen xxxii 24 *sqq*, xxviii 11 *sqq*) The overthrow of Sodom and Gomorrah is described in Genesis (xviii *seq*), but Hosea refers only to that of Admah and Zeboim (xi 8, *cf* Deut xxix 23, Gen x 19)—different versions of the great catastrophe were doubtless current Consequently investigation must start with the particular details which happen to be preserved, and these not necessarily in their original or in their only form Since the antiquity of elements of tradition is independent of the shape in which they appear before us, a careful distinction must be drawn between those details which do not admit of being dated or located and those which do There is evidence for the existence of the *names* Abram, Jacob and Joseph in early times, but this does not prove the antiquity of the present narratives encircling them

Historical Backgrounds.—Popular tradition often ignores events of historical importance, or, as repeated experience shows, will represent them in such a form that the true historical kernel could never have been recovered without some external clue The absence of definite references to the events of the Israelite monarchy does not necessarily point to the priority of the traditions in Genesis or their later date. Nevertheless, some allusion to national fortunes is reflected in the exaltation of Jacob (Israel) over Esau (Edom), and in the promise that the latter should break the yoke from his neck; later writers (in the Targums) bring this up-to-date Israelite kings are foreshadowed (xvii 6, xxxv. 11 P), and Israel's kingdom has the ideal limits as ascribed to Solomon (xv. 18, *see* I. Kings iv 21, but *cf.* art SOLOMON) Judah is promised a world-wide king (xlix 8–10), though elsewhere the supremacy of Joseph rouses the jealousy of his "brothers" (xxxvii 8) Different dates and circles of interest are thus manifest The cursing and dispersion of Simeon and Levi (xlix 5–7) recall the fact that Simeon's cities were in the territory of Judah (Josh. xix. 1, 9), and that the Levitical priests are later scattered and commended to the benevolence of the Israelites. But the curse obviously represents an attitude quite opposed to the blessing pronounced upon Levi by Moses (Deut xxxiii 8–11). The Edomite genealogies (xxxvi) represent a more extensive people than the references in the popular stories suggest, and the latter by no means indicate that Edom had so important a career as we actually gather from a few allusions to its kings (xxxvi 31–39) The references to Philistines are anachronistic for the pre-Mosaic age, and it is clear that the tradition of a solemn covenant with a Philistine king and his general (xxi 22 *seq*, xxvi. 26 *seq*) does not belong to the age or the circle which remembered the heavy oppressions of the Philistines Similarly, the treatment of the covenant by the author of Jubilees (xxiv 28 *sqq*) is only intelligible when one recalls the attitude of Judah to the Philistine cities in the 2nd century B C Finally, the thread of the tradition unmistakably represents a national unity of the 12 sons (tribes) of Israel; but this unity was not felt at certain periods of disorganization, and the idea of including Judah among the sons of Israel could not have arisen at a time when Israel and Judah were rival kingdoms Thus in the original text of 2 Sam xix 43 the men of Israel claim to be the first-born rather than Judah, *cf.* also I Chron v. 1 *sq* where Joseph obtains the birth-right In so far as the traditions can be read in the light of biblical history it is evident that they belong to different ages and represent different national, tribal, or local standpoints

Religious Interests.—Noteworthy is the interest taken in *sacred sites* Certain places are distinguished by theophanies or by the erection of an altar (*lit* place of sacrificial slaughter) *Mizpah* in Gilead is the scene of a covenant or treaty between Jacob and his Aramaean relative commemorated by a pillar (*Maṣṣēbah*) It was otherwise known for an annual religious ceremony, the traditional origin of which is related in the story of Jephthah's vow and sacrifice (Judg xi), and its priests are denounced by Hosea (v 1) *Shechem*, the famous city of the Samaritans ("the foolish nation," Ecclus I 50, 26), where Joseph was buried (Josh xxiv 32), had a sanctuary and a sacred pillar and tree It was the scene of the coronation (a religious ceremony) of Abimelech (Judg ix), and Rehoboam (I Kings xii 1) The pillar was ascribed to Joshua (Josh xxiv 26 *seq*), and although Jacob set up at Shechem an "altar," the verb suggests that the original object was a pillar (Gen xxxiii 20) The first ancestor of Israel, on the other hand, is merely associated with a theophany at an oracular tree (xii 6) The Benjamite *Bethel* was especially famous in Israelite religious history The story tells how Jacob discovered its sanctity (it was the gate of heaven), made a covenant with its God, established the sacred pillar, and instituted its tithes (xxviii) The prophetess Deborah dwelt under a palm-tree near Bethel (Judg iv 5), and her name is also that of the foster-mother of Rebekah who was buried near Bethel beneath the "oak of weeping" (xxxv. 8) *Bochim* ("weeping") elsewhere receives its name when an angel appeared to the Israelites (Judg ii 1, Septuagint adds Bethel) To the prophets Hosea and Amos the cultus of Bethel was heathen and immoral, even though it was Yahweh himself who was worshipped there (*see* BETHEL) South of Hebron lay *Beersheba*, an important centre and place of pilgrimage, with a special numen by whom oaths were taken (Amos viii 14, *see* Sept and *cf* the commentaries) Isaac built its altar, and Isaac's God guarded Jacob in his journeying (xxxi 29, xlvi 1) This patriarch and his "brother" Ishmael are closely associated with the district south of Judah, both are connected with *Beer-lahai-roi* (xxiv 62, Sept xxv 11), whose fountain was the scene of a theophany (xvi) Their traditions are thus localized in the district of Kadesh, famous in the events of the Exodus (*cf* xvi. 14, xxi 21, xxv 18, Ex xv. 22) Abraham planted a sacred tree at Beersheba and invoked "the everlasting God" (xxi 33) But the patriarch is more closely identified with *Hebron*, which had a sanctuary (*cf* 2 Sam xv 7 *seq*), and an altar which he built "unto Yahweh" (xiii 18) The sacred oak of Mamre was famous in the time of Josephus (*B J* iv 9, 7), it was later a haunt of "angels" (Sozomen), and Constantine was obliged to put down the heathenish cultus The place still has its holy tree Beneath the oak there appeared the three di-

vine beings, and in the cave of Machpelah the illustrious ancestor and his wife were buried There is a distinct tendency to emphasize the importance of Hebron. Taken from primitive giants by the non-Israelite clan Caleb (*q v*) it is predominant in the patriarchal traditions Jacob leaves his dying father at Beersheba (xxviii 10), but according to the *latest* source he returns to him at Hebron (xxxv 27), and here, north of Beersheba, he continues to live (xxxvii. 14, xlvi 1–5) The cave of Machpelah became the grave of Isaac, Rebekah and Leah (but not Rachel), and though Jacob appears to be buried beyond the Jordan, it is the latest source which places his grave at Hebron (l 1–11 and 12 *seq*). So in still later tradition, all the sons of Jacob with the exception of Joseph find their last resting-place at Hebron, and in Jewish prayers for the dead it is besought that their souls may be bound up with those of the patriarchs, or that they may go to the cave of Machpelah and thence to the Cherubim The increasing prominence of the old Calebite locality is not the least interesting phase in the comparative study of the patriarchal traditions

The association of the ancestors of Israel with certain sites is a feature which finds analogies even in modern Palestine There are old centres of cult which have never lost the veneration of the people, the shrines are known as the tombs of saints or *welis* (patrons) with such orthodox names as St George, Elijah, etc Traditions justify the reputation for sanctity, and not only are similar stories told of distinct figures, but there are varying traditions of a single figure Genesis preserves a selection of traditions relating to a few of the old Palestinian centres of cult We cannot suppose that these first gained their sacred character in the pre-Mosaic "patriarchal" age, there is in any case the obvious difficulty of bridging the gap between the descent into Egypt and the Exodus, and it is clear that when the Israelites entered Palestine they came among a people whose religion, tradition and thought were fully established It is only in accordance with analogy if stories were current in Israel of the institution of the sacred places, and closer study shows that we do not preserve the original version of these traditions

A venerated tree in modern Palestine will owe its sanctity to some tradition, associating it, it may be, with some saint, the Israelites in their turn held the belief that the sacred tree at Hebron was one beneath which their first ancestor sat when three divine beings revealed themselves to him But it is noteworthy that Yahweh alone is now prominent, the tradition has been revised, apparently in writing, and, later, the author of Jubilees (xvi) ignores the triad At Beer-lahai-roi an El ("god") appeared to Hagar, whence the name of her child Ishmael, but the writer prefers the unambiguous proper name Yahweh, and, what is more, the divine being is now Yahweh's angel—the Almighty's subordinate (xvi) The older traits show themselves partly in the manifestation of various *Els*, and partly in the cruder anthropomorphism of the earlier sources Later hands have by no means eliminated or modified them altogether, and in xxxi 53 one can still perceive that the present text has endeavoured to obscure the older belief that the God of Abraham was not the God of his "brother" Nahor (*see* the commentaries) The sacred pillar erected by Jacob at Bethel was solemnly anointed with oil, and it (and not the place) was regarded as the abode of the Deity (xxviii 18, 22) This agrees with all that is known of stone-cults, but it is quite obvious that this interesting example of popular belief is far below the religious ideas of the writer of the chapter in its present form There were many places where it could be said that Yahweh had recorded his name and would bless his worshippers (Ex xx 24). They were abhorrent to the advanced ethical teaching of prophets and of those imbued with the spirit of Deuteronomy (*cf* ii Kings xviii 4 with *v* 22), and it is patent from Jeremiah, Ezekiel and Is lvi–lxvi that even at a late date opinion varied as to how Yahweh was to be served It is significant, therefore, that the narratives in Genesis (apart from P) reflect a certain tolerant attitude; there is much that is contrary to prophetical thought, but even the latest compilers have not obliterated all features that, from a strict standpoint, could appear distasteful Although the priestly source shows how the lore could be reshaped, and Jubilees represents later efforts along similar lines, it is evident that for ordinary readers the patriarchal traditions could not be presented in an entirely new form, and that to achieve their aims the writers could not be at direct variance with current thought.

Southern Interests.—There is relatively little tradition from north Israel, Beersheba, Beer-lahai-roi and Hebron are more prominent than even Bethel or Shechem, and there are no stories of Gilgal, Shiloh or Dan Yet in the nature of the case there must have been a great store of local tradition accessible to some writers and at some periods Interest is taken not in Phoenicia, Damascus or the northern tribes, but in the east and south, in Gilead, Ammon, Moab and Ishmael Particular attention is paid to Edom and Jacob, and there is good evidence for a close relationship between Edomite and allied names and those of south Palestine (including Simeon and Judah) Especially significant, too, is the interest in traditions which affected the south of Palestine, that district which is of importance for the history of Israel in the wilderness and of the Levites It is noteworthy therefore, that while different peoples had their own theories of their earliest history, the first-born of the first human pair is Cain, the eponym of the Kenites, and the ancestor of the beginnings of civilization (iv 17, 20–22) This "Kenite" version had its own view of the institution of the worship of Yahweh (iv 26), it appears to have ignored the Deluge, and it implies the existence of a fuller corpus of written tradition Elsewhere, in the records of the Exodus, there are traces of specific traditions associated with Kadesh, Kenites, Caleb and Jerahmeel, and with a movement into Judah, all originally independent of their present context Like the prominence of the traditions of Hebron and its hero Abraham, these features are not fortuitous, though the problems they bring cannot be discussed here (see *Camb Anc History*, ii 359 *sqq*, iii 472 *sqq*, vi 185 *seq*)

Bibliography—S R Driver's commentary (*Westminster Series*) deals thoroughly with all preliminary problems of criticism, and is the best for the ordinary reader, Dillmann (6th ed, E trans) is technical, Ryle (*Cambridge Bible*) and Bennett (*Century Bible*) more popular Spurrell, *Notes on the Text of Genesis*, and Ball (in Haupt's *Sacred Books of the O T*) appeal to Hebrew students Addis, *Documents of the Hexateuch*, Carpenter and Harford-Battersby, *The Hexateuch*, and C F Kent, *Beginnings of Hebrew History*, are important for the literary analysis J Wellhausen's sketch in his *Proleg to Hist of Israel* (E trans, pp 259–342) is admirable, as also is the general intro (trans by W H Carruth, 1907) to Gunkel's valuable commentary Fuller bibl information will be found in the works already mentioned, in the articles in the *Ency Bib* (G F Moore), and Hastings's *Dict* (G A Smith), and in the fine volume by J Skinner in the *International Critical Series*. (S A C)

GENET, EDMOND CHARLES (1763–1834), French minister plenipotentiary to the United States in 1793, was born on Jan. 8, 1763, at Versailles He was for a time attached to the embassy at Berlin and later to the embassy at Vienna, and at the age of 18, following his father's death, succeeded him as secretary interpreter at the ministry of foreign affairs In 1787 he was sent to the embassy at St Petersburg where he remained until July 1792, when his liberal views made him *persona non grata* After a brief stay in Paris, where he came more fully under the influence of the Revolution, "citizen" Genet was sent as French minister to the Congress of the United States He was assuming a position which would require much tact, but his impetuous nature combined with the ovations accorded him by the Democratic-Republicans, led him into misjudging public opinion regarding American neutrality His activities in instigating military operations against the Spanish possessions of Florida and Louisiana and against Canada, the fitting out of privateers in American parts, his acrimonious debates with the Federal Government and his caustic attacks on the president, demonstrate conclusively his lack of diplomacy Genet's threat to override the executive by appealing to the people caused Washington to ask the French republic to recall its representative His successor, "citizen" Fauchet, brought orders to arrest him and send him back to France for trial, but Washington refused to permit the extradition He subsequently became a naturalized American citizen. In 1794 he married Cornelia Tappen Clinton, daughter of the governor of New York and in 1814, four years after the death of his first wife, married Martha Brandon Osgood, daughter of the first postmaster general He died on July 14, 1834

See M. Minnigerode, *Lives and Times* (1925); G C. Genet, *Washington, Jefferson and "Citizen" Genet 1793* (privately printed 1899); *Report 1896* (1897) and *Report 1897* (1898) of the American Historical Association, *The American Historical Review* vol iii. (1898); and *Mississippi Valley Historical Review* vol vi.

GENET, a south European carnivorous mammal referable to the *Viverridae* or family of civets, but also taken to include several allied species from Africa The true genet (*Genetta genetta*) occurs throughout the south of Europe and in Palestine, as well as North Africa The fur is of a dark-grey colour, thickly spotted with black, and having a dark streak along the back, while the tail, which is nearly as long as the body, is ringed with black and white It frequents the banks of streams and feeds on small mammals and birds. It differs from the true civets in that the anal pouch is a mere depression and contains only a faint trace of the characteristic odour of the former.



COMMON GENET (GENETTA VULGARIS)

GENETICS, a term coined by Bateson to designate that portion of biology concerned with heredity, variation, development and evolution It is the science which seeks to account for the resemblances and the differences which are exhibited among organisms related by descent Its problems are those of the cause, the material basis, and the method of maintenance of the specificity of germinal substance; in other words, "how the characters of parents and offspring are related, how those of the adult lie latent in the egg, and how they become patent as development proceeds" Its methods are those of observation, experimental breeding, cytology and experimental morphology. Its prosecution demands a knowledge of general physiology and of mathematics. It has both scientific and practical application its principles impinge upon all doctrines of evolution and upon agricultural, animal and plant breeding practices Its possible applications to human affairs have created the need for and the development of the applied science of eugenics (*q v*)

Out of the accumulated facts of genetical experimentation, there has been developed the theory of the gene (*q v*) intended to accommodate these facts It states (1) that the hereditary characters of the individual are referable to paired elements (the genes) in the germinal material (the chromosomes, *q v*) which are held together in a definite number of linkage groups; (2) that the members of each pair of genes separate when the germ-cells mature in accordance with Mendel's first law, and that in consequence each ripe germ-cell comes to contain one set only, (3) that the members of different linkage groups assort independently in accordance with Mendel's second law, (4) that an orderly interchange—crossing-over—also takes place, between the elements in corresponding linkage groups, and (5) that the frequency of crossing-over furnishes evidence of the linear order of the genes in each linkage group and of the relative position of the genes with respect to each other

The gene, a conception as reasonable and as real as the atom, is to be looked upon as a particular state of organization of the chromatin at a particular point in the length of a particular chromosome. (*See* ANIMAL BREEDING, HEREDITY, CYTOLOGY, MENDELISM and PLANT BREEDING)

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GENEVA, a city and canton of Switzerland, situated at the extreme south-west corner both of the country and of the Lake of Geneva or Lac Léman The canton is, save Zug, the smallest in the Swiss Confederation, while the city, long the most populous in the land, is now surpassed by Zürich and by Basel

The Canton.—The canton has an area of 108·9 sq m, of which 11½ are lake. It is entirely surrounded by French territory (the department of Haute Savoie to the south, and that of the Ain west and north), save for about 3½ m on the extreme north, where it borders on the Swiss canton of Vaud The Rhone flows through it from east to west, and then along its south-west edge. The turbid Arve is its largest tributary and flows from the snows of the chain of Mont Blanc, the only other affluent of any size being the Allondon. Market gardens, orchards, and vineyards occupy a large proportion of the soil, the apparent fertility of which is largely due to the unremitting industry of the inhabitants In 1926 there were 6,907 cows, 2,575 horses, 4,585 swine and 2,298 bee-hives in the canton. Besides building materials, such as sandstone, slate, etc., the only mineral to be found within the canton is bituminous shale, the products of which can be used for petroleum and asphalt. The canton is served by broad gauge railways and electric tramways. It was admitted into the Swiss Confederation in 1815 and ranks as the junior of the 22 cantons. In 1815–1816 it was increased by adding to the old territory belonging to the city (just around it, with the outlying districts of Jussy, Genthod, Satigny and Cartigny) 16 communes (to the south and east, including Carouge and Chêne) ceded by Savoy, and 6 communes (to the north, including Versoix), cut off from the French district of Gex

In 1920 the canton had 171,000, the city 135,059 inhabitants. (In the following statistics those for the city are enclosed within brackets) This population was divided as follows in point of religion. Roman Catholic 75,488 (57,744), Protestants 84,977 (68,016) and Jews 2,919 (2,815). In point of language 133,436 (102,699) were French-speaking, 20,705 (17,449) German-speaking, and 11,539 (10,118) Italian-speaking, while there were also 193 (170) Romansch-speaking. These are the figures for nationality: 54,901 (39,910) were Genevese citizens, and 64,376 (55,550) Swiss citizens of other cantons. Of the 51,721 (42,599) foreigners, there were 26,751 French, 14,744 Italians, 3,061 subjects of the German republic, 851 British subjects, 1,367 Russians, and some citizens of the United States of America In the canton there were 13,293 (6,639) inhabited houses and 49,626 (40,285) separate households In 1910 the canton contained 62,611 (51,740) foreigners but the number has fallen in consequence of the emigration during and after the World War.

HISTORY

In prehistoric times a great lake city, built upon piles which may still be seen, existed where the waters from the Alpine lakes spread out over the plain before narrowing into the channel of the Rhône This city was the prehistoric Geneva After the end of the period of lake dwellings the inhabitants established themselves on the hill on the left bank of the lake and the river

Caesar states that Geneva was a town (*oppidum*) situated in the extreme north of the country of the Allobroges, the Rhône separated it from the territory of the Helvetii, whose invasion Caesar repelled The community (*vicus*) of Geneva was one of those dependent on the city of Vienne It was of some size, and had temples, aqueducts, ports and ships It was built on the usual plan of intersecting roads meeting in a central forum One road ran from the south to the lake ports, and the other from the east to the bridge over the Rhône When the district of Vienne was made into a province, Geneva became a Roman city (*civitas*) with part of what is now Savoy dependent on it When the empire became Christian, a bishop was appointed at Geneva After the Barbarian invasions the city shrank to half its former size It was now concentrated on the high ground; at the foot of the hill the forum constituted a separate township, the *Bourg de Four.* The pagan temples were converted into Christian churches At the top of the hill rose St Peter's, while St Victor's was built in the detached part of the town

Order had been restored by the Burgundian kings in the 5th century, but Gundibald was defeated by Clovis and his sons were dethroned by the Franks (534). Geneva owed its importance to its bridge over the Rhône In 563 the bridge was carried away by a flood caused by a landslide at the other end of the lake. it was, however, immediately rebuilt. Geneva lay on the path of the armies marching to the conquest of Italy. Charlemagne held an assembly there in 773 After the break-up of his empire, a new kingdom was set up in Burgundy, that of the Rudolphians. During the feudal period the Burgundian kings

had more to fear from the hereditary counts of Geneva than from the elected bishops. Rudolph III conferred estates on the bishops and favoured them at the expense of the counts. On his death in 1032 the emperors of the Holy Roman empire inherited his lands. Frederick Barbarossa confirmed the temporal powers of the bishop of Geneva, who became a prince of the empire, and made the Church independent of the nobles of the district. The count of Geneva had a residence in the town, the old royal château, but had to do homage to the bishop for the château and for other fiefs

The sole direct ruler of Geneva was the prince bishop But the Genevese were always characterised by their passion for independence, and imitating the example of the Italian towns, with which they traded, they attempted towards the end of the 13th century to create a municipal organization for themselves They were able to play off against one another the rival rulers of the district

Savoy.—In Maurienne, a remote district of the country, there presently arose a count, who came to be known as the count of Savoy and was on bad terms with both the count of Geneva and the bishop Peter of Savoy, who was well received in England by the queen, his niece, acquired the rights of the elder branch of the counts of Geneva, succeeded in depriving the younger branch of the county of Vaud, and entered into relations with the city of Geneva His nephew Amadeus the Great declared himself the protector of the citizens, who had formed themselves into a municipality with syndics and other officers The count of Geneva was reduced to a mere vassal of his cousin of Savoy, while the bishop was compelled to yield to the latter his palace, together with the *vidomnat,* the office empowering him to administer summary justice in the city. Finally the bishop recognized the municipality, after the citizens, posted on the towers of St Peter's, had withstood bombardment by the count of Geneva from his castle This castle was dismantled in 1320 In the meantime the citizens had defeated the count's army near the lake (June 6, 1307), a victory comparable with that of the Swiss over the duke of Austria at the other end of Switzerland (Morgarten, 1315). But by calling in the count of Savoy the Genevese had fallen out of the frying pan into the fire They had been able to free themselves from the count of Geneva and to defy the bishop, but they discovered that their protector, not content with the office of *vidomne,* intended to make himself "prince" of the city He still retained some partisans, however, although some of the bishops did more to deserve the support of the citizens—Guillaume de Marcossey, who rebuilt the walls, and Adhémar Fabry, who codified the privileges of the town (1387) The counts of Savoy, successors to the counts of Geneva and created dukes of Savoy, endeavoured to obtain election to the bishopric of Geneva either for themselves (Amadeus VIII, Pope Felix V), or for a cadet of the family or for a prelate devoted to its interests Involved in the struggle between France and Burgundy by the policy of the House of Savoy, the town was ransomed by the Swiss after their victory over Charles the Bold (1477). The measures taken by Louis XI had destroyed the fairs at Geneva, and the prevalent distress of the 15th century became still worse in the 16th, when Duke Charles III, in 1525, went so far as to impose his will on the assembly of the citizens (*Conseil des Hallebardes*).

Better times came at last thanks to the commercial relations established between Geneva and the Swiss Some of the citizens arranged an alliance with Fribourg A few of the leaders were executed by the duke and the bishop, including Berthelier and Lévrier, but this did not prevent the two cities from being united, after several attempts, by a treaty of *combourgeoisie* (1526). The name of *Eiguenots* (*Eidgenossen,* confederates), was given to the patriotic party, and that of *Mamelus* to the remaining partisans of the duke, who were supported, outside the city, by the *gentilshommes de la Cuiller*

The Reformation and Independence.—The situation was complicated by the Reformation. The canton of Berne had in the meantime joined the *combourgeoisie* of Geneva and Fribourg. The latter town remained attached to the old faith, while Berne embraced the Reformation. One party in Geneva showed a similar tendency, and this was encouraged by Berne. The French theologian Guillaume Farel was sent to convert the French-speaking districts After a certain amount of conflict, the people of Geneva declared definitely in favour of the Reformed faith on May 21, 1536 The bishop, Pierre de la Baume, had already left the city, never to return (July 14, 1533) The syndics and the council took over the reins of authority, and claimed the sovereign powers of the bishop The Fribourgeois, who, together with the Bernese, had again come to the help of Geneva in 1530, now seceded from the alliance The Bernese had their hands full with their obligations to other cantons, and the Genevese had to defend their new republic unaided in the war which was waged without mercy from 1534 to 1536

The bishop rallied his supporters at the château of Peney (they were therefore known as the *peneisans*) and joined forces with the duke to attack Geneva The Genevese were on the point of succumbing in the unequal struggle when, in Jan. 1536, the Bernese at last came to their aid They occupied the Vaud, which Charles III had promised six years earlier to hand over to them as a pledge if he attacked Geneva They also seized the Gex district, and, in combination with the Genevese, took the castle of Chillon, from which they delivered Bonivard, the prior of St. Victor The Valaisans and even the Fribourgeois themselves joined in the struggle. The duke was on the point of losing his lands on the shores of Lake Leman and the bishop of Lausanne his city when King Francis I undertook the conquest of the remainder of Savoy and Piedmont The little war waged round Geneva was the match which set alight a larger conflagration. Francis I's rival, Charles V, took a hand in the quarrel When peace was restored between the two potentates, Charles III had lost his lands Once the Genevese were rid of him they were able to organize their independent Protestant republic in peace.

Calvin.—It was at this stage that Calvin appeared on the scene He was passing through the town and was induced by Farel to remain The great reformer was not immediately successful, and was obliged to leave the town He was, however, recalled by his partisans, and he undertook the task of imposing on the Genevese, who were intoxicated with their newly-won freedom, a severe moral discipline He succeeded in subduing the *libertins,* though not without some executions, as was the manner of the day. One of his most lasting achievements was the foundation of the Academy of Geneva, which he set up with the assistance of Théodore de Bèze (1559). It became a sort of training school for Protestant missionaries Geneva came to be to Protestantism what Rome was to Catholicism It was a city of refuge for the persecuted from Italy, England and France, and it thus acquired a cosmopolitan character, and the love of learning was fostered Calvin was the virtual ruler of the city, and from that fastness, through his emissaries and a voluminous correspondence, he directed his disciples in all parts of Europe. His influence was particularly great in France, and the Huguenots (*q v*) promised if necessary to send an army to the assistance of Geneva, "the holy city of Jerusalem," as Sully called it.

The gains of the war of 1536 were not lasting, Emmanuel-Philibert of Savoy recovered his lands, Berne only retained the Vaud; Geneva was once more encircled by enemies; and finally, Calvin died in 1564. On the other hand, Berne renewed the treaty of *combourgeoisie,* and Zurich entered the alliance in 1584. Some time before this Henry III. of France had made an alliance with Berne and Solothurn for the "conservation" of Geneva (1579) Civil war broke out in France Henry III's envoy Sancy brought a Swiss contingent to his aid, and Geneva entered the struggle. Sometimes in concert with Sancy's troops and the Bernese, sometimes alone, the Genevese fought and held their ground in the devastated districts like Gex Henry of Navarre, the former Huguenot leader, presently succeeded Henry III In spite of his former friendship with Geneva, he deprived the Genevese of the Gex district, which they had conquered, when he made peace with Savoy (1601).

With complete disregard of treaties, Duke Charles Emmanuel

attempted to take Geneva by surprise by scaling the walls with ladders (night of the *Escalade*, Dec 12, 1602). He was checked, and after peace had been concluded the king of France and the Swiss came to realize that they must keep good guard over the town which served them as a door of communication Henry IV hoped to discharge the considerable debt which the crowns of France and Navarre owed Geneva by paying the garrison of the town

Development.—Geneva now entered on a period of tranquillity. It enjoyed the friendship of the last of the Huguenot leaders, Agrippa d'Aubigné, who died in the city, and Henry de Rohan, who was buried there Industry prospered, particularly the clock-making industry, with the assistance of the refugees who fled to Geneva at the time of the St Bartholomew massacre and of the revocation of the Edict of Nantes (*qq v*) There grew up a patrician class, which constantly became more exclusive The cultivated middle classes, however, claimed a share in the management of affairs

The *Seigneurie* was governed by a *Petit Conseil* of 25 members, from among whom the four syndics were appointed annually Although they were elected, or their elections were confirmed, by the other councils (which they appointed themselves), they were always chosen from a small group of families The councils consisted of larger bodies including smaller ones; the "Sixty" included the "Twenty-five," and this again any smaller number of members considered suitable to deal with difficult cases; the "Two hundred" included the "Sixty," with a sufficient number of deputies to make up the total The assembly of the citizens and burghers, which gradually became less and less influential, was called the *Conseil Général.*

The citizens were constantly restive under the rule of the *Petit Conseil;* during the 18th century there were sometimes such serious disturbances that the allies of Geneva were obliged to act as mediators or even to intervene and to guarantee the treaties of pacification which were concluded The citizens had the right of protest (*représentation*) against the decisions of the *Petit Conseil,* but the latter did not consider itself obliged to take notice of the protests Hence the terms *représentants* and *négatifs* which often occur in connection with the measures taken against Jean Jacques Rousseau

The fame of Geneva had grown greatly To Russia she had given Lefort, to France, Necker, to America, Gallatin, to the world, Rousseau Among Rousseau's friends the physicist De Luc became reader to the queen of England, and the publicist D'Ivernois, who also lived in London, was, like Mallet du Pan, an opponent of the French Revolution Voltaire, Rousseau's rival, made the château of Ferney, not far from Geneva, a centre of European intellectual society, and Dr Tronchin attracted many distinguished guests to his native country Later, Horace Bénédict de Saussure undertook the scientific conquest of Mont Blanc, and a school of painters began to flourish. And on her exile, Madame de Staël, Necker's daughter, was to transfer to the château at Coppet, near Geneva, the salon she had formerly held at Paris

The 19th Century.—Just as this Genevan school was developing, the French Revolution occurred Revolutionary clubs were formed and under the influence of incitements from abroad, began to persecute the aristocrats Geneva, imitating the example of Paris, had its "Terror" An attempt was made to remedy the situation by the egalitarian constitution of 1794, but an end was not put to disorder until the French occupation of 1798

On the fall of Napoleon Geneva became the 22nd canton of Switzerland Its territory was increased by the inclusion of certain Catholic communes, both Sardinian and French, and this linked it up directly with the rest of Switzerland Geneva made an important contribution to the confederation in the person of General Dufour, who defeated the seceding league of Catholic cantons, the *Sonderbund.* The first Government of the Restoration period was regarded as reactionary Democratic agitation in the 19th century resulted in the constitution of 1842, which set up the *Conseil d'Etat* as the executive authority and the *Grand Conseil* as the legislative body, and established municipal autonomy. In 1847 James Fazy instituted a pure radical régime; his failure to obtain re-election to the *Conseil d'Etat* led to the disturbances of Aug. 22, 1864.

The radical party returned to power under Antoine Carteret, and supported the church of Père Hyacinthe Loyson against the Catholics. The Catholic curé Gaspard Mermillod, who later became a cardinal, was exiled in 1873. A later radical leader, Henri Fazy, was more in sympathy with the Catholics. The separation of Church and State was voted in 1907 The conservative party, now known as the Democrats, has sometimes held office under Arthur Chenevière, Gustave Ador, and Théodore Turrettini It has introduced certain reforms such as the referendum, the popular initiative and proportional representation The socialist party and other party formations have since come into existence.

Culture.—Geneva is noted for its intellectual activities One of the best-known periodicals was the old *Bibliothèque britannique,* or *Bibliothèque universelle,* now amalgamated with the *Revue de Genève* The Academy founded by Calvin has been transformed into a university with six Faculties. An Institute of Higher International Studies was founded in the year 1927. Great interest is taken in intellectual and social questions of all kinds The International Red Cross Society was founded at Geneva in 1864 This institution, together with the more recently founded League of Red Cross Societies, exists to tend the sick in time of peace and to mitigate the horrors of war

It is not surprising that such a city, with its tradition of independence, and its fame as an intellectual centre and as a focus of international movements, should have been chosen as the seat of the League of Nations (*q v*), which has been housed in the Hotel National since Nov. 1920 Designs for a new building and conference hall (the latter for the joint use of the League of Nations and the International Labour Office) were approved by the Council in 1927, after an international competition. The plans were subsequently changed owing to a gift of £400,000 from Mr John D Rockefeller, Jr, for a new Library, but the site was finally selected in 1928 The International Labour Office was at first housed at Pregny, 1½ m out of Geneva A new building (adjoining the League of Nations new site) was begun in 1923—and finally opened in June 1926

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GENEVA, a city of Ontario county, New York, U S A, at the northern end of Lake Seneca (36m long, with an average width of 2m and a maximum depth of 624 feet) It is on federal highway 20 and the State Barge canal, and is served by the Lehigh Valley and the New York Central railways. The population was 14,648 in 1920 (83% native white) and was estimated locally at 18,000

in 1928. Geneva is a well built city, with fine old residences and streets arched with century-old trees, and is surrounded by the beautiful and romantic scenery of the Finger Lake region It is the seat of Hobart college for men (founded 1822) and William Smith college for women (a co-ordinate institution, founded 1908); the Smith observatory (1888); a State armory; and a State agricultural experiment station. The Lafayette tree, under which Gen Lafayette held a reception in 1825, is said to be the largest tree in the State A medicinal spring, struck at a depth of 640ft. in boring for natural gas in 1885, flows at the rate of 350,-000gal per day There are large nurseries in and around the city, and it has important manufactures, notably of razors, optical frames, lenses, marine engines, preserved fruits and vegetables, canning machinery, enamelled ware and paste, with an aggregate output in 1925 valued at $10,930,785 Geneva was settled about 1787, near the site of a Seneca village (Kanadasega), which had been destroyed in 1779 The Indian burial mound, on the edge of the city, is still inviolate, in accordance with a pact made by the early settlers A delegation from the Seneca Nation visits it annually to make sure that the agreement is kept. The city was chartered in 1898

GENEVA, LAKE OF, the largest lake in central Europe It is *Lacus Lemannus* of classical writers, but from the 16th century onwards *Lac de Genève,* though from the end of the 18th century the name *Lac Léman* was revived Its area is 223 sq m , of which about 140 sq m are Swiss and 83 sq m French The French part takes in nearly the whole of the south shore, save its west and east ends, which belong respectively to Geneva and to Valais

The lake is formed by the Rhone, which enters it at its east end, between Villeneuve and St Gingolph and quits it at its west end, flowing through the city of Geneva The only important tributaries are the Drance (S), the Venoge (N) and the Veveyse (N). The direct length from Chillon to Geneva is 39½ m , the maximum depth is 1,015½ ft , mean depth 500 ft , greatest width (between Morges and Amphion) 8½ m , normal width 5 miles The lake forms two well-marked divisions separated by the strait of Promenthoux, and as a bar, divides the Grand Lac from the Petit Lac The "Grand Lac" is to the east and the "Petit Lac" (W) is the special Genevese portion. The unusual blueness of the waters has long been remarked, and transparency increases away from the Rhone entry as the river-borne mud sinks to the bottom The lake level is highest in summer There are remarkable temporary disturbances of level known as *seiches* both longitudinal and transverse, in which the whole mass of water in the lake rhythmically swings from shore to shore The currents are irregular The principal winds that blow over the lake are the *bise* (north-east), the *vaudaire* or *Fohn* (south-east), the *sudois* or *vent de plue* (south-west) and the *joran* (north-west) The storm winds are *molan* (from the Arve valley) and the *bornan* (from the Drance valley) The lake is not as rich in fish as the other Swiss lakes Prof Forel knows of but 20 indigenous species (of which the *Féra,* or *Coregonus fera,* is the principal) and six that have been introduced by man in the 19th century Lake dwellings, of varying dates, have been found on the shores

Despite steamers first placed on the lake in 1823, and railways along each shore, the red lateen sails of minor craft still brighten the landscape The railway along the northern shore runs from Geneva past Nyon, Rolle, Morges, Ouchy (the port of Lausanne), Vevey and Montreux to Villeneuve (56½ miles). That on the south shore gains the edge of the lake at Thonon only (22¼ m. from Geneva), and then runs past Evian and St. Gingolph to Le Bouveret (20 m from Thonon) In the harbour of Geneva two erratic granite boulders project above the water, and are named *Pierres du Niton* (supposed to be altars of Neptune). The lower of the two has been taken as the basis of the triangulation of Switzerland

See Prof. F A. Forel's monumental work, *Le Léman* (3 vols, Lausanne, 1892–1904), also (with fine illustrations) G. Fatio and F Boissonnas, *Autour du lac Léman* (Geneva, 1902), L. W. Collet, *Les Lacs* (1925).

GENEVA CONVENTION, an international agreement for the purpose of improving the condition of wounded soldiers of armies in the field, originally adopted at an international conference held at Geneva, Switzerland, in 1864, and afterwards replaced by the convention of July 6, 1906, also adopted at Geneva. This later agreement is the one now known as the Geneva Convention. The conference of 1864 was the result of a movement which sprang from the publication in 1862 of a book entitled *Un Souvenir de Solférino* by Henri Dunant, a Genevese philanthropist, in which he described the sufferings of the wounded at the battle of Solférino with such vivid effect that the subject became forthwith one of public interest. It was energetically taken up by M. Gustave Moynier, whose agitation led to an unofficial congress being held at Geneva in Oct 1863 The convention afterwards received the adherence of every civilized power

At a second conference on the same subject, held at Geneva in 1868, a supplementary convention was drawn up, consisting of 14 additional articles which never became operative The Brussels International Conference (1874) for the codification of the law and customs of war occupied itself with the Geneva Convention, but in this relation led to no result.

At The Hague Peace Conference of 1899 Great Britain withdrew her objections to the application of the convention to maritime warfare, and agreed to the adoption of a special convention "adapting to Maritime warfare the principles of the Geneva Convention" After some unsuccessful efforts an invitation by the Swiss Government was accepted in March 1906 by 35 States, only Turkey, Salvador, Bolivia, Venezuela, Nicaragua and Colombia abstaining, and the conference was held at Geneva in July 1906, when a full revised convention was adopted, which replaced that of 1864 This was again revived at The Hague Peace Conference of 1907 and adopted as Convention X

See *The Hague Conventions and Declarations of 1899 and 1907* (ed. by James Brown Scott, 1918), and the article, WAR, LAWS OF

GENEVIÈVE, ST. (*c* 422–512), patroness of Paris, was born, according to tradition, at Nanterre near Paris At the age of seven she was induced by St Germain, bishop of Auxerre, to dedicate herself to the religious life, and on the death of her parents she removed to Paris, where she distinguished herself by her benevolence, as well as by her austere life She is said to have predicted the invasion of the Huns, and when Attila with his army was threatening the city, she persuaded the inhabitants to remain on the island and encouraged them by an assurance, justified by subsequent events, that the attack would come to nothing (451) She is also said to have had great influence over Childeric, father of Clovis, and in 460 to have caused a church to be built over the tomb of St Denis She was buried in the church of the Holy Apostles, popularly known as the church of St Geneviève In 1793 the body was taken from the new church, built in her honour by Louis XV. in 1764, when it became the Panthéon, and burnt on the Place de Grève, but the relics were enshrined in the church of St. Étienne du Mont, where they still attract pilgrims Her festival is celebrated on Jan 3

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GENEVIÈVE (GENOVEVA OR GENOVFFA), **OF BRABANT,** heroine of mediaeval legend Her story is a typical example of the widespread tale of the chaste wife falsely accused and repudiated, generally on the word of a rejected suitor Genovefa of Brabant, wife of the palatine Siegfried of Treves, was falsely accused by the majordomo Golo Sentenced to death she was spared by the executioner, and lived for six years with her son in a cave in the Ardennes nourished by a roe. Siegfried, who had meanwhile found out Golo's treachery, was chasing the roe when he discovered her hiding-place, and reinstated her in her former honour Her story is said to rest on the history of Marie of Brabant, wife of Louis II , duke of Bavaria, and count-palatine of the Rhine, who was beheaded on Jan 18, 1256, for supposed infidelity, a crime for which Louis afterwards had to do penance The change in name may have been due to the cult of St Geneviève, patroness of Paris The tale first obtained wide popularity in *L'Innocence reconnue, ou vie de Sainte Geneviève de Brabant* (pr. 1638) by the Jesuit René de Cérisier (1603–62),

and was a frequent subject for dramatic representation in Germany Several other forms of the legend exist

BIBLIOGRAPHY.—S. Grundtvig, *Danske Kaempeviser* (1867); R. Kohler, "Die deutschen Volksbücher von der Pfalzgrafin Genovefa" in *Zeitschrift fur deutsche Philologie* (1874), B. Seuffert, *Die Legende von der Pfalzgràfin Genovefa* (Würzburg, 1877); "Sir Tramore," in Bishop Percy's Folio ms, ed Hales and Furnivall, vol ii (1868); *The Erl of Toulous and the Emperes of Almayn,* ed G Lüdtke (Berlin, 1881); *The Romance of Octavian,* ed E M Goldsmid (Aungervyle Soc, Edinburgh, 1882), F J Child, *English and Scottish Popular Ballads,* vol ii, art. "Sir Aldingar" (1886); B Golz, *Pfalzgràfin Genovefa in der deutschen Dichtung* (Leipzig, 1897).

GENGA, GIROLAMO (*c* 1476–1551), Italian architect and painter of the Umbrian school, was born in Urbino about 1476 He studied with Luca Signorelli and then with Pietro Perugino. According to Vasari, who knew him personally, he decorated the hall of Pandolfo Petrucci's palace at Siena with a series of frescoes. Six of these were carved out of the wall and sold, three are now in the National Gallery (*See* J P Richter, *Mond Collection*) In Rome he painted the "Resurrection" in the church of S Caterina da Siena One of his leading works is the "Disputation of the Four Fathers of the Church" in the Brera, Milan, painted for the church of S Agostino at Cesena As a painter he was an eclectic, making the different styles of Signorelli and Perugino his own He also imitated Pintoricchio His work is decorative in design and light in colour but does not rise to the excellence of his great masters Genga was a sculptor, a musician, a theatrical designer and an architect as well as a painter He was indeed in the first place an architect, when in Rome he studied and measured the antique buildings, and he was then appointed ducal architect by the duke of Urbino His most important architectural works are San Giovanni Battista in Pesaro; the bishop's palace at Sinigaglia; the new palace for the duke of Urbino on the Monte Imperiale He was also concerned in the fortifications of Pesaro. Genga died on July 11, 1551. His son Bartolommeo (1516–58) was an architect and painter

GENISTA, in botany, a genus of about 90 species of shrubs of the family Leguminosae, and natives of Europe, western Asia and north Africa; three are British *G. anglica* is the needle-furze or petty whin, found on heaths and moist moors, a spinous plant with slender spreading branches 1 to 2 ft long, very small leaves and short racemes of small yellow flowers The pollen is emitted in a shower when an insect alights on it *G tinctoria,* dyer's greenweed, the flowers of which yield a yellow dye, has no spines It is a native of Europe and Asia and naturalized in the north-eastern United States Other species are grown on rock-work or as greenhouse plants.

GENITIVE, in grammar the name given to one of the cases or declensions of nouns to indicate the relationship in which they stand to other words in the sentence The Latin language contained six declensions of nouns the Nominative or subject, the Vocative or person addressed, the Accusative or the object towards which the action is directed, the Genitive indicating its origin or source, the Dative that to which an action is directed, and the Ablative from which something is taken In Greek the ablative was excluded, and in French and Italian case is obviated by the use of prepositions In English the genitive, also called the possessive case, is the only declension employed, though certain exceptions necessitate the use of the dative and accusative cases. *See* GRAMMAR and articles on the different languages.

GENIUS (Lat the begetter) In its earliest meaning in private cult, the *genius* of the Roman house-father and the *iuno* (*see* JUNO) of the house-mother were worshipped. These certainly were not the souls of the married pair, as is clear both from their names and from the fact that we never hear in any early document of the *genius* or *iuno* of a dead person As no cult was paid to the *genius* of any other member of the family, it seems reasonable to suppose that they were the male and female forms of the family's, or clan's, power of continuing itself by reproduction which were in the keeping of the heads of the family or clan for the time being, and passed at death to their successors (*See* Rose, *Primitive Culture in Italy,* 149 *et seq*) In this as in all forms of his cult, the *genius* was often conceived as appearing in the form of a snake, although he is also shown in art as a young man, generally engaged in sacrificing. At every wedding a bed, the *lectus genialis,* was made for the *genius* and *iuno* of the husband and wife, and its presence in the house was a sign of matrimony (Horace, *Epp.* 1. 1, 87; Paulus, *epit. Fest.* 83, 23 Lindsay).

Individual Genius.—Owing to the rise of individualism and also to the prevalence of Greek ideas concerning a guardian spirit or *daimon,* the *genius* lost its original meaning, and came to be a sort of personification of the individual's natural desires and appetites Hence the phrases *indulgere genio, genium defrudare,* signifying respectively to lead a pleasurable and a stingy life. However, the development did not stop here. The *genius* came to be thought of as a sort of guardian angel, a higher self; and, as the Greek *daimon* was sometimes rationalized into the individual's character or temper, so also Horace half-seriously (*Epp* ii. 2, 187) says that only the *genius* knows what makes one person so different from another, adding that he is a god who is born and dies with each one of us This individual *genius* was worshipped by each individual especially on his birthday A few inscriptions even mention the *genius* of a dead person, as Christian epitaphs sometimes speak of his angel.

Genius of the Emperor.—To show reverence for the genius of another, or to swear by it, was a mark of deep respect; hence it is not unnatural that the *genius* of Augustus and of his successors formed objects of popular cult Thus to worship the *genius Augusti* avoided the feeling against worshipping any living emperor, which remained fairly strong in Italy (*see* L. R. Taylor in *Trans Amer. Philol Assoc,* vol li, 116 et seq), for of course all *genii* were divine and might properly be worshipped.

Further Developments.—As Greek *daimones* were by no means always the guardian spirits of individuals, so also we get a vast variety of *genii; i.e.,* guardian spirits, of places, *genius loci,* including buildings (*genius balneorum,* etc) and corporations of all sorts, from the State (*genius populi Romani*) to small bodies of troops, guilds of tradesmen and so forth A very curious development is that we sometimes hear of the *genius* of a god, even of Jupiter, or of the *iuno* of a goddess

Use in English.—Apart from the Latin use of the term, the plural "genii" (with a singular "genie") is used in English, as equivalent to the Arabic *jinn,* for a class of spirits, good or bad, such as are described, for instance, in *The Arabian Nights* But "genius" itself has become the regular English word for the highest conceivable form of original ability, something altogether extraordinary and beyond even supreme educational prowess, and differing, in kind apparently, from "talent," which is usually distinguished as marked intellectual capacity short only of the inexplicable and unique endowment to which the term "genius" is confined

See further Wissowa, *Religion u Kultus,* 2nd ed, p 175 *et seq,* and the classical dictionaries, also J. F Nisbet, *Insanity of Genius* (1891); F Galton, *Hereditary Genius* (new ed, 1892), and C Lombroso, *Man of Genius* (Eng. trans., 1891).

GENLIS, STÉPHANIE-FÉLICITÉ DU CREST DE SAINT-AUBIN, COMTESSE DE (1746–1830), French writer and educator, was born at Champcéry, Autun, France. At six years of age she was received as a canoness into the noble chapter of Alix, near Lyons, with the title of Madame la Comtesse de Lancy, taken from the town of Bourbon-Lancy Her entire education, however, was conducted at home. In her 16th year she was married to Charles Brûlart de Genlis, a colonel of grenadiers, who afterwards became marquis de Sillery Some years later, through the influence of her aunt, Madame de Montesson, who had been clandestinely married to the duke of Orleans, she entered the Palais Royal as lady-in-waiting to the duchess of Chartres (1770) She acted with great energy and zeal as governess to the daughters of the family, and was in 1781 appointed by the duke of Chartres to the responsible office of *gouverneur* of his sons, a step which led to the resignation of all the tutors as well as to much social scandal She wrote several works for the use of her pupils, the best known of which are the *Théâtre d'éducation* (4 vols, 1779–80), a collection of short comedies for young people, *Les Annales de la vertu* (2 vols., 1781) and *Adèle et Théodore* (3 vols, 1782). She anticipated many modern methods of teaching. His-

tory was taught with the help of magic lantern slides and her pupils learnt botany from a practical botanist during their walks. Madame de Genlis welcomed the Revolution, but the fall of the Girondins in 1793 compelled her to take refuge in Switzerland along with her pupil Mademoiselle d'Orléans In this year her husband, from whom she had been separated since 1782, was guillotined.

In 1794 Madame de Genlis fixed her residence at Berlin, but was expelled by order of King Frederick William, and afterwards settled in Hamburg, where she supported herself for some years by writing and painting After the 18th Brumaire (1799) she returned to France, and was well received by Napoleon, who gave her apartments at the arsenal, and assigned her a pension of 6,000 francs Her government pension was discontinued by Louis XVIII Her *Dîners du Baron d'Holbach* (1822), in which she set forth with a good deal of sarcastic cleverness the intolerance, the fanaticism, and the eccentricities of the "philosophes" of the 18th century, caused much discussion She died on Dec 31, 1830

The numerous works of Madame de Genlis (which exceed 80) owed much of their success to adventitious causes They are useful, however (especially the voluminous *Mémoires inédits sur le XVIIIe siècle*, 10 vols, 1825), as furnishing material for history Most of her writings were translated into English almost as soon as they were published A list of her works with useful notes is given by Quérard in *La France littéraire* Startling light was thrown on her relations with the duc de Chartres by the publication (1904) of her correspondence with him in *L'Idylle d'un "gouverneur"* by G Maugras *See* also Sainte-Beuve, *Causeries du lundi*, vol III, H Austin Dobson, *Four Frenchwomen* (1890), W de Chabreul, *Gouverneur de princes, 1737–1830* (1900), L Chabaud, *Les Précurseurs du féminisme* (1901); *Lettres inédites à . Casimir Baecker, 1802–1830* (1902), edited by H. Lapauze, and T Harmand, *Madame de Genlis* (1912)

GENNADIUS II. or **GEORGIOS SCHOLARIOS** (d. *c.* 1468), patriarch of Constantinople from 1454 to 1456, philosopher and theologian, was one of the last representatives of Byzantine learning He appears to have been born at Constantinople and to have served the emperor John VII Paleologus as counsellor He was present at the great council held in 1438 at Ferrara and Florence with the object of uniting the Greek and Latin Churches, and there met the celebrated Platonist, Gemistus Pletho In church matters, as in philosophy, the two were opposed,—Pletho maintaining strongly the principles of the Greek Church, Georgios being more willing to compromise On his return to Greece, however, Georgios violently opposed the union In 1448 he became a monk at Pantokrator, and in 1453 was elected patriarch of Constantinople by Mohammed II A few years later he found his position under a Turkish sultan so irksome that he retired to the monastery of John the Baptist near Serrae in Macedonia, where he died about 1468

His writings, which include philosophical translations and commentaries, defences of Aristotle, and expositions of Christianity for Mohammedans and Jews, are described in W Gass, *Gennadius und Pletho* (1844), and in Fabricius, *Bibliotheca Graeca*, ed Harles, vol xi Some are printed in Migne, *Patrol Gr* vol clx *See* also F Schultze, *Gesch der Phil d Renaissance* (1874), i

GENOA (anc *Genua*, Ital *Genova*, Fr *Gênes*), the chief port of Liguria, Italy, and capital of the province of Genoa, 119 m N W of Leghorn by rail Pop (1921) 316,217 (town), 553,999 (commune) The town is situated on the Gulf of Genoa, and is the chief port of Italy, the seat of an archbishop and a university and a strong fortress The city, as seen from the sea, is "built nobly," and deserves the title of the Superb Finding only a small space of level ground along the shore, it has been obliged to climb the lower hills of the Ligurian Alps, which afford many a coign of vantage for the effective display of its architectural magnificence The original nucleus of the city is that portion which lies to the east of the port in the neighbourhood of the old pier (Molo Vecchio) In the middle of the 12th century, it was found necessary to extend the line of circumvallation. but it was not till 1320–30 that a third line took in the greater part of the modern site of the city proper This presented about 3 m. of rampart towards the land side, and can still be traced, though large portions, especially towards the east, have been dismantled The present line of circumvallation dates from 1626–32, the period when the independence of Genoa was threatened by the dukes of Savoy. From the mouth of the Bisagno in the east, and from the lighthouse point in the west, it stretches inland over hill and dale to the great fort of Sperone (the Spur), on the summits of Monte Peraldo at a height of 1,650 ft,—the circuit being little less than 12 m, and all the important points along the line being defended by forts or batteries A portion of the enclosed area is open country, dotted only here and there with houses and gardens There are eight gates, the more important being Porta Pila and Porta Romana towards the east, and the Porta Lanterna or Lighthouse gate to the west

Architectural Features.—The main architectural features of Genoa are its mediaeval churches, with striped façades of black and white marble, and its magnificent 16th-century palaces The earlier churches of Genoa show a mixture of French Romanesque and the Pisan style—they are mostly basilicas with transepts, and as a rule a small dome, the pillars are sometimes ancient columns, and sometimes formed of alternate layers of black and white marble The façades are simple, without galleries, having only pilasters projecting from the wall, and are also alternately black and white This style continued in Gothic times also The oldest is S Maria di Castello (11th century), the columns and capitals of which are almost all antique S Cosma, S Donato (with remains of the 10th-century building) and others belong to the 12th century, and S Giovanni di Prè, S Agostino (with a fine campanile), S Stefano, etc, to the 13th S Matteo, the church of the Doria family, was founded in 1126 by Martino Doria The façade dates from 1278, and the interior from 1543 In the crypt is the tomb of Andrea Doria by Montorsoli, and above the high altar hangs the dagger presented to the doge by Pope Paul III To the left of the church is an exquisite cloister of 1308 with double columns, in which a number of sepulchral inscriptions of the family and the statue of Andrea Doria by Montorsoli are preserved The little square in front of the church is surrounded by Gothic palaces of the Doria family The cathedral of S Lorenzo was reconstructed about the end of the 11th century, and consecrated in 1118. The façade has three elaborate doorways (13th century) The interior was rebuilt in 1307 The campanile, which rises above the right-hand doorway, was completed in 1522, and the cupola was erected after the designs of the architect Galeazzo Alessi in 1567 The fine Early Renaissance (1448) sculptural decorations of the chapel of S John the Baptist were due to Domenico Gagini of Bissone on the Lake of Lugano In the treasury of the cathedral is an octagonal bowl, the Sacro Catino, brought from Caesarea in 1101, which corresponds to the descriptions given of the Holy Grail, and was long regarded as an emerald of matchless value, but is in reality only a remarkable piece of ancient glass

The church of S Ambrose, rebuilt by the Jesuits (1587), has a richly decorated interior (16th century) The Annunziata del Guastato (1587), one of the largest churches in the city, is a cruciform structure, with a dome The interior is covered with gilding and frescoes of the 17th century San Siro was rebuilt by the Benedictines in the 11th century, and restored and enlarged by the Theatines in 1576, the façade being added in 1830 Santa Maria di Carignano, belongs mainly to the 16th century, and was designed by Galeazzo Alessi in imitation of S Peter's at Rome The interior is fine, while the colouring of the exterior is less pleasing The highest gallery of the dome is 368 ft. above the sea-level, and 194 ft above the ground

The palaces of the Genoese patricians, famous for their sumptuous architecture, their general effectiveness, and their artistic collections, were many of them built in the latter part of the 16th century by Galeazzo Alessi, a pupil of Michelangelo, whose style is imposing and displays marvellous ingenuity in using a limited or unfavourable site to the greatest advantage Several of the villas in the vicinity of the city are also his work The Via Garibaldi is flanked by a succession of magnificent palaces, chief among which is the Palazzo Rosso It was presented by the duchess of Galliera to the city (1874), along with its valuable contents, its library and picture gallery, which includes fine examples of Van Dyck and Paris Bordone The Palazzo Municipale, built by Rocco Lurago at the end of the 16th century, once the

property of the dukes of Turin, has a beautiful entrance court and a hanging terraced garden fronting a noble staircase of marble which leads to the spacious council chamber. In an adjoining room are preserved two autograph letters of Columbus, and the violin of Paganini (*q v*). Opposite the Palazzo Rosso is the Palazzo Bianco, bequeathed to the city by the duchess of Galliera (1889) and subsequently converted into a museum In the Via Balbi is the Durazzo Pallavicini palace with a noble façade and staircase and a rich picture-gallery; also the Palazzo Balbi-Senarega, which has Doric colonnades and a fine orangery The Palazzo dell' Università has an extremely fine court and staircase of the early 17th century. The Palazzo Doria in the Piazza Principe, presented to Andrea Doria by the Genoese in 1522, was remodelled in 1529 by Montorsoli and decorated with fine frescoes by Perino del Vaga Its garden was destroyed by the building of the railway. The old palace of the doges, originally a building of the 13th century, to which the tower alone belongs, stands near the cathedral. Another very fine building is the Gothic Palazzo di S Giorgio, near the harbour, dating from about 1260, occupied from 1408 to 1797 by the Banca di S Giorgio, now completely restored and occupied by the offices of the Port Authority The Cimitero di Staglieno, about 1½ m from the city on the banks of the Bisagno, is one of the chief features of Genoa; its situation is of great natural beauty and it is remarkable for its modern sepulchral monuments The university, founded in 1471, has 1,409 students, with faculties in law, medicine, natural science, engineering and philosophy The naval engineering school has 261 students, and the institute of economics and commerce 587 Genoa is also well supplied with other institutions for higher education The hospitals and the asylum for the poor are among the finest institutions of their kind in Italy Mention must also be made of the Academy of Fine Arts, the municipal library, the Teatro Carlo Felice and the Verdi Institute of Music

The irregular relief of its site and its long confinement within the fortifications have made Genoa a picturesque confusion of narrow streets, lanes and alleys, varied with stairways climbing the steeper slopes and bridges spanning the deeper valleys Large portions of the town are inaccessible to carriages, and many of the important streets have very little room for traffic In modern times, however, a number of fine streets and squares with beautiful gardens have been laid out. The Piazza Deferrari, a large irregular space, is the chief focus of traffic and the centre of the Genoese tramway system, and imposing new buildings have been erected in and round it The Via Venti Settembre leads south-east to the Ponte Pila, the central bridge over the Bisagno, and to a growing residential quarter beyond it, with a new sea front, the Corso d'Italia, connecting with the previously existing coast road. The Via Roma, which gives on to the Via Carlo Felice near the Piazza Deferrari, leads to the Piazza Corvetto, with the equestrian statue of Victor Emmanuel II To the left is the Villetta Dinegro, a beautiful park belonging to the city To the right is another park, the Acquasola, laid out in 1837 on the site of the old ramparts. In front of the principal station is the Piazza Acquaverde, with a statue of Columbus, at whose feet kneels the figure of America The Via di Circonvallazione a Monte leads up to the hills at the back of the town, where new suburbs have been constructed San Pier d'Arena on the west has now become a part of Genoa. Genoa is well served with electric tramways, which run into the suburbs on the east as far as Nervi and to Pegli on the west. Three funicular railways from different points of the city give access to the highest parts of the hills behind the town.

Commerce and Industry.—Though its existence as a maritime power was originally due to its port, it is only since 1870 that Genoa has provided the conveniences necessary for the modern development of its trade, the duke of Galliera's gift of £800,000 to the city in 1875 being devoted to this purpose A further enlargement of the harbour was necessitated upon the opening of the St Gotthard tunnel in 1882, which extended the commercial range of the port through Switzerland into Germany. The old harbour is semi-circular in shape, 232 ac in area, with numerous quays, and protected by moles from southern and south-westerly winds. An outer harbour, 247 ac. in area, has been constructed in front of this by extending the Molo Nuovo by the Molo Duca di Galliera, and another basin, the Vittorio Emanuele III, for coal vessels, with an area of 96 ac., has been formed to the west of this, between it and the lofty lighthouse which rises on the promontory at the south-west extremity of the harbour, while a further extension in front of San Pier d'Arena as far as the mouth of the river Polcevera is in progress. The largest ships can enter the harbour, which has a minimum depth of 30 ft ; it has two dry docks, a graving dock and a floating dry dock Very large warehouses have been constructed The exports are olive oil, hemp, flax, rice, fruit, wine, hats, cheese, steel, velvets, gloves, flour, paper, soap and marble, while the main imports are coal, cotton, grain, machinery, etc. Genoa has a large emigrant traffic with South America, and a large general passenger steamer traffic both for America and for the East (161,922 in 1926)

The development of industry has kept pace with that of the harbour The Ansaldo shipbuilding yards construct armoured cruisers both for the Italian navy and for foreign Governments The Odero yards, for the construction of merchant and passenger steamers, have been similarly extended, and the Foce yard is also important A number of foundries and metallurgical works supply material for repairs and shipbuilding Tanneries and cotton-spinning and weaving mills have considerably extended throughout the province Cement works have acquired considerable importance The manufactures of motor cars, hats, crystallized fruits and of filigree silver-work may also be mentioned The total trade of the port increased from well under 1,000,000 tons in 1876 to 7,581,359 metric tons in 1926 Of this large total 6,192,225 tons are imports and only 1,389,134 tons are exports, and as the railway returns show that in the financial year 1925–26, 5,944,341 tons were loaded on to trucks, the vast majority of the former amount was conveyed by rail

The four main lines which centre on Genoa—(1) to Novi, which is the junction for Alessandria, where lines diverge to Turin and France via the Mont Cenis, and to Novara and Switzerland and France via the Simplon, and for Milan; (2) to Acqui and Piedmont, (3) to Savona, Ventimiglia and the French Riviera, along the coast, (4) to Spezia and Pisa—all have been electrified, and the first has two alternative double lines for the passage over the Apennines, as far as Arquata Scrivia. There is a marshalling station, connected directly with the harbour by tunnels, at Campasso north of San Pier d'Arena Genoa is the most important harbour in the western Mediterranean, with the exception of Marseilles, with which it carries on a keen rivalry. The total of shipping entered in 1926 was 5,069 vessels with a tonnage of 8,645,246, while that cleared was 5,092 vessels with a tonnage of 8,662,119

HISTORY

The discovery of a Greek cemetery of the 4th century B C is the only proof that Genoa was ever occupied by the Greeks. It was destroyed by the Carthaginians in 209 B C but restored by the Romans, who made it and Placentia their headquarters against the Ligurians An inscription of 117 B C (now preserved in the Palazzo Municipale at Genoa) gives the text of the decision given by the *patroni*, Q and M Minucius of Genua, in a controversy between the people of Genua and the Langenses or Langates, the inhabitants of a neighbouring hill-town It is only from inscriptions of other places that we know that Genoa had municipal rights, and we do not know at what period it obtained them Strabo (IV 6 2, p. 202) states that Genoa exported wood, skins, and honey, and imported olive oil and wine, though Pliny speaks of the wine of the district as the best of Liguria (*Hist. Nat.* xiv. 67)

The history of Genoa during the dark ages, throughout the Lombard and Carolingian periods, is but the repetition of the general history of the Italian communes The patriotic spirit and naval prowess of the Genoese, developed in their defensive wars against the Saracens, led to the foundation of a popular constitution and to the rapid growth of a powerful marine From the necessity of leaguing together against the common Saracen foe,

Genoa united with Pisa early in the 11th century in expelling the Muslims from the island of Sardinia; but the Sardinian territory thus acquired soon furnished occasions of jealousy to the conquering allies, and there commenced between the two republics the long naval wars which terminated fatally for Pisa in the battle of Meloria (1284) Genoa secured great advantages from the trade stimulated by the crusades The seaports wrested at the same period from the Saracens along the Spanish and Barbary coasts became important Genoese colonies, whilst in the Levant, on the shores of the Black Sea, and along the banks of the Euphrates were erected Genoese fortresses of great strength

The commercial and naval successes of the Genoese during the middle ages were the more remarkable because, unlike their rivals, the Venetians, they were the unceasing prey to intestine discord—the Genoese commons and nobles fighting against each other, rival factions amongst the nobles themselves striving to grasp the supreme power in the state, nobles and commons alike invoking the arbitration and rule of some foreign captain as the sole means of obtaining a temporary truce From these contests of rival nobles, in which the names of Spinola and Doria stand forth with greatest prominence, Genoa was soon drawn into the great vortex of the Guelph and Ghibelline factions, but its recognition of foreign authority—successively German, Neapolitan, and Milanese—gave way to greater independence in 1339, when the government assumed a more permanent form with the appointment of the first doge, an office held at Genoa for life, in the person of Simone Boccanera Alternate victories and defeats of the Venetians and Genoese—the most terrible being the defeat sustained by the Venetians at Chioggia in 1380—ended by establishing the great relative inferiority of the Genoese rulers, who fell under the power now of France, now of the Visconti of Milan. The Banca di S Giorgio, with its large possessions, mainly in Corsica, formed during this period the most stable element in the state, until in 1528 the national spirit appeared to regain its ancient vigour when Andrea Doria succeeded in throwing off the French domination and restoring the old form of government The government as restored by him, with certain modifications tending to impart to it a more conservative character, remained unchanged until the outbreak of the French Revolution and the creation of the Ligurian republic

The Ligurian republic was soon swallowed up in the French empire, but not before Genoa had experienced terrible privations in the siege when Masséna held the city against the Austrians (1800). In 1814 Genoa rose against the French, on the assurance given by Lord William Bentinck that the allies would restore to the republic its independence It had, however, been determined by a secret clause of the treaty of Paris that Genoa should be incorporated with the dominions of the king of Sardinia The discontent so created kept alive in Genoa the republican spirit which, through the influence of a young Genoese citizen, Joseph Mazzini, was a permanent menace not only to the Sardinian monarchy but to all the established governments of the peninsula A republican outbreak occurred in 1848, but after a short and sharp struggle the city, momentarily seized by the republican party, was recovered by General Alfonzo La Marmora

In April–May 1922 an important Conference of the Powers, attended also by representatives from the British Dominions was held at Genoa (*See* GENOA, CONFERENCE OF)

BIBLIOGRAPHY.—Among the earlier Genoese historians the most important are Bartolommeo Fazio and Jacopo Bracelli, both of the 15th century, and Paolo Partenopeo, Jacopo Bonfadio, Oberto Foglietta, and Agostino Giustiniano of the 16th Paganetti wrote the ecclesiastical history of the city, and Accinelli and Gaggero collected material for the ecclesiastical archaeology The memoirs of local writers and artists were treated by Soprani and Ratti *See* also Bréquigny, *Histoire des révolutions de Gênes jusqu'en 1748;* Serra, *La Storia dell' antica Liguria e di Genova* (1834), *Nuova istoria della repubblica di Genova* (1858), and *Storia della rep di Genova dall' anno 1528 al 1550* (Genoa, 1874); Blumenthal, *Zur Verfassungs- und Verwaltungsgeschichte Genua's im 12ten Jahrhundert* (Kalbe an der Saale, 1872), Malleson, *Studies from Genoese History* (1875), L Isnardi and E Celesia, *Storia della Università di Genova* (Genoa, 1861–67), The *Liber jurium reipublicae Genuensis* was edited by Ricotti in the 7th, 8th, and 9th volumes of the *Monumenta historiae patriae* (1854–57) *See* further *Atti della Società Ligure di storia patria* (1861 *seq*), *Giornale Ligustico di archeologia, storia, e belle arti*

GENOA, CONFERENCE OF (April 10–May 19, 1922), a meeting of representatives of the British self-governing Dominions and of 29 European states, including not only the Allies and ex-neutrals, but all the ex-enemy Powers except Turkey (who was excluded on the ground that she was an Asiatic country) Above all, the conference was attended by representatives of Soviet Russia, and the dominant issue was the renewal of relations between Russia and the countries of Europe Before the conference met M Briand had been succeeded as prime minister by M Poincaré Since the project of the Genoa conference had already been accepted by the supreme council, M Poincaré could not reject it altogether, but he sought to interpret the agreed programme in the narrowest sense and to hedge the participation of Russia with the fullest possible restrictions He gave detailed and stringent instructions in this sense to his representative, M. Barthou

The general conference was preceded by a meeting between M Poincaré and Mr. Lloyd George at Boulogne, on Feb 25, a meeting of Allied economic experts in London from March 20 to 28, which drew up detailed agenda for Genoa, and two other preliminary meetings of a regional character, one between the members of the Little Entente at Belgrade, and another at Warsaw between Poland, Latvia, Estonia, and Finland The parties represented at Warsaw subsequently conferred at Riga with representatives of Soviet Russia The invitation to Genoa was accepted by the Soviet Government with alacrity, but was declined by the United States

Adverse Influence of the Rapallo Treaty.—At its first plenary session the conference set up four commissions, the first to examine methods of putting into practice the principles of the Cannes resolution of Jan 6, 1922 (*see* CANNES, CONFERENCE OF), while the other three were to deal respectively with financial subjects, economic and commercial subjects, and transport. These three latter commissions all reported before the conference came to an end, but their reports were bound to remain academic unless the first commission achieved positive results The task of the first commission was more difficult, because it was general and political in character, and its work was soon suspended in favour of informal discussions between the three principal Allied Powers and Belgium on the one side and the Russians on the other Meanwhile the Germans signed, on April 16, a separate treaty with the Russians at Rapallo, in which the objects of the Genoa conference were achieved as between these two parties by a mutual renunciation of reparation claims and a resumption of normal consular and diplomatic relations

This separate Russo-German treaty damaged the general prospects of the conference by the fear it instilled into the Allies In these circumstances there was little prospect of success for a general pact of non-aggression, which Mr Lloyd George suggested on April 25 But the conference actually broke down through the intransigence of Belgium, who insisted upon the integral restitution of foreign-owned private property in Russia France supported the Belgian contention Eventually a formula on the British lines was carried, even Belgium finally giving way; but it was so evident that, with Great Britain and France divided, no positive result could be achieved, that the Genoa conference was quietly wound up by remitting its agenda to a mixed commission of experts, who duly met at The Hague from June 26 to July 20, 1922, but also foundered on the rock of foreign-owned private property in Russia The Genoa conference was interesting because economic and financial problems were approached from the point of view of reconstruction, and not of reparation It was also the first attempt at a settlement between the European governments and Soviet Russia

See Sir C Gordon and E Montpetit, *The Genoa Conference,* Joint Report of the Canadian Delegates (1922), J. S. Mills, *The Genoa Conference* (1922)

GENOVESI, ANTONIO (1712–1769), Italian writer on philosophy and political economy, was born at Castiglione, near Salerno, on the 1st of November 1712 He was educated for the church, and, after some hesitation, took orders in 1736 at Salerno, where he was appointed professor of eloquence at the theological seminary During this period of his life he began the study of

philosophy, being especially attracted by Locke. Dissatisfied with ecclesiastical life, Genovesi resigned his post, and qualified as an advocate at Rome Finding law as distasteful as theology, he devoted himself entirely to philosophy, of which he was appointed extraordinary professor in the university of Naples. His first works were *Elementa Metaphysicae* (1743 et seq) and *Logica* (1745) The former is divided into four parts, Ontosophy, Cosmosophy, Theosophy, Psychosophy, supplemented by a treatise on ethics and a dissertation on first causes The *Logic,* an eminently practical work, written from the point of view of Locke, is in five parts, dealing with (1) the nature of the human mind, its faculties and operations, (2) ideas and their kinds, (3) the true and the false, and the various degrees of knowledge, (4) reasoning and argumentation; (5) method and the ordering of our thoughts. If Genovesi does not take a high rank in philosophy, he deserves the credit of having introduced the new order of ideas into Italy, at the same time preserving a just mean between the two extremes of sensualism and idealism Although bitterly opposed by the partisans of scholastic routine, Genovesi found influential patrons, amongst them Bartolomeo Intieri, a Florentine, who in 1754 founded the first Italian or European chair of political economy (commerce and mechanics), on condition that Genovesi should be the first professor, and that it should never be held by an ecclesiastic. The fruit of Genovesi's professorial labours was the *Lezioni di Commercio,* the first complete and systematic work in Italian on economics On the whole he belongs to the "Mercantile" school, though he does not regard money as the only form of wealth Specially noteworthy in the *Lezioni* are the sections on human wants as the foundation of economical theory, on labour as the source of wealth, on personal services as economic factors, and on the united working of the great industrial functions He advocated freedom of the corn trade, reduction of the number of religious communities, and deprecated regulation of the interest on loans. In the spirit of his age he denounced the relics of mediaeval institutions, such as entails and tenures in mortmain Gioja's more important treatise owes much to Genovesi's lectures Genovesi died on the 22nd of September 1769

BIBLIOGRAPHY—*Opere scelte,* with Life by A Fabroni (3 vols, Milan, 1824–35), *Opuscoli e Lettere familiari* (Venice, 1827), R Bobba, *Commemorazione di Antonio Genovesi* (Benevento, 1867), G. M. Monti, *Due grandi reformatori del settecento A Genovesi et G. H Galanti* (1926)

GENRE, as applied to paintings, has primarily to do with a type of subject, but the proper application of the term is limited also by the painter's attitude toward the subject In genre painting the artist deals with intimate scenes and subjects from ordinary daily life. The elimination of imaginative content serves to focus attention upon the shrewd observation of types, costumes and settings and upon the beauty and appropriateness of colour, form and texture. True genre painting should reduce to a minimum such subjective qualities as the dramatic, historical, ceremonial, satirical, didactic, romantic, sentimental and religious Characteristic works by Steen, Daumier, Rowlandson and Hogarth would thus be too satirical or didactic to qualify perfectly as genre, while those of Wheatley, Morland and Fragonard would be too sentimental and those of J F. Millet too romantic

In Europe, genre painting scarcely deserves serious notice until the late middle ages when we often find in manuscript books illuminated calendars showing the occupations appropriate to the months or seasons. (*See* ILLUMINATED MANUSCRIPTS) These little genre pictures give intimate glimpses of the life of the time. Soon the taste for genre becomes so keen that Petrus Cristus, Pieter Aertsen and Pieter Bruegel paint scenes in shops and kitchens thinly disguised as religious subjects This practice was followed later by Rembrandt, supreme in his ability to express profound emotion without surrendering the objective attitude. The greatest home of genre painting was indeed Holland in Rembrandt's time when flourished Adriaen van Ostade, Gerard Dou, Gabriel Metsu, Jan Vermeer, Pieter de Hooch and Terborch. Among later exponents are Jean Siméon Chardin in France and Pietro Longhi in Italy

GENSONNÉ, ARMAND (1758–1793), French revolutionary, son of a military surgeon, was born at Bordeaux on August 10, 1758. He studied law, and at the outbreak of the Revolution was an advocate of the parlement of Bordeaux In 1790 he became *procureur* of the Commune, and in July 1791 was elected by the newly created department of the Gironde a member of the court of appeal. In the same year he was elected deputy for the department to the Legislative Assembly As reporter of the diplomatic committee, in which he supported the policy of Brissot, he proposed two of the most revolutionary measures passed by the Assembly: the decree of accusation against the king's brothers (January 1, 1792), and the declaration of war against the king of Bohemia and Hungary (April 20, 1792) He was vigorous in his denunciations of the intrigues of the court and of the "Austrian committee"; but the violence of the extreme democrats, culminating in the events of Aug. 10, greatly alarmed him; and when he was returned to the National Convention, he attacked the Commune of Paris (October 24 and 25) At the trial of Louis XVI he supported an appeal to the people, but voted for the death sentence As a member of the Committee of General Defence, and as president of the Convention (March 7–21, 1793), he shared in the bitter attacks of the Girondists on the Mountain; and on the fatal day, June 2, 1793, his name appeared among the first of those inscribed on the prosecution list He was tried by the Revolutionary Tribunal on Oct 24, 1793, condemned to death and guillotined on the 31st of the month, displaying on the scaffold a stoic fortitude Gensonné was accounted one of the most brilliant of the little band of brilliant orators from the Gironde, though his eloquence was somewhat cold and he always read his speeches

See F. A Aulard, *L'Eloquence Parlementaire pendant la Revolution française,* vol 2 p. 462

GENTIAN, botanically *Gentiana,* a large genus of herbaceous plants belonging to the family Gentianaceae The genus comprises about 400 species—most of them perennial plants with tufted growth, growing in hilly or mountainous districts, chiefly in the northern hemisphere, but they are absent from Africa The leaves are opposite, entire, smooth, and often strongly ribbed The flowers have a persistent 4- to 5-lobed calyx and a 4- to 5-lobed tubular corolla, the stamens are equal in number to the lobes of the corolla The ovary is one-celled, with two stigmas, either separate and rolled back or contiguous and funnel-shaped The fruit when ripe separates into two valves, and contains numerous small seeds The majority of the genus are remarkable for the deep or brilliant blue colour of their blossoms, comparatively few having yellow, white, or more rarely red flowers, the last are almost exclusively found in the Andes

Only six species occur in Great Britain *G Amarella* (felwort or autumn gentian) and *G Campestris* are small annuals growing on chalky or calcareous hills, and bearing in autumn tubular pale purple flowers, the latter is most easily distinguished by having two of the lobes of the calyx larger than the other two, while the former has the parts of the calyx in fives, and equal in size Some intermediate forms between these two species occur, although rarely, in England; one of these, *G germanica,* has larger flowers of a bluer tint, spreading branches, and a stouter stem. Some of these forms flower in spring. *G Pneumonanthe,* the Calathian violet, is a rather rare perennial species, growing in moist heathy places from Cumberland to Dorsetshire Its average height is from 6 to 9 in It has linear leaves, and a bright blue corolla 1½ in long, marked externally with five greenish bands. It is the handsomest of the British species; two varieties of it are known in cultivation, one with spotted and the other with white flowers *G. verna* and *G. nivalis* are small species with brilliant blue flowers and small leaves. The former is a rare and local perennial, occurring, however, in Teesdale and the county of Clare in Ireland It has a tufted habit of growth, and each stem bears only one flower. It is sometimes cultivated as an edging for flower borders *G nivalis* in Britain is very rare and occurs only on a few of the loftiest Scottish mountains. It differs from the last in being an annual, and having a more isolated habit of growth, and in the stem bearing several flowers. On the Swiss mountains these beautiful little plants are very abundant, and

are one of the striking floral features of the Alps. For ornamental purposes several species are cultivated.

About 50 species occur in North America, widely distributed throughout the continent, but most numerous in the Rocky Mountain region Of some 15 species found from the Great Plains eastward, among the best known are the fringed gentian (*G. crinita*), one of the most beautiful American wild flowers; the closed or bottle gentian (*G. Andrewsii*), the most common species; the downy gentian (*G puberula*), of the prairie region; and the stiff gentian or ague-weed (*G. quinque-flora*), which extends southward to Florida Of the many Rocky Mountain species, those with fringed flowers, as *G. elegans* and *G. barbellata,* are among the most conspicuous Representative of the 12 or more species found in California and northward in the coastal mountains are the single-flowered gentian (*G simplex*), with slightly fringed flowers, and the western blue gentian (*G calycosa*), which throughout the summer forms sheets of intense blue in alpine meadows from California to British Columbia and eastward to Montana

By far the most important of the species used in medicine is *G. lutea,* a large handsome plant 3 or 4 ft high, growing in open grassy places on the Alps, Apennines and Pyrenees, as well as on some of the mountainous ranges of France and Germany, extending as far east as Bosnia and the Danubian principalities. It has large oval strongly-ribbed leaves and dense whorls of conspicuous yellow flowers Its use in medicine is of very ancient date Pliny and Dioscorides mention that the plant was noticed by Gentius, a king of the Illyrians, living 180–167 B C, from whom the name *Gentiana* is supposed to be derived During the middle ages it was much employed in the cure of disease, and as an ingredient in counter-poisons In 1552 Hieronymus Bock (Tragus) (1498–1554), a German priest, physician and botanist, mentions the use of the root as a means of dilating wounds

The root, which is the part used in medicine, is tough and flexible, scarcely branched, and of a brownish colour and spongy texture It has a pure bitter taste and faint distinctive odour The bitter principle, known as *gentianin,* is a glucoside, soluble in water and alcohol It can be decomposed into glucose and gentiopicrin by the action of dilute mineral acids It is not precipitated by tannin or subacetate of lead A solution of caustic potash or soda forms with gentianin a yellow solution, and the tincture of the root to which either of these alkalis has been added loses its bitterness in a few days Gentian root also contains *gentianic acid* ($C_{14}H_{10}O_5$), which is inert and tasteless It forms pale yellow silky crystals, very slightly soluble in water or ether, but soluble in hot strong alcohol and in aqueous alkaline solutions This substance is also called *gentianin, gentisin* and *gentisic acid*

The root also contains 12 to 15% of an uncrystallizable sugar called gentianose, of which fact advantage has long been taken in Switzerland and Bavaria for the production of a bitter cordial spirit called *Enzianbranntwein* The use of this spirit, especially in Switzerland, has sometimes been followed by poisonous symptoms, which have been doubtfully attributed to inherent narcotic properties possessed by some species of gentian, the roots of which may have been indiscriminately collected with it; but it is quite possible that it may be due to the contamination of the root with that of *Veratrum album,* a poisonous plant growing at the same altitude, and having leaves extremely similar in appearance and size to those of *G lutea.*

Gentian is one of the most efficient of the class of substances which act upon the stomach so as to invigorate digestion and thereby increase the general nutrition, without exerting any direct influence upon any other portion of the body than the alimentary canal Having a pleasant taste and being nonastringent (owing to the absence of tannic acid), it is the most widely used of all bitter tonics. The British Pharmacopoeia contains an aqueous extract (dose, 2–8 grains), a compound infusion with orange and lemon peel (dose, ½–1 ounce), and a compound tincture with orange peel and cardamoms (dose ½–1 drachm). It is used in dyspepsia, chlorosis, anaemia and various other diseases, in which the tone of the stomach and alimentary canal is deficient, and is sometimes added to purgative medicines to increase and improve their action. In veterinary medicine it is also used as a tonic, and enters into a well-known compound called *diapente* as a chief ingredient.

GENTIANACEAE (the gentian family), in botany, a family of Dicotyledons belonging to the sub-class Sympetalae, and containing about 800 species and 80 genera. It has a world-wide distribution, and representatives adapted to very various conditions, including, for instance, alpine plants, like the true gentians (*Gentiana*), meadow plants such as the British *Chlora perfoliata* (yellow-wort) or *Erythraea Centaurium* (centaury), marsh plants such as *Menyanthes trifoliata* (bog-bean), floating water plants such as *Limnanthemum,* or steppe and sea-coast plants such as *Cicendia.* They are annual or perennial herbs, rarely shrubs, and generally growing erect, with a characteristic forked manner of branching; the Asiatic genus *Crawfurdia* has a climbing stem; they are often low-growing and caespitose, as in the alpine gentians



FROM REGEL, "GARTEN FLORA" (FERDINAND ENKE)

GENTIAN (GENTIANA ACAULIS), AN ALPINE GENUS OF GENTIANACEAE

The leaves are in decussating pairs (that is, each pair is in a plane at right angles to the previous or succeeding pair), except in *Menyanthes* and a few allied aquatic or marsh genera, where they are alternate or radical Several genera, chiefly American, are saprophytes, forming slender low-growing herbs, containing little or no chlorophyll and with leaves reduced to scales; such is *Voyria,* mainly tropical American. The inflorescence is generally cymose, often dichasial, recalling that of Caryophyllaceae, the lateral branches often becoming monochasial, it is sometimes reduced to a few flowers or one only, as in some gentians The flowers are hermaphrodite and regular, with parts in fours and fives, with reduction to two in the pistil, in *Chlora* there are six to eight members in each whorl The calyx generally forms a tube with teeth or segments which usually overlap in the bud. The corolla shows great variety in form; thus among the British genera it is rotate in *Chlora,* funnel-shaped in *Erythraea,* and cylindrical, bell-shaped, funnel-shaped or salver-shaped in *Gentiana;* the segments are generally twisted to the right in the bud; the throat is often fimbriate or bears scales The stamens, as many as, and alternating with, the corolla-segments, are inserted at very different heights on the corolla-tube, the filaments are slender, the anthers are usually attached dorsally, are versatile, and dehisce by two longitudinal slits, after escape of the pollen they sometimes become spirally twisted as in *Erythraea* Dimorphic flowers are frequent, as in the bog-bean (*Menyanthes*) There is considerable variation in the size, shape and external markings of the pollen grains The form of the honey-secreting developments of the disk at the base of the ovary also shows considerable variety The superior ovary is generally one-chambered, with two variously developed parietal placentas, which occasionally meet, forming two chambers, the ovules are generally numerous and anatropous or half-anatropous in form The style, which varies much in length, is simple, with an undivided or bilobed or bipartite stigma The fruit is generally a membranous or leathery capsule, splitting septicidally into two valves, the seeds are small and numerous, and contain a small embryo in a copious endosperm.

The brilliant colour of the flowers, which often occur in large numbers (as in the alpine gentians), the presence of honey-glands and the frequency of dimorphy and dichogamy, are adaptations for pollination by insect visitors In the true gentians (*Gentiana*) the flowers of different species are adapted for widely differing types of insect visitors Thus *Gentiana lutea,* with a rotate yellow corolla and freely exposed honey, is adapted to short-tongued insect visitors; *G Pneumonanthe,* with a long-tubed, bright blue corolla, is visited by humble bees; and *G verna,* with a still longer

narrower tube, is visited by Lepidoptera.

Gentiana, the largest genus, contains about 400 species, distributed over Europe (including arctic), five being British, the mountains of Asia, south-east Australia and New Zealand, the whole of North America (30 species) and along the Andes to Cape Horn, it does not occur in Africa Bitter principles are general in the vegetative parts, especially in the rhizomes and roots, and have given a medicinal value to many species, e g., *Gentiana lutea* and others The next largest genus in North America is *Sabbatia* which has representatives from the Atlantic coast westward into the prairie region (*See* GENTIAN)

GENTILE, GIOVANNI (1875–), Italian philosopher and politician, was born at Castelvetrano (Trapani) on May 29, 1875 He studied literature and philosophy at the University of Palermo, and after a series of university appointments became in 1918 professor of the history of philosophy in the University of Rome Two years later he founded the *Giornale critico della filosofia italiana* Created a Senator in 1918, he supported the Fascist movement from its beginnings, and when Mussolini's Government came into power, Gentile was appointed minister of education He was then a Liberal, but subsequently joined the Fascist party, of which he became a prominent member As minister of education, he carried out an organic reform of the Italian educational system, impressing upon teachers the importance of an understanding of the development of mind and reviving religious teaching in the schools For Gentile, education is a process of self-formation which should culminate in philosophy, the supreme form of self-consciousness At this point alone do we arrive at reality, which is something given in the pure actuality of mind Reality is not identifiable with the ideas of individual minds, but with the pure thinking or perfect self-consciousness of the super-personal, transcendental principle in the universe which overcomes all oppositions and distinctions In this obvious attempt to revive idealism, Gentile endeavours to reform Hegelian dialectics and often appeals to the system of Vico

Among his numerous works, which include an edition of Bruno's writings (1907), one of Vico's works (1914) and a translation of Kant's *Critique of Pure Reason* (1910), are —*La Filosofia di Marx* (1899); *Storia, della filosofia italiana* (1902, etc), *Il modernismo* (1909), *Bernardino Telesio* (1911), *I problemi della scolastica e il pensiero italiano* (1913); *Sommario di Pedagogia come scienza filosofica* (2 vols , 1913–14), *Teoria generale dello spirito come atto puro* (1916; 3rd ed , 1920; Eng trans , 1922); *Sistema di Logica come teorie del conoscere* (1917, 2nd ed , 1918), *I fondamenti della filosofia del diritto* (1917), *Le origini della filosofia contemporanea in Italia* (4 vols , 1917–23); *Il Problemo scolastico del dopo guerra* (1919); *La Riforma dell' educazione* (1920; Eng trans , 1923), *Studi sul Rinascimento* (1923), *Lo Spavento* (1924); *Il Fascismo al governo della scuola* (1924), *Che cosa è il fascismo* (1925), *Scritti politici* (1925).

See E Chiocchetti, *La filosofia di Gentile* (1922) V La Via, *L'Idealismo Attuale di Gentile* (1925) and F de Sarlo, *Gentile e Croce* (1925).

GENTILE, in the English Bible, the term generally applied to those who were not of the Jewish race It is an adaptation of the Lat *gentilis,* of or belonging to the same *gens,* the clan or family, as defined by the grammarian Sextus Pompeius Festus (*c* A.D. 150, edit K. O Muller, 1839, p 94): "gentilis dicitur et ex eodem genere ortus et is qui simili nomine appellatur, ut ait Cincius [*c* 210 B C], gentiles mihi sunt, qui meo nomine appellantur." In post-Augustan Latin *gentilis* meant "national," belonging to the same race. Later still it meant "foreign," *i e ,* other than Roman, and was used in the Vulgate with *gentes,* to translate the Hebrew *goyyim,* nations, LXX ἤθνη, the non-Israelitish peoples (*see* further JEWS). It is also used by Mormons of all who are not Mormons. (A L W)

GENTILE DA FABRIANO (*c.* 1370–1427), Italian painter, born at Fabriano, was the first great Umbrian master. About 1411 he went to Venice, where by order of the doge and senate he was engaged to adorn the great hall of the palace with frescoes from the life of Barbarossa He executed this work so entirely to the satisfaction of his employers that they granted him a pension for life, and accorded him the privilege of wearing the habit of a Venetian noble. These paintings influenced the development of Venetian art; they are unfortunately no longer extant. About 1420 he went to Florence, where in 1423 he painted an "Adoration of the Magi" for the church of Santa Trinita, which is preserved in the Uffizi, Florence, and is considered his best work now extant. To the same period belongs a "Madonna and Child," which is now in the Berlin museum. Another fine example of his work is the "Madonna with Angels" (1425) lent by H M the King to the National Gallery, London The wings of this altarpiece are in the Uffizi. He attained a wide reputation, and was engaged to paint pictures for various churches, more particularly Brescia, Siena, Perugia and Orvieto In 1427 he was called to Rome by Martin V to adorn the church of St. John Lateran with frescoes. Michelangelo said of him that his works resembled his name, meaning noble or refined. They are full of a quiet joyousness, and show a naive delight in splendour and in gold ornaments

GENTILESCHI, ARTEMISIA and **ORAZIO DE',** Italian painters

ORAZIO (*c* 1562–*c.* 1647) is generally named Orazio Lomi de' Gentileschi. He was born in Pisa, and studied under his half-brother Aurelio Lomi He afterwards went to Rome and painted frescoes in S Maria Maggiore, in the Lateran and in San Niccolo in Carcere; he was associated with the landscape-painter Agostino Tassi, executing the figures for the landscapes of this artist Among his best works are: "The Circumcision" in the church of Gesu at Ancona, "The Madonna and S Clara" in the Casa Rosei at Fabriano, "The Annunciation" in San Siro, Genoa, "Mary Magdalene" in Pal Negrotti at Genoa; "The Finding of Moses" in the Prado, Madrid, "Saints Cecilia and Valerian" in the Brera, Milan; a "Flight into Egypt" in the Louvre, Paris, another in the Belvedere, Vienna, and "Joseph and Potiphar's Wife" at Hampton Court At an advanced age Gentileschi went to England at the invitation of Charles I , and he was employed in the palace at Greenwich Van Dyck included him in his portraits of a hundred illustrious men His works generally are strong in shadow and positive in colour He died in England about 1647

ARTEMISIA (1597– after 1651), Orazio's daughter, studied first under Guido Reni, acquired much renown for portrait-painting, and considerably excelled her father's fame She was a beautiful and elegant woman, her likeness, painted by her own hand, is to be seen in Hampton Court Her most celebrated composition is "Judith and Holofernes," in the Uffizi gallery, Florence, certainly a work of singular energy, but repulsive in its physical horror. She went to England about 1638 and painted many portraits there Artemisia refused an offer of marriage from Agostino Tassi, and bestowed her hand on Pier Antonio Schiattesi, continuing, however, to use her own surname She settled in Naples, whither she returned from England, and was commissioned to paint three pictures for the cathedral of Pozzuoli

GENTILI, ALBERICO (1552–1608), Italian jurist, who has great claims to be considered the founder of the science of international law, second son of Matteo Gentili, a physician of noble family and scientific eminence, was born on the 14th of January 1552 at Sanginesio, a small town of the march of Ancona which looks down from the slopes of the Apennines upon the distant Adriatic. After taking the degree of doctor of civil law at the university of Perugia, and holding a judicial office at Ascoli, he returned to his native city, and was entrusted with the task of recasting its statutes Sharing the Protestant opinions of his father, he and his brother, Scipio, afterwards a famous professor at Altdorf, fled with their father to Carniola, where in 1579 Matteo was appointed physician to the duchy The Inquisition condemned the fugitives as contumacious, and they soon received orders to quit the dominions of Austria.

Alberico set out for England, travelling by way of Tubingen and Heidelberg, and everywhere meeting with the reception to which his already high reputation entitled him. He arrived at Oxford in the autumn of 1580, with a commendatory letter from the earl of Leicester, at that time chancellor of the university, and was shortly afterwards qualified to teach by being admitted to the same degree which he had taken at Perugia. His lectures on Ro-

man law soon became famous, and the dialogues, disputations and commentaries, which he published henceforth in rapid succession, established his position as an accomplished civilian, of the older and severer type, and secured his appointment in 1587 to the regius professorship of civil law It was, however, rather by an application of the old learning to the new questions suggested by the modern relations of states that his labours have produced their most lasting result. In 1584 he was consulted by government as to the proper course to be pursued with Mendoza, the Spanish ambassador, who had been detected in plotting against Elizabeth He chose the topic to which his attention had thus been directed as a subject for a disputation when Leicester and Sir Philip Sidney visited the schools at Oxford in the same year; and this was six months later expanded into a book, the *De legationibus libri tres.* In 1588 Alberico selected the law of war as the subject of the law disputations at the annual "Act" which took place in July; and in the autumn published in London the *De Jure Belli commentatio prima* A second and a third *Commentatio* followed, and the whole matter, with large additions and improvements, appeared at Hanau, in 1598, as the *De Jure Belli libri tres* It was doubtless in consequence of the reputation gained by these works that Gentili became henceforth more and more engaged in forensic practice, and resided chiefly in London, leaving his Oxford work to be partly discharged by a deputy. In 1600 he was admitted to be a member of Gray's Inn, and in 1605 was appointed standing counsel to the king of Spain. He died on the 19th of June 1608, and was buried, by the side of Dr. Matteo Gentili, who had followed his son to England, in the churchyard of St Helen's, Bishopsgate By his wife, Hester de Peigni, he left two sons, Robert and Matthew, and a daughter, Anna, who married Sir John Colt His notes of the cases in which he was engaged for the Spaniards were posthumously published in 1613 at Hanau, as *Hispanicae advocationis libri duo* This was in accordance with his last wishes; but his direction that the remainder of his MSS should be burnt was not complied with, since fifteen volumes of them found their way, at the beginning of the 19th century, from Amsterdam to their permanent home in the Bodleian library.

The true history of Gentili and of his principal writings has only been ascertained in recent years, in consequence of a revived appreciation of the services which he rendered to international law The movement to do him honour originated in 1875 in England, as the result of the inaugural lecture of Prof T E Holland, and was warmly taken up in Italy In spreading through Europe it encountered two curious cross-currents of opinion—one the ultra-Catholic, which three centuries before had ordered his name to be erased from all public documents and placed his works in the *Index;* another the narrowly-Dutch, which is, it seems, needlessly careful of the supremacy of Grotius These two currents resulted respectively in a bust of Garcia Moreno being placed in the Vatican, and in the unveiling in 1886, with much international oratory, of a fine statue of Grotius at Delft The English committee, under the honorary presidency of Prince Leopold, in 1877 erected a monument to the memory of Gentili in St Helen's church, and saw to the publication of a new edition of the *De Jure Belli* The Italian committee, of which Prince (afterwards King) Humbert was honorary president, was less successful It was only in 1908, the tercentenary of the death of Alberico, that the statue of the great heretic was at length unveiled in his native city by the minister of public instruction, in the presence of numerous deputations from Italian cities and universities Preceding writers had dealt with various international questions, but they dealt with them singly, and with a servile submission to the decisions of the church It was left to Gentili to grasp as a whole the relations of states one to another, to distinguish international questions from questions with which they are more or less intimately connected, and to attempt their solution by principles entirely independent of the authority of Rome. He uses the reasonings of the civil and even the canon law, but he proclaims as his real guide the *Jus Naturae,* the highest common sense of mankind, by which historical precedents are to be criticized and, when this appears to be necessary, set aside

His faults are not few His style is prolix, obscure, and to the modern reader pedantic enough; but a comparison of his greatest work with what had been written upon the same subject by, for instance, Belli, or Soto, or even Ayala, will show that he greatly improved upon his predecessors, not only by the fullness with which he has worked out points of detail, but also by clearly separating the law of war from martial law, and by placing the subject once for all upon a non-theological basis. If, on the other hand, the same work be compared with the *De Jure Belli et Pacis* of Grotius, it is at once evident that the later writer is indebted to the earlier, not only for a large portion of his illustrative erudition, but also for all that is commendable in the method and arrangement of the treatise.

The following is probably a complete list of the writings of Gentili, with the places and dates of their first publication: *De juris interpretibus dialogi sex* (London, 1582), *Lectionum et epist. quae ad jus civile pertinent libri tres* (London, 1583–1584), *De legationibus libri tres* (London, 1585), *Legal. comitiorum Oxon. actio* (London, 1585–1586), *De divers temp appellationibus* (Hanau, 1586), *De nascendi tempore disputatio* (Witteb, 1586); *Disputationum decas prima* (London, 1587), *Conditionum liber singularis* (London, 1587); *De jure belli comm prima* (London, 1588), *secunda, ib.* (1588–1589); *tertia* (1589), *De injustitia bellica Romanorum* (Oxon. 1590); *Ad tit. de Malef et Math. de Prof et Med.* (Hanau, 1593), *De jure belli libri tres* (Hanau, 1598), *De armis Romanis, etc* (Hanau, 1599), *De actoribus et de abusu mendacii* (Hanau, 1599); *De ludis scenicis epist duae* (Middleburg, 1600), *Ad I Maccabaeorum et de linguarum mistura disp* (Frankfurt, 1600); *Lectiones Virgilianae* (Hanau, 1600), *De nuptus libri septem* (1601), *In tit. si quis principi, et ad leg. Jul maiest.* (Hanau, 1604), *De latin vet Bibl* (Hanau, 1604); *De libro Pyano* (Oxon 1604); *Laudes Acad Perus et Oxon* (Hanau, 1605); *De unione Angliae et Scotiae* (London, 1605); *Disputationes tres, de libris jur. can, de libris jur civ, de latinitate vet vers.* (Hanau, 1605), *Regales disput tres, de pot. regis absoluta, de unione regnorum, de vi civium* (London, 1605); *Hispanicae advocationis libri duo* (Hanau, 1613), *In tit de verb. signif* (Hanau, 1614), *De legatis in test* (Amsterdam, 1661)

An edition of the *Opera omnia,* commenced at Naples in 1770, was cut short by the death of the publisher, Gravier, after the second volume *See* several tracts by the Abate Benigni in Colucci, *Antichità Picene* (1790), a dissertation by W. Reiger annexed to the *Program of the Groningen Gymnasium* for 1867, an inaugural lecture delivered in 1874 by T E. Holland, translated into Italian, with additions by the author, by A Saffi (1884), the preface to a new edition of the *De jure belli* (1877) and *Studies in International Law* (1898) (which *see,* for details as to the family and mss of Gentili), by the same, works by Valdarnini and Foglietti (1875), Speranza and De Giorgi (1876), Fiorini (a translation of the *De jure belli,* with essay, 1877), A Saffi (1878), L Marson (1885), M Thamm (1896), B Brugi (1898), T. A Walker (an analysis of the principal works of Gentili) in his *History of the Law of Nations,* vol 1 (1899), H. Nézarel, in Pillet's *Fondateurs de droit international* (1904), E Agabiti (1908) *See* also E Comba, in the *Rivista Christiana* (1876–77), Sir T Twiss, in the *Law Review* (1878), articles in the *Revue de droit international* (1875–78, 1883, 1886, 1908), O. Scalvanti, in the *Annali dell' Univ di Perugia,* N S, vol viii (1898), A Gentili, *Hispanicae advocationis libri dvo,* with an introduction and translation by F. F Abbott (1921), A Gentili, *De legationibus Libri Tres,* with an introduction by E Nys and a translation of the text by G J. Laing (1924)

GENTLEMAN, in its original and strict signification, a term denoting a man of good family (from Lat *gentilis,* "belonging to a race or *gens,*" and "man"; the Lat *generosus* [its invariable translation in English-Latin documents]) In this sense it is the equivalent of the Fr *gentilhomme,* "nobleman," which latter term has in Great Britain been long confined to the peerage (*see* NOBILITY); and the term "gentry" ("gentrice" from O Fr *genterise* for *gentelise*) has much of the significance of the Fr *noblesse* or the Ger. *Adel* This was what was meant by the rebels under John Ball in the 14th century when they repeated.

> When Adam delved and Eve span,
> Who was then the gentleman?

Selden (*Titles of Honor,* 1672), discussing the title "gentleman," speaks of "our English use of it" as "convertible with *nobilis,*" and describes in connection with it the forms of ennobling in various European countries William Harrison, writing a century

earlier, says "gentlemen be those whom their race and blood, or at the least their virtues, do make noble and known." But for the complete gentleman the possession of a coat of arms was in his time considered necessary; and Harrison gives the following account of how gentlemen were made in Shakespeare's day:

"Who soever studieth the laws of the realm, who so abideth in the university, giving his mind to his book, or professeth physic and the liberal sciences, or beside his service in the room of a captain in the wars, or good counsel given at home, whereby his commonwealth is benefited, can live without manual labour, and thereto is able and will bear the port, charge and countenance of a gentleman, he shall for money have a coat and arms bestowed upon him by heralds (who in the charter of the same do of custom pretend antiquity and service, and many gay things) and thereunto being made so good cheap be called master, which is the title that men give to esquires and gentlemen, and reputed for a gentleman ever after No man hath hurt by it but himself, who peradventure will go in wider buskins than his legs will bear, or as our proverb saith, now and then bear a bigger sail than his boat is able to sustain"

In this way Shakespeare himself was turned, by the grant of a coat of arms, from a "vagabond" into a gentleman.

The fundamental idea of "gentry," symbolized in this grant of coat-armour, had come to be that of the essential superiority of the fighting man; and, as Selden points out (p. 707), the fiction was usually maintained in the granting of arms "to an ennobled person though of the long Robe wherein he hath little use of them as they mean a shield." At the last the wearing of a sword on all occasions was the outward and visible sign of a "gentleman"; and the custom survives in the sword worn with "court dress." This idea that a gentleman must have a coat of arms, and that no one is a "gentleman" without one is, however, of comparatively late growth, the outcome of the natural desire of the heralds to magnify their office and collect fees for registering coats; and the same is true of the conception of "gentlemen" as a separate class. That a distinct order of "gentry" existed in England very early has, indeed, been often assumed, and is supported by weighty authorities Thus, the late Professor Freeman (*Ency. Brit.* xvii. p 540 b, 9th ed) said. "Early in the 11th century the order of 'gentlemen' as a separate class seems to be forming as something new. By the time of the conquest of England the distinction seems to have been fully established." Stubbs (*Const. Hist*, ed. 1878, iii 544, 548) takes the same view. Sir George Sitwell, however, has conclusively proved that this opinion is based on a wrong conception of the conditions of mediaeval society, and that it is wholly opposed to the documentary evidence. Even so late as 1400 the word "gentleman" still only had the sense of *generosus*, and could not be used as a personal description denoting rank or quality, or as the title of a class Yet after 1413 we find it increasingly so used; and the list of landowners in 1431, printed in *Feudal Aids*, contains, besides knights, esquires, yeomen and husbandmen, a fair number who are classed as "gentilman."

Sir George Sitwell gives a lucid explanation of this development. The immediate cause was the statute 1 Henry V. cap v of 1413, which laid down that in all original writs of action, personal appeals and indictments, in which process of outlawry lies, the "estate, degree or mystery" of the defendant must be stated, as well as his present or former domicile Now the Black Death (1349) had put the traditional social organization out of gear. Before that the younger sons of the *nobiles* had received their share of the farm stock, bought or hired land, and settled down as agriculturists in their native villages Under the new conditions this became increasingly impossible, and they were forced to seek their fortunes abroad in the French wars, or at home as hangers-on of the great nobles. These men, under the old system, had no definite status; but they were *generosi*, men of birth, and, being now forced to describe themselves, they disdained to be classed with franklins (now sinking in the social scale), still more with yeomen or husbandmen; they chose, therefore, to be described as "gentlemen" On the character of these earliest "gentlemen" the records throw a lurid light. According to Sir George Sitwell (p. 76), "the premier gentleman of England, as the matter now stands, is 'Robert Erdeswyke of Stafford, gentilman,'" who had served among the men-at-arms of Lord Talbot at Agincourt (*ib.* note). He is typical of his class. "Fortunately—for the gentle reader will no doubt be anxious to follow in his footsteps—some particulars of his life may be gleaned from the public records He was charged at the Staffordshire Assizes with housebreaking, wounding with intent to kill, and procuring the murder of one Thomas Page, who was cut to pieces while on his knees begging for his life." If any earlier claimant to the title of "gentleman" be discovered, Sir George Sitwell predicts that it will be within the same year (1414) and in connection with some similar disreputable proceedings.

From these unpromising beginnings the separate order of "gentlemen" was very slowly evolved. The first "gentleman" commemorated on an existing monument was John Daundelyon of Margate (d *c* 1445); the first gentleman to enter the House of Commons, hitherto composed mainly of "valets," was "William Weston, gentylman"; but even in the latter half of the 15th century the order was not clearly established. As to the connection of "gentilesse" with the official grant or recognition of coat-armour, that is a profitable fiction invented and upheld by the heralds; for coat-armour was but the badge assumed by gentlemen to distinguish them in battle, and many gentlemen of long descent never had occasion to assume it, and never did This fiction, however, had its effect; and by the 16th century, as has been already pointed out, the official view had become clearly established that "gentlemen" constituted a distinct order, and that the badge of this distinction was the heralds' recognition of the right to bear arms. It is unfortunate that this view, which is quite unhistorical, has of late years been given a wide currency in popular manuals of heraldry.

In this narrow sense, however, the word "gentleman" has long since become obsolete The idea of "gentry" in the continental sense of *noblesse* is extinct in England, and is likely to remain so, in spite of the efforts of certain enthusiasts to revive it (*see* A. C. Fox-Davies, *Armorial Families*, Edinburgh, 1895). That it once existed has been sufficiently shown, but the whole spirit and tendency of English constitutional and social development tended to its early destruction The comparative good order of England was not favourable to the continuance of a class, developed during the foreign and civil wars of the 14th and 15th centuries, for whom fighting was the sole honourable occupation. The younger sons of noble families became apprentices in the cities, and there grew up a new aristocracy of trade Merchants are still "citizens" to William Harrison; but he adds "they often change estate with gentlemen, as gentlemen do with them, by mutual conversion of the one into the other." A frontier line between classes so indefinite could not be maintained, especially as in England there was never a "nobiliary prefix" to stamp a person as a gentleman by his surname, as in France or Germany. The process was hastened, moreover, by the corruption of the Heralds' College and by the ease with which coats of arms could be assumed without a shadow of claim; which tended to bring the "science of armory" into contempt. The word "gentleman" as an index of rank had already become of doubtful value before the great political and social changes of the 19th century gave to it a wider and essentially higher significance. The change is well illustrated in the definitions given in the successive editions of the *Encyclopædia Britannica*. In the 5th edition (1815) "a gentleman is one, who without any title, bears a coat of arms, or whose ancestors have been freemen." In the 7th edition (1845) it still implies a definite social status· "All above the rank of yeomen." In the 8th edition (1856) this is still its "most extended sense"; "in a more limited sense" it is defined in the same words as those quoted above from the 5th edition; but the writer adds, "By courtesy this title is generally accorded to all persons above the rank of common tradesmen when their manners are indicative of a certain amount of refinement and intelligence." The Reform Bill of 1832 has done its work; the "middle classes" have come into their own; and the word "gentleman" has come in common use to signify not a distinction of blood but a distinction of position, education and manners. The test is no longer good birth, or the right to bear arms, but the capacity to mingle on

equal terms in good society. In its best use, moreover, "gentleman" involves a certain superior standard of conduct, due, to quote the 8th edition once more, to "that self-respect and intellectual refinement which manifest themselves in unrestrained yet delicate manners." The word "gentle," originally implying a certain social status, had very early come to be associated with the standard of manners expected from that status Thus by a sort of punning process the "gentleman" becomes a "gentle-man" Chaucer in the *Meliboeus* (*c.* 1386) says: "Certes he sholde not be called a gentil man, that . . . ne dooth his diligence and bisynesse, to kepen his good name"; and in the *Wife of Bath's Tale*:

> Loke who that is most vertuous alway
> Prive and apert, and most entendeth ay
> To do the gentil dedes that he can
> And take him for the gretest gentilman,

and in the *Romance of the Rose* (*c* 1400) we find "he is gentil bycause he doth as longeth to a gentilman" This use develops through the centuries, until in 1714 we have Steele, in the *Tatler* (No 207), laying down that "the appellation of Gentleman is never to be affixed to a man's circumstances, but to his Behaviour in them," a limitation over-narrow even for the present day. In this connection, too, may be quoted the old story, told by some—very improbably—of James II, of the monarch who replied to a lady petitioning him to make her son a gentleman, "I could make him a nobleman, but God Almighty could not make him a gentleman." Selden, however, in referring to similar stories "that no Charter can make a Gentleman, which is cited as out of the mouth of some great Princes that have said it," adds that "they without question understood Gentlemen for *Generosus* in the ancient sense, or as if it came from *Gentilis* in that sense, as *Gentilis* denotes one of a noble Family, or indeed for a Gentleman by birth." For "no creation could make a man of another blood than he is." The word "gentleman," used in the wide sense with which birth and circumstances have nothing to do, is necessarily incapable of strict definition For "to behave like a gentleman" may mean little or much, according to the person by whom the phrase is used, "to spend money like a gentleman" may even be no great praise, but "to conduct a business like a gentleman" implies a standard at least as high as that involved in the phrase *"noblesse oblige."* In this sense of a person of culture, character and good manners the word "gentleman" has supplied a gap in more than one foreign language

The evolution of this meaning of "gentleman" reflects very accurately that of English society, and there are not wanting signs that the process of evolution, in the one as in the other, is not complete The indefinableness of the word mirrors the indefinite character of "society" in England, and the use by "the masses" of "gentleman" as a mere synonym for "man" has spread *pari passu* with the growth of democracy It is a protest against implied inferiority, and is cherished as the modern French *bourgeois* cherishes his right of duelling with swords, under the *ancien régime* a prerogative of the *noblesse*. Nor is there much justification for the denunciation by purists of the "vulgarization" and "abuse" of the "grand old name of gentleman." Its strict meaning has now fallen completely obsolete Its current meaning varies with every class of society that uses it. But it always implies some sort of excellency of manners or morals It may by courtesy be over-loosely applied by one common man to another, but the common man would understand the reproach conveyed in "You're no gentleman"

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GENTLEMEN'S AGREEMENTS. Where two or more rivals in business meet privately and agree as to what prices they shall charge or what areas they shall serve or what goods they will or will not handle, the arrangement is known as a Gentlemen's Agreement or honourable understanding Such arrangements have always been a common feature of local trade Coal dealers will meet and agree not to cut below a certain price, or arrange that one shall confine his canvassing to the north side of the town and the other to the south. The grocer and the greengrocer will agree, the one not to sell oranges if the other will not sell packet peas. At the other end of the economic scale steel or shipping magnates will meet and come to an understanding as to tonnage, prices, markets, freights or routes Such arrangements are essentially informal and temporary; there are no documents, there is no association, there is no bond except that of good faith; but they are not on that account of negligible importance; they are, indeed, a particularly insidious and undetectable form of trade combination. They do not necessarily make for ill, they may serve a useful purpose in restraining vicious competition and in avoiding the overlapping of services, but because they are secret they lend themselves the more easily to the exploitation of the buying public

In the United Kingdom such arrangements are not illegal unless they involve an illegal act, in which case they constitute a breach of the common law In the United States they are forbidden under the Sherman Law, which declares illegal "every . . . conspiracy in restraint of trade or commerce," but the detection and penalising of "honourable understandings" has proved to be one of the most difficult of all the applications of that law The most notable example of the Gentlemen's Agreement in industrial history is the "Gary Dinners" which the president of the United States Steel Corporation gave to presidents of other American steel companies from Nov. 1907 to Jan 1911. At these dinners "honourable understandings" were reached between persons controlling some 90% of the entire steel output of the country.

At one stage of the development of the "Open Price Association" movement in the United States (*see* ASSOCIATION, INDUSTRIAL) the plan was tried of regular meetings of Association members at which the prices quoted by members were openly announced and discussed without any agreement being reached as to what prices ought to be and would be charged; but this was held in the courts to have the effect in practice of establishing a concerted price on the ground that members conformed, by an honourable understanding, to the conclusions reached in the course of the discussion (*See* TRUSTS and COMBINATION for an account of other forms of trade combination) (J H.)

GENTZ, FRIEDRICH VON (1764–1832), German publicist and statesman, was born at Breslau on May 2, 1764 His father was an official, his mother an Ancillon, distantly related to the Prussian minister of that name On his father's transference to Berlin, as director of the mint, the boy was sent to the Joachimsthal gymnasium there, his brilliant talents, however, did not develop until, at the university of Königsberg, he fell under the influence of Kant. But though his intellect was sharpened and his zeal for learning quickened by the greater thinker's influence, Kant's "categorical imperative" did not prevent him from yielding to the taste for wine, women and high play which pursued him through life. In 1785 he received the appointment of secret secretary to the royal *Generaldirectorium* in Berlin.

His interest in public affairs was first aroused by the outbreak of the French Revolution, which he greeted at first with enthusiasm, but its subsequent developments cooled his ardour and he was converted to more conservative counsels by Burke's *Essay on the French Revolution*, a translation of which into German (1794) was his first literary venture. This was followed, next year, by translations of works on the Revolution by Mallet du Pan and Mounier. He also founded and edited a monthly journal, the *Neue deutsche Monatsschrift*, in which for five years he wrote, mainly on historical and political questions, maintaining the principles of British constitutionalism against those of revolutionary France The knowledge he displayed of the principles and practice of finance was especially remarkable His literary output at this time, all inspired by a moderate Liberalism, included an essay

on the results of the discovery of America, and another, written in French, on the English financial system (*Essai sur l'état de l'administration des finances de la Grande-Bretagne,* London, 1800) Especially noteworthy, however, was the *Denkschrift* or *Missive* addressed by him to King Frederick William III. on his accession (1797), in which, *inter alia,* he urged upon the king the necessity for granting freedom to the press and to commerce Opposition to France was the inspiring principle of the *Historisches Journal* founded by him in 1799–1800, which once more held up English institutions as the model, and became in Germany the mouthpiece of British policy towards the revolutionary aggressions of the French republic. In 1801 he ceased the publication of the *Journal,* and issued instead, under the title *Beitrage zur Geschichte,* etc , a series of essays on contemporary politics The first of these was *Über den Ursprung und Charakter des Krieges gegen die franzosische Revolution* (1801), by many regarded as Gentz's masterpiece.

This activity brought him reputation and gifts of money from the British and Austrian governments, but it made his position as an official in Berlin impossible, for the Prussian government had no mind to abandon its attitude of cautious neutrality A separation from his wife also made it desirable for Gentz to leave the Prussian service In May 1802, accordingly, he took leave of his wife and left with his friend Adam Muller for Vienna. In Berlin he had been intimate with the Austrian ambassador, Count Stadion, whose good offices procured him an introduction to the emperor Francis The immediate result was the title of imperial councillor, with a yearly salary of 4,000 gulden (December 6th, 1802), but he was not actively employed until 1809 Before returning to Berlin to make arrangements for transferring himself finally to Vienna, Gentz paid a visit to London, where he made the acquaintance of Pitt and Granville, who guaranteed him an annual pension by the British government in recognition of the value of his writings against Bonaparte From this time forward he was engaged in a ceaseless polemic against every fresh advance of the Napoleonic power and pretensions; he denounced the recognition of Napoleon's imperial title, and drew up a manifesto of Louis XVIII against it The formation of the coalition and the outbreak of war for a while raised his hopes, in spite of his lively distrust of the competence of Austrian ministers; but the hopes were speedily dashed by Austerlitz and its results Gentz used his enforced leisure to write a brilliant essay on "The relations between England and Spain before the outbreak of war between the two powers" (Leipzig, 1806), and shortly afterwards appeared *Fragmente aus der neuesten Geschichte des politischen Gleichgewichts in Europa* (trans *Fragments on the Balance of Power in Europe,* London, 1806) This latter, the last of Gentz's works as an independent publicist, was a masterly exposé of the actual political situation, and at the same time prophetic in its suggestions as to how this should be retrieved "Through Germany Europe has perished, through Germany it must rise again"

He realized that the dominance of France could only be broken by the union of Austria and Prussia, acting in concert with Great Britain He watched with interest the Prussian military preparations, and, at the invitation of Count Haugwitz, he went at the outset of the campaign to the Prussian headquarters at Erfurt, where he drafted the king's proclamation and his letter to Napoleon. The writer was known, and it was in this connection that Napoleon referred to him as "a wretched scribe named Gentz, one of those men without honour who sell themselves for money" In this mission Gentz had no official mandate from the Austrian government, and whatever hopes he may have cherished of privately influencing the situation in the direction of an alliance between the two German powers were dashed by the campaign of Jena

The downfall of Prussia left Austria the sole hope of Germany and of Europe Gentz, who from the winter of 1806 onwards divided his time between Prague and the Bohemian watering-places, occupied himself with a series of essays on the future of Austria and the best means of liberating Germany and redressing the balance of Europe

In 1809, on the outbreak of war between Austria and France, Gentz was for the first time actively employed by the Austrian government under Stadion, he drafted the proclamation announcing the declaration of war (April 15), and during the continuance of hostilities his pen was ceaselessly employed. But the peace of 1810 and the fall of Stadion once more dashed his hopes, and he once more retired to Prague. It was not till 1812 that there sprang up between him and Metternich the close relations that were to ripen into life-long friendship But when Gentz returned to Vienna as Metternich's adviser and henchman, he was no longer the fiery patriot who had sympathized and corresponded with Stein in the darkest days of German depression and in fiery periods called upon all Europe to free itself from foreign rule Disillusioned and cynical, though clear-sighted as ever, he was henceforth before all things an Austrian, more Austrian on occasion even than Metternich; as, *e g ,* when, during the final stages of the campaign of 1814, he expressed the hope that Metternich would substitute "Austria" for "Europe" in his diplomacy and secure an Austro-French alliance by maintaining the husband of Marie Louise on the throne of France

For ten years, from 1812 onward, Gentz was in closest touch with all the great affairs of European history, the assistant, confidant, and adviser of Metternich He accompanied the chancellor on all his journeys; was present at all the conferences that preceded and followed the war; no political secrets were hidden from him, and his hand drafted all important diplomatic documents He was secretary to the congress of Vienna (1814–1815) and to all the congresses and conferences that followed, up to that of Verona (1822), and in all his vast knowledge of men and affairs made him a power. He was under no illusion as to their achievements; his memoir on the work of the congress of Vienna is at once an incisive piece of criticism and a monument of his own disillusionment But the liberalism of his early years was gone for ever, and he had become reconciled to Metternich's view that, in an age of decay, the sole function of a statesman was to "prop up mouldering institutions" It was the hand of the author of that offensive *Missive* to Frederick William III , on the liberty of the press, that drafted the Carlsbad decrees, it was he who inspired the policy of repressing the freedom of the universities, and he noted in his diary as "a day more important than that of Leipzig" the session of the Vienna conference of 1819, in which it was decided to make the convocation of representative assemblies in the German states impossible, by enforcing the letter of Article XIII of the Act of Confederation

As to Gentz's private life there is not much to be said His love affairs are too numerous to record Passion tormented him to the end, and his infatuation for Fanny Elssler, the celebrated *danseuse,* forms the subject of some remarkable letters to his friend Rahel, the wife of Varnhagen von Ense (1830–1831) He died on June 9, 1832

Gentz has been described as a mercenary of the pen, but he was more than the "wretched scribe" sneered at by Napoleon Though by birth belonging to the middle class in a country of hide-bound aristocracy, he lived to move on equal terms in the society of princes and statesmen, which would never have been the case had he been notoriously "bought and sold" Yet that he was in the habit of receiving gifts from all and sundry who hoped for his backing is beyond dispute He notes that at the congress of Vienna he received 22,000 florins through Talleyrand from Louis XVIII , while Castlereagh gave him £600, accompanied by *les plus folles promesses;* and his diary is full of such entries Yet he never made any secret of these gifts, Metternich was aware of them, and he never suspected Gentz of writing or acting in consequence against his convictions. No man was more free or outspoken in his criticism of the policy of his employers than this apparently venal writer

Indeed, the very impartiality and objectivity of his attitude make the writings of Gentz such illuminating documents for the period. Allowance must of course be made for his point of view, but less so perhaps than in the case of any other writer so intimately concerned with the policies which he criticizes And, apart from their historical value, Gentz's writings are literary monuments, classical examples of nervous and luminous German prose,

or of French which is a model for diplomatic style

A selection of Gentz's works (*Ausgewählte Schriften*) was published by Weick in 5 vols (1836–38), his lesser works (Mannheim, 1838–40) in 5 vols and *Mémoires et lettres inédites* (Stuttgart, 1841) were edited by G. Schlesier. Subsequently there have appeared *Briefe an Chr Garve* (Breslau, 1857); correspondence (*Briefwechsel*) with Adam Muller (Stuttgart, 1857), *Briefe an Pilat* (2 vols, Leipzig, 1868); *Aus dem Nachlass Friedrichs von Gentz* (2 vols), ed Count Anton Prokesch-Osten (Vienna, 1867), *Aus der alten Registratur der Staats-Kanzlei. Briefe politischen Inhalts von und an Friedrich von Gentz*, edited by C. von Klinckowstrom (Vienna, 1870); *Dépêches inédites du chev de Gentz aux Hospodars de Valachie 1813–1828* (a correspondence on current affairs commissioned by the Austrian government), ed. Count Anton von Prokesch-Osten the younger (3 vols, Paris, 1876), incomplete, but partly supplemented in *Oesterreichs Teilnahme an den Befreiungskriegen* (Vienna, 1887), a collection of documents of the greatest value, *Zur Geschichte der orientalischen Frage: Briefe aus dem Nachlass Friedrichs von Gentz* (Vienna, 1877), ed Count Prokesch-Osten the younger, *Briefe von und an Friedrichs von Gentz*, ed F C Wittichen (4 vols, 1909–13) Finally Gentz's diaries, from 1800 to 1828, an invaluable mine of authentic material, were edited by Varnhagen von Ense and published after his death under the title *Tagebucher*, etc (Leipzig, 1861, new ed, 4 vols, *ib* 1873) For the biography of Gentz *see* K Mendelssohn-Bartholdy, *Friedrich von Gentz* (1867), E Guglia, *Friedrich von Gentz* (1901), M Pfluger, *Friedrich von Gentz als Widersacher Napoleons* (1904) E Guglia, *Friedrich von Gentz* (Vienna, 1901)

GEODESY, in modern English usage is the science of surveying tracts of country so large that the curvature of the earth must be allowed for, also the determination of the figure of the Earth, including the various geophysical problems most intimately connected therewith Sometimes in modern languages other than English the word cognate to *geodesy* may mean hardly more than the original Greek (Gr γεωδαισία, the art or science of mensuration, from γῆ, Earth, and δαίειν, to divide), that is, it may mean merely accurate land surveying, and some epithet, such as *higher,* must be added to make the phrase coextensive with the English word *geodesy*

(1.) THE FIGURE OF THE EARTH—HISTORICAL

The earliest geodesy (in the English sense) was concerned almost exclusively with determining the figure of the Earth, a problem then chiefly of speculative interest, for the need of accurate maps, in which the figure of the Earth must be taken into account, was hardly felt until the time of Columbus [1] The naive view of primitive man, still held by the backward and uneducated, was that the Earth is a flat plane, or a circular disk, diversified by seas, rivers and mountains It might seem as if some notion of the approximate sphericity, or at least of the curvature, of the Earth might have originated with those earlier peoples, such as the Babylonians, who cultivated the science of astronomy, and who must have noticed that when an observer travelled south the aspect of the heavens changed, as stars hitherto never seen came into view over the southern horizon and the number of northern circumpolar stars always on view became smaller, the phenomena being reversed as the observer journeyed northward But no record of any explanation of all this based on the curvature of the Earth has come down to us from any pre-Hellenic source Or it might seem as if any seafaring people, observing a vessel go "hull down, down and under," as the observer's distance from it increased, might have conceived the idea of a spherical or at least of a rotund Earth But again we have no record of any such doctrine emanating from any of the earlier maritime peoples

The earliest enunciation of the doctrine of a spherical Earth comes from Pythagoras or from his school of philosophy, and even then the doctrine may have been based quite as much on metaphysical as on physical considerations By the time of Aristotle, however, the doctrine of a spherical Earth had at least a respectable amount of support among the more learned of his contemporary Greeks Aristotle devotes a part of his book *De Caelo* to a defence of the doctrine He even gives an estimate of the size of the Earth, saying·

"Moreover those mathematicians who try to compute the circumference of the Earth say that it is 400,000 stadia, which indicates not only that the earth's mass is spherical in shape but also that it is of no great size as compared with the heavenly bodies." (*De Caelo*, Book II, Chap 14)

This passage follows a long argument in favour of the sphericity of the earth Some of the arguments sound modern enough, others seem strange to our present ways of thinking This seems to represent the first scientific attempt now on record to determine the size of the Earth Even the unit has been supplied by the commentators, the word *stadia* not occurring in the best texts How this figure of 400,000 stadia was attained we do not know It may have been by a process such as that used by Eratosthenes, who will next be mentioned, or it may have been by crude measures of the depression of objects at sea If we take Aristotle's stadion to be the Attic stadion of 185 meters (607 ft), then this figure represents a considerable over-estimate, but is of the right order of magnitude, as a mathematician would say

Eratosthenes of Alexandria (*c* 276–*c* 195 B C) is the first known writer to describe and apply a method for determining the size of the Earth He assumed that Syene (the modern Assuan on the Nile) lay on the Tropic of Cancer so that the sun at the summer solstice was exactly overhead Eratosthenes observing at Alexandria at the solstice found the sun to be 1/50 of a circumference away from the zenith, that is, the difference of latitude between the two places he took to be 1/50 of 360° = 7° 12′ He assumed that Alexandria and Syene lie on the same meridian, which is not exactly true, and that the distance between them is 5 000 stadia

On the principle of the exact correspondence between angular distances in the heavens and distances measured on the terrestrial globe it follows that 1/50 of the circumference represents 5,000 stadia, or that the whole circumference is 250,000 stadia With any plausible modern equivalent of that stadion this is much nearer the truth than Aristotle's figure

We have reports of two other Greek attempts to determine the circumference of the Earth, but there is no reason to suppose the results to be any better than that found by Eratosthenes Ptolemy in his *Geography* gives the length of a degree as 500 stadia, which makes the circumference 180,000 stadia These results are all clouded by the uncertainty as to the modern equivalent of the stadion, and it may well be that the stadion used by different writers was different The same uncertainty affects a determination on principles similar to those of Eratosthenes made on the plains of Shinar in Mesopotamia under the orders of the Caliph Abdullah al Mamun (A D 786–833), although the distances were actually measured instead of being estimated

No refinement of theory over Eratosthenes was made until the oblateness of the Earth came into question during the late 17th and the first half of the 18th centuries For determining distances on the Earth, Willebrord Snell (1591–1626) substituted a chain of triangles in Holland for direct measurement

In 1669 Picard (*q v*) first used the telescope both in the determination of latitude and in the measurement of angles of triangulation, a device whereby the accuracy of both operations was increased Picard's results for the length of a degree were used by Newton in his calculations to prove that the attraction of the Earth is the principal force governing the motion of the Moon in its orbit

With Newton and his contemporary Huyghens a new era in geodesy begins The physical proofs of the sphericity of the Earth had so far been proofs of its general rotundity In the Ptolemaic astronomy it had seemed natural to assume—for reasons usually of a metaphysical sort—the earth to be an exact sphere, but with the growing conviction that the Copernican system is true and that the earth rotates about its axis, and with the advance in mechanical knowledge due chiefly to Newton and Huyghens, it seemed natural to conceive the earth as an oblate spheroid flattened at the poles There was also the experimental evidence of the astronomer Jean Richer, who found that his clock, regulated

[1] This does not mean that until about this time there were no maps in which places were located by their latitude and longitude, there had been such at least as early as the time of the Greco-Egyptian astronomer, Claudius Ptolemy, although they were extremely inaccurate. Nor does it mean that fairly accurate charts did not exist before the time of Columbus, for the mediaeval seamen's charts, or portolani, had then long been known, but these made little or no use of latitude and longitude

to keep time at Paris, lost two and a half minutes a day at Cayenne in South America, where he had been sent to make observations.

But the arguments from theory and the evidence of Richer's clock, confirmed by the experience of other observers, seemed to be contradicted by the work of the Cassinis in France If the Earth is an oblate spheroid, the length of a degree of latitude must increase from the equator to the pole[1], but the Cassinis, continuing Picard's work, found a small difference in the opposite direction; the length of a degree seemed to decrease as the pole was approached, as if the Earth were a prolate ellipsoid instead of an oblate one

The difference was small because the range of latitude available in France was comparatively small, and might conceivably be due to observational error; nevertheless many accepted it as real and there ensued a lively controversy between the Earth-flatteners and the Earth-elongators To settle the matter the Paris Academy of Sciences sent two expeditions to places whose difference of latitude was as great as was reasonably possible, one to "Peru"[2] and the other to Lapland. The northern party measured an arc extending from Tornea at the upper end of the Gulf of Bothnia to Kittis, not quite a degree to the northward, and finished its work before the Peruvian expedition did This latter expedition left France in 1735 and did not return till 1743

The result of a comparison of the Peruvian with the Lapland arc was a vindication of the theory of an earth flattened at the poles, but it was realized that the inevitable errors made the exact amount of the flattening uncertain. By taking the two measurements as exact the flattening found was $\frac{1}{213}$, the modern value is $\frac{1}{297}$.

During the century that followed there were numerous measurements of arc that in this brief sketch cannot even be mentioned by name The trigonometrical survey of England was begun in 1783, in the first place to establish a geodetic connection between Greenwich and Paris; and Méchain and Delambre undertook operations in France to determine the length of the meter[3]

Gradually of course methods and instruments improved and standards of precision became more exacting Gauss devised the method of least squares, a method that diminished the arbitrary element that had hitherto entered into the adjustment of conflicting observations. This method was used extensively by the German astronomer Bessel in the Prussian arc of 1830–35 In geodesy, as in astronomy, Bessel was a leader in the introduction of refined methods of observation and higher standards of accuracy.

(2.) GEODETIC SURVEYING INSTRUMENTS AND METHODS OF OBSERVATION

In a sketch of this sort it would not be desirable to enter into details about the design, construction and use of the instruments employed in geodesy. The instruments used in the astronomical part of the work for determining latitude and longitude are simply the ordinary astronomical instruments for those purposes. For longitudes the transit instrument is, and has been for a long time, in general use. Nowadays it is ordinarily provided with a self-recording micrometer and is used in connection with a chronograph For latitude determinations the zenith telescope and the broken-telescope transit are in almost universal use. For the determination of azimuths and for the measurement of the angles of triangulation, theodolites are used, of a type more accurate than those needed in ordinary surveying but not differing from them in principle As an additional means to secure greater accuracy a large number of measurements are taken, the pointings on any given object being evenly distributed around the horizontal circle of the instrument, in order to eliminate errors of graduation as far as possible

The sides of the triangles are of any convenient length up to the maximum length of intervisibility between stations Exceptionally this may be 200 miles or more in mountainous regions, and 100 miles is by no means unusual At the other extreme, it is not desirable to make the sides of the principal triangles too short, for then errors in centering both the instrument and the object sighted on play too large a part Moreover, too many triangles, each subject to error, are then required for a given amount of linear progress The practical lower limit for the best work is now considered to be about 2 miles Theoretically, one measured base connected with the triangulation and taken in conjunction with the measured angles would suffice to determine the lengths of all the sides of the triangles, but in practice directly measured bases are connected with the triangulation at frequent intervals The accuracy of a base directly measured is much greater than that of the length of the same line computed by means of angular measurements from another measured base, though the two bases may be separated by only a few intervening triangles The direct measurement of frequent bases serves therefore as a check on the measurements of angle.

Formerly bases were measured with bars or rods. Great care was necessary in making contacts between the ends of the bars and in determining their temperature, which might not be the same as the temperature of the surrounding air, because the expansion of the bars by heat made a very appreciable difference in their lengths Nowadays bases are measured with tapes or wires made of invar alloy The coefficient of the thermal expansion of this alloy is so low that the temperatures need not be determined with any great accuracy The wires or tapes are always used at a standard tension maintained with weights and pulleys, or with spring balances, and their lengths are accurately determined in a standardizing laboratory—under conditions similar to those in the field—both before and after a campaign in the field In this way the accuracy of a base measured with invar tapes or wires is quite as great in practice as that obtainable with the more elaborate and cumbrous base-bar apparatus used during the 19th century Roughly speaking, an accuracy of one part in 500,000 or even one part in 1,000,000 may be obtained in base measurements.

The instruments for precise leveling are in principle the same as the usual engineering instruments for spirit leveling, but various refinements have been introduced into the design, and special precautions to secure accuracy are adopted.

(3.) FUNDAMENTAL PRINCIPLES AND DEFINITIONS

The gradual increase in the accuracy of geodetic observations has been accompanied by an increasing precision in definition of the quantities sought and an increasing attention to details of theory When we say that we are endeavouring to determine the figure of the Earth, we are not concerned with the exact contours of the hills, valleys and ocean basins These are matters for the topographer and hydrographer The forms of these superficial features are specified with reference to a surface that defines the figure of the Earth Over the sea this surface is mean sea level, and beneath the land it is an imaginary sea-level surface defined by spirit leveling If small sea-level canals were dug into the

[1] It may seem as if just the reverse would be true, but this is because the reader may be thinking of the length of a degree of *geocentric* latitude, that is the length of an elliptical arc subtending an angle of one degree at the center of the Earth The latitude meant, however, is not the *geocentric* latitude, which is not susceptible of direct observation, but the *astronomic* latitude (*see* LATITUDE), which is the angle between the plumb-line and the plane of the equator. The plumb-line is assumed to be normal to the meridian section through the place of observation The ratio of the change in latitude to the change in linear distance from the equator is obviously a measure of the curvature, and the curvature of an ellipse (which may be taken as typical of all symmetrical ovals) is obviously greatest at the vertex, which corresponds to the end of the major axis or to the equator, and least at the end of the minor axis, that is, at the poles

[2] The then Spanish province of Peru included what is now Ecuador, where all the geodetic work was done The word "Peru" has become inseparably attached to this expedition The measuring bar used was called the "toise of Peru" and because it was made with special care it became the standard of length on which much later geodetic work was based. A toise consisted of six French feet, equivalent to a little less than 6 feet 5 inches English measure.

[3] It was intended that the meter should be one ten-millionth of the length of the quadrant of a meridian, as nearly as could be determined With the meter established, however, as a length defined by a certain standard bar, this bar serves as the definition, and later determinations of the figure of the Earth have no effect on the length of the meter.

interior of the continents or open-ended pipes like inverted siphons were run from the land out into the ocean, the surface sought would be defined physically at various points by the level of the water in these canals or pipes But even this physical definition lacks mathematical precision. Sea level is affected by winds, salinity, barometric pressure and temperature What is really sought is the form of what is known mathematically as an equipotential surface or level surface, characterized by the fact that over its entire extent the so-called potential function is constant This potential function is due to the effect of the gravitational attraction of the matter composing the Earth, as it is and where it is, combined with the effect due to the rotation of the earth about its axis Any shifting of mass such as would be implied in the digging of the supposed sea-level canals would change slightly the form of these equipotential surfaces; and so, to be accurate, we must resort to the mathematical fiction that these canals are to be infinitesimal

There is an indefinite number of equipotential surfaces all characterized by the property that they are everywhere perpendicular to the direction of the apparent gravity[1] What is sought is the form of the particular equipotential surface that most nearly coincides with the mean level of the ocean The figure of this surface is by definition the figure of the Earth, and the surface is termed the *Geoid,* a term invented to avoid any commitment in advance of exact knowledge as to the exact shape of the Earth, for the use of this non-committal term merely means that the Earth is Earth-shaped We know of course that it is approximately an ellipsoid of revolution flattened at the poles Spirit leveling gives the elevation of points with respect to the geoid[2], not with respect to the terrestrial ellipsoid

For mapping purposes it is customary to use an ellipsoid of revolution as an adequate and convenient substitute for the geoid The dimensions and orientation of the assumed ellipsoid may represent an attempt to find the ellipsoid that most nearly fits the geoid as a whole, or they may represent an attempt to fit only a particular part of the geoid without regard to the rest of it When we speak of the figure of the Earth we usually mean the dimensions of the ellipsoid most nearly representing the geoid as a whole If the Earth is assumed to be a sphere, the length of a single meridional arc with the difference of latitude of its end points suffices to determine its size If it is assumed to be an ellipsoid of revolution, at least two meridional arcs and the latitudes of all end points must be determined If we have more than two such arcs, various combinations of them two and two will not give precisely the same result because the geoid is not exactly an ellipsoid The accepted way down to the middle of the 19th century was to take as many meridional arcs as might be available, rejecting perhaps those whose end latitudes were judged abnormal because of marked topographical relief in the vicinity, and reconcile them as well as might be by some arbitrary procedure or later by a least-squares adjustment

It is obvious that if differences of longitude could be obtained as accurately as differences of latitude, measured arcs of parallel would serve as well as measured meridional arcs to determine the figure of the Earth There were methods of determining astronomical differences of longitude before the invention of the electric telegraph, and arcs of parallel were measured, but little weight was given to them because of the inaccuracy of the astronomic longitudes With the invention of the electric telegraph[3] differences of longitude began to be used, at first in much the same way as differences of latitude, but later in connection with what may be called the area method or the deflection method of determining the figure of the geoid[1], in contradistinction to the arc method, or method involving only unconnected arcs of meridians and parallels

The area or deflection method supposes a considerable extent of territory more or less covered by connected chains of triangulation Somewhere in the midst of this triangulation a point is taken as the origin, a latitude and a longitude are assigned to this point, an azimuth is also assigned to a side of one of the triangles passing through this point The latitude, longitude and azimuth are to a certain extent arbitrary, but it would not be usual or convenient to assign to them values differing greatly from the astronomic values of those quantities Besides these, dimensions of the terrestrial ellipsoid are assumed These five quantities, the latitude and longitude of the initial point, the azimuth of a line through the point, and the two parameters necessary to specify the dimensions of the terrestrial ellipsoid of revolution, constitute a *geodetic datum* for the area covered by the triangulation For instance, for the triangulation of the United States the initial point is Meades Ranch in Kansas, latitude 39° 13′ 26″ 686 longitude 98° 32′ 30″ 506, azimuth to Waldo 75° 28′ 14″ 52 The dimensions of the terrestrial spheroid used in computing the triangulation are those known as the Clarke Spheroid of 1866 expressed in meters, namely semi-major axis 6,378,206 4 meters and semi-minor axis 6,356,583 8 meters

The triangles are assumed to lie on the assumed ellipsoid and from the assumed values for the origin and the known sides and angles of the triangulation the latitude and longitude of every vertex of every triangle and the azimuth of every side may be computed, all without reference to the astronomic values of those quantities The quantities so computed are termed the geodetic latitude, west longitude and azimuth If we denote these quantities by ϕ, λ and α, affecting them with subscript A or G to denote respectively the astronomic or geodetic values, the deflections or differences between the astronomic and geodetic verticals are.

$$\text{In the meridian } \phi_A - \phi_G,$$
$$\text{in the prime vertical } (\lambda_A - \lambda_G)\cos\phi,$$
$$\text{or } -(\alpha_A - \alpha_G)\cot\phi$$

Stations at which observations of both longitude and azimuth are available are called Laplace stations, at such stations there are two determinations of the deflection in the prime vertical These should be made consistent, in doing this the geodetic azimuth generally receives most of the correction, as it is much more subject to an accumulation of error than the geodetic longitude

The deflections obtained in this way obviously depend on the geodetic datum used It is usual to assume, in accordance with the principle of least squares, that the best geodetic datum is that which makes the sum of the squares of the deflections (weighted, perhaps, according to some principle) a minimum The dimensions of the ellipsoid constituting part of this geodetic datum then represent the *figure of the Earth* for this territory.

It should be noted that geodetic latitudes, longitudes and azimuths, as previously defined, are quantities dependent partly on convention, that is, on the assumed geodetic datum, and partly on a series of observed quantities, that is, the angles and sides of the triangles, a least-squares adjustment may also be involved The geodetic latitude, longitude and azimuth at a station are then not capable of immediate verification by direct observation on the spot as the corresponding astronomic quantities are, except of course that the longitude must be referred to the prime meridian.

The difference between an astronomic latitude, longitude or azimuth and the corresponding geodetic quantity is usually small The average value is only a few seconds of arc and differences of over 10″ of arc are rare except in mountainous regions There is, however, a classic instance of large deflections of contrary sign at stations no great distance apart in the midst of a plain near Moscow. Some mass of abnormally low density must lie beneath

[1]Gravity, as here used, means the combined effect of gravitational attraction and the centrifugal force of rotation.

[2]Except of course in so far as the relation of the geoid to the assumed mean sea level on which the leveling operations are based may be uncertain for reasons already given Strictly speaking, a knowledge of gravity at points along the level line is also needed, but this is a refinement that need not be here considered.

[3]Recently radiotelegraphy has been used with great success in the determination of longitudes By this method it is easier to determine the longitude of a large number of points than when the electric telegraph is used, and it is possible to select, if desired, points remote from towns There is no difference in principle, geodetically speaking, between the two methods but only differences in technical detail.

[1]The word *geoid* is used advisedly rather than *Earth,* because it may be the purpose to determine by the deflection method the figure of a portion of the geoid in the given area rather than to determine the figure of the Earth as a whole

the surface. It might seem as if the astronomic values of the latitude and longitude would be the ones used for mapping purposes; but this is not the case Where the geodetic values are available they are invariably used in preference to the astronomic values, in spite of the conventional and derivative character of the former This is because astronomic latitude and longitude depend on the direction of the plumb line and are therefore so affected by local topographic conditions as to render inaccurate any determinations of distance and direction based on the astronomic values

For instance, if we used the astronomic latitudes of two points one on the north coast of Porto Rico and one on the south coast, and computed the distance between them from these latitudes and from the known size of the Earth, the distance would come out about a mile in error, or about one part in 50, as against an accuracy of one part in 100,000, or better, obtainable from direct measurement by triangulation. Again, the western part of the boundary between the United States and Canada is the 49th parallel of latitude; for reasons of convenience this parallel was defined astronomically, and the result is that in one instance one bounding station is about 8″ north of where a geodetic determination would have put it, and another station less than 100 miles away is some 6″ south The greatest relative error between two adjacent stations is about 7″ in a distance of 20 miles, which would mean an error in the direction from one station to the other, as inferred from the latitudes, of about 35 ft to the mile

(4.) ISOSTASY

These irregular deflections of the plumb line have plagued geodesists from the beginning, they far exceed the errors in either the astronomical or geodetic determinations, and even for a comparatively small region they cannot be greatly reduced by changing the geodetic datum If the region covered is large or if the same dimensions of the terrestrial ellipsoid are used for several separate regions, the deflections are still larger

At first the only feasible procedure for determining the figure of the Earth as a whole was to reject those arcs where the ruggedness of the topography seemed likely to introduce abnormally large deflections, treat the remaining deflections like accidental errors, and hope that their effects would more or less balance out in the final result As better topographic maps became available and geodetic surveys became better organized, it began to seem feasible to calculate by some sort of mechanical integration the effects of the visible topography—mountains, plateaus, valleys, ocean basins, etc—on the direction of the plumb line, that is, on the deflections J H Pratt, archdeacon of Calcutta, was the first one to try calculations of this sort on a large scale with some attempt to make the calculations apply with fair approximation, even at the expense of considerable labour, to the actual topography instead of to highly conventionalized geometrical substitutes for it

Pratt found, what had already been suspected, that although the plumb line was in general deflected toward a hill, a range of mountains, or the interior of a continent, and away from a hollow, a valley, or the ocean deeps, nevertheless the amount of such deflection was in general considerably less than the amount computed by taking these topographic features at what might be termed their full face value The most satisfactory way of obtaining approximate agreement between the observed and the computed deflections was found to be the assumption that apparent excesses of matter protruding above the geoid, such as hills, mountain ranges and continents, and apparent deficiencies of matter where the Earth's surface is depressed below the level of the surrounding country, or indeed below the level of the geoid, such as valleys and ocean basins, are not real excesses or deficiencies of matter, but that these apparent excesses or deficiencies are *compensated* That is, beneath each apparent excess as represented by the surface form there is somewhere a deficiency of density, so that there is little or no real excess of matter; similarly, below each apparent deficiency of matter as revealed by surface configuration there is a compensating excess of density In short, under mountain ranges and plateaus the density of the crust is less and under the oceans greater.

It is convenient for mathematical reasons and is in fair agreement with the observed facts to assume that the excess or deficiency of mass, as shown by surface conformation, is exactly compensated by the subterranean deficiency or excess of density This compensation is called *isostatic compensation* and the corresponding state of affairs *isostasy*, a name invented by C. E Dutton. To state the matter differently: assume unit areas at some depth to be specified later and called the *depth of compensation* in different regions, and compare the total mass standing upon the various unit areas The hypothesis of isostasy states that the amount of matter standing upon a unit area will be the same regardless of whether it is under highlands or lowlands, continents or ocean deeps It is not to be supposed that the unit area may be taken indefinitely small, or that the state of isostasy is perfect A circle with a radius of 100 miles is almost certainly large enough to serve as a unit area, and a much smaller circle might be large enough in most cases.

There are two competing hypotheses as to the way in which isostatic compensation is effected, to these the names of Pratt and of Sir George Biddell Airy, former Astronomer Royal, have been attached According to the Pratt hypothesis there is a definite depth of compensation, the crustal material underneath the higher parts of the surface being less dense and under lower parts more dense, so that the total mass standing on any unit area is the same The Airy theory is, roughly speaking, a flotation theory, the blocks of lighter crust floating in a denser plastic material, which Airy called the *lava*, but which modern geologists prefer to call *magma*[1] The deficiency of density corresponding to a height of land is secured, not in the upper part of the crust, but in the "root" which projects down into the denser magma and displaces it Just as a tall iceberg means one that extends far below the surface, so a high mountain or plateau has its roots dipping deep into the magma On the Pratt hypothesis the depth of compensation is perhaps 60 miles (100 km), according to investigations of Bowie and others, but this is merely an average figure On the Airy hypothesis the lighter crust extends down to an average depth of perhaps half this, say 30 miles or less; less under the oceans, more under the continents and highlands. As a rule geologists prefer the Airy hypothesis, as more in accordance with their way of thinking, but most of the existing computations have been made according to the Pratt hypothesis For geodetic purposes there is not much to choose between the two hypotheses

When the deflections are applied to determine the ellipsoid that best fits a comparatively small region, the deflections that are to be minimized by the method of least squares should be the actual deflections for which formulas have previously been given But if it is desired to make the region to which the deflections apply representative of the earth as a whole in order to determine the figure of the earth, then the deflections should be corrected for the visible surface topography and its presumed isostatic compensation

This isostatic method was first applied by Hayford to observations extending over the United States In spite of the limited extent of the territory covered—in comparison with the land surface of the globe—the figure of the Earth deduced by him was adopted in 1924 by the Section of Geodesy of the International Geodetic and Geophysical Union as the best available figure of the Earth as a whole This terrestrial ellipsoid thus determined is known as the International Ellipsoid of Reference Heiskanen applied the isostatic method to deflections of the vertical in Europe and found results agreeing substantially with Hayford's. The dimensions of the International Ellipsoid are given in a later section The conclusions regarding isostasy derived from a study of the vertical are in general supported by a study of the observations of gravity discussed in the next section.

(5.) OBSERVATIONS WITH THE PENDULUM

If the Earth were composed of a series of homogeneous con-

[1]Or *sima* in the language of the Wegener hypothesis of continental drift The crust corresponds to Wegener's *Sial* or *Sal*.

centric spherical shells, its attraction would be uniform all over its surface and would be directed towards the common centre For the sake of simplicity, let us imagine that the Earth had this spherical form at the start and then acquired its present rotation about its axis Even if the Earth were absolutely rigid and unyielding the "centrifugal" force of rotation, being zero at the poles and a maximum at the equator, would introduce a variation into the apparent gravity, a variation dependent on the latitude The substance of which the Earth is composed is, however, not unyielding, but gives way under the "centrifugal force" so that the Earth has approximately the form that it would have if it were fluid and in equilibrium under the combined forces of its own attraction and the "centrifugal force" of rotation,[1] its form is nearly that of an ellipsoid of revolution flattened at the poles. This departure from the spherical form is a further cause of a change of apparent gravity between poles and equator

The intensity of gravity can be measured very accurately by means of the oscillations of a pendulum[2] and from the variation in gravity between equator and pole the flattening or ellipticity of the earth may be determined

The process is as follows From theoretical considerations it is known that the gravity on the surface of an ellipsoid of revolution, this surface being at the same time an equipotential surface, may be written in the form

$$g_0 = g_k(1 + b\sin^2\phi - b_4\sin^2 2\phi).$$

Here g_0 is gravity at the surface in geographic latitude ϕ, g_k is gravity at the equator, b and b_4 are constant coefficients, depending on the flattening The coefficient b_4 is small and the flattening is sufficiently well known so that its value may be set down in advance as 0 000006 for an exact ellipsoid This leaves two coefficients, g_k and b, to be determined by observation Theoretically, two values of g in different latitudes would suffice for this In practice as many gravity stations as are available are used, the discordances being adjusted by the method of least squares These discordances arise from the fact that the earth is not an exact ellipsoid of revolution, as is assumed in the formula, and furthermore that local topographic and geological conditions, that is, the existence of mountains, valleys, oceans, and abnormally high or low densities in the neighbourhood of a gravity station, cause deviations from any theoretical formula that can be devised These deviations are called gravity anomalies

When the best obtainable values of the coefficients g_E and b have been found the flattening f is found from the relation

$$b = \frac{5}{2}\frac{\omega^2 a}{g_k} - f - \frac{17}{14}\frac{\omega a}{g_E}f.$$

Here a is the equatorial radius of the ellipsoid, which must be known in advance and ω is the angular velocity of the Earth's rotation This formula is due in substance to Clairaut ($q\ v$), who, however, did not push his approximations far enough to include the term $\frac{17}{14}\frac{\omega a}{g_E}f$. This term is correct only when, as stated, the Earth's surface is assumed to be exactly that of an ellipsoid of revolution

The observations of gravity are generally taken at or near the surface of the Earth, though occasional observations have been made in mines The formulas given refer to the ideal level surface of the spheroid or ellipsoid The observed values of gravity could be reduced to this level surface by adding

$$\frac{2g_k}{a}\left[1 + \frac{\omega^2 a}{g_E} + f - \left(3f - \frac{5}{2}\frac{\omega^2 a}{g}\right)\sin^2\phi\right]H,$$

where H is the height of the point of observation above the level surface in question[1] But we do not know our elevations with respect to the ellipsoid or spheroid of reference The best available approximation is the elevation with respect to the geoid Observations of gravity are then reduced to the geoid, which is treated as if it were a regular surface The coefficients g_E and b are found by a least squares adjustment, b_4 being so small that a very approximate value of the flattening determines it with more than sufficient accuracy, and from these the value of the flattening f is obtained Theoretically it is possible to determine a also, but the determination is so poor as to be valueless Gravity observations thus determine the shape but not the size of the terrestrial ellipsoid

The preceding formula for the correction for the elevation of the station is derived on the supposition that there is no matter intervening between the station and the level surface to which the observation is reduced, a method based on a supposition manifestly false and yet found to work better on the whole in practice than the method of computing the effect of all visible surface irregularities either in the neighbourhood of the station only or over the entire globe and taking this effect at its full face value This fact is another manifestation of isostasy The effect of the visible irregularities of the surface is largely counteracted by effects of contrary nature in the crust beneath them This was noticed very early In the expedition of the Paris Academy to Peru Bouguer swung his crude pendulums at sea-level and then at Quito in about the same latitude but over 9,000 feet above sea-level He found to his surprise that the land masses below the level of Quito seemed to have much less effect than they apparently should Later writers commented on this and speculated on the possibility of extensive cavities, but it was not until over a century later that Pratt undertook the extensive computations that established isostasy on a comparatively secure basis

Gravity observations may be used not only, as has been stated, to determine the flattening of the terrestrial ellipsoid but also to determine the deviations of the geoid from this assumed ellipsoid The practical possibility of this was shown by Sir George Gabriel Stokes ($q\ v$) in 1849, but the requisite observations seemed then unobtainable, for Stokes' theory required that gravity be observed at fairly close intervals over the entire globe, including the sea, and there seemed no way to do this with the requisite accuracy[1] Various devices were tried for measuring gravity at sea, the most successful, until very recently, being a method due to Hecker based on the comparison of the atmospheric pressure obtained by a determination of the boiling point of water with that obtained by a direct reading of the mercury barometer Hecker's method was accurate enough to prove that in a general way isostasy prevailed over the oceans as well as over the land, but the accuracy obtained by great labour and complication was far inferior to that easily obtainable on land with the pendulum

Finally, a Dutch geodesist, Vening Meinesz, in seeking to overcome the difficulties of the unstable support of the pendulum apparatus in a country like Holland where the land itself is none too stable, hit on the idea of eliminating the *horizontal* acceleration of the pendulum, which was found to be the principal cause of the difficulty, by swinging two pendulums in the same vertical plane and therefore subject to the same horizontal acceleration By using a certain hypothetical pendulum, the phase of which at any instant is the difference between the phases of the two pendulums at that instant, the effect of the horizontal acceleration was eliminated The idea was found capable of adaptation to even more trying conditions than those presented by the unstable soil of Holland By using an improved form of the apparatus in a submarine vessel submerged deep enough to escape most of the motion on the surface of the sea, and by supporting the apparatus

[1]Mountains, plateaus and ocean deeps are obvious exceptions, they are supported by the stiffness of the outer crust, but the general conformation of the Earth is as stated On the subject of fluid equilibrium *see* in this article under the subhead *Isostasy*

[2]If the *same* pendulum is swung at two different places and the periods of an oscillation there are found to be t_1 and t_2, the values of gravity g_1 and g_2 at the two places are connected by the relation $g_2/g_1 = (t_1/t_2)^2$ The modern process of determining the figure of the earth from gravity observations depends on this formula for the *relative* gravity at two places *Relative* gravity may be determined within one or two parts in a million The *absolute* value of the acceleration of gravity at any given place is found from the formula $g = \pi^2(l/t^2)$, l being the length of the pendulum The accurate determination of *absolute* gravity is much more difficult, on account of the complications arising in measuring l

[1]The factor of H is nearly constant and corresponds to a variation in gravity of about one part in 1,000,000 for each three meters (or 10 ft) of elevation.

on gimbals, it was found possible to get gravity observations on the open ocean. The accuracy obtainable is not quite as great as on solid land but the results are nevertheless very gratifying

In this way Meinesz has observed gravity at 250 ocean stations mostly in low or middle latitudes. It is to be hoped that, soon, enough ocean gravity stations will be observed over all oceanic areas so that when taken in conjunction with the numerous stations on land they will enable the bumps and hollows of the geoid to be determined by Stokes' method, that is, bumps and hollows when compared with the regular mathematical surface of the terrestrial ellipsoid.

Enough has already been learned to raise interesting questions In regard to the perfectness of the isostatic condition over ocean areas there seem to be two opposite tendencies toward imperfection On the one hand, stations over great ocean deeps show a tendency toward abnormally small gravity—from the point of view of perfect isostasy—as if the hollows in the sea bottom represented real uncompensated, or only partly compensated, deficits of matter. On the other hand, there seems to be a slight though definite tendency toward an excess of gravity—still from the point of view of perfect isostasy—over ocean areas in general Some indication of this state of affairs had previously been given by gravity observations on land The theory of isostasy would predict slight hollows in the geoid over oceanic areas. The fact seems to be that there are slight bumps It is well, however, to be cautious in drawing conclusions as the observational evidence is still rather meager and no consensus of opinion has been reached in regard to the interpretation of it

(6.) THE VARIATION OF LATITUDE

The deflections of the vertical in the meridian depend on both the astronomical latitude and the geodetic latitude. The latter, as has been noted, involves a certain convention, that is, the assumed geodetic datum, and moreover depends upon surveying operations to connect the initial point of the datum with the point whose geodetic latitude is sought The astronomic latitude, though depending on observation at the place in question, is not absolutely invariable. The variability is due to a displacement of the axis of rotation in the body of the Earth There is in every body, however irregular in shape, an *axis of figure*, the axis about which the moment of inertia is a maximum If for any reason the axis of figure and the axis of rotation do not coincide, the pole of the axis of rotation will describe *in the body* a closed curve about the pole of the axis figure For a nearly spherical body like the Earth, the axis of rotation will retain *in space* a nearly invariable direction

The laws of these phenomena were first stated for a rigid rotating body by Leonhard Euler (*q v.*). With Euler's theorems in mind astronomers sought to detect by observation a possible variation in latitude, but succeeded only in reaching the conclusion that if any such existed, it must be small. Finally S C Chandler undertook a careful study apart from any preconceived theory, basing it both on observations of his own and a study of old records, notably those of Greenwich Observatory At about the same time, the reality of a change in latitude due to a motion of the pole was proved by simultaneous latitude observations in Berlin and Honolulu, places differing in longitude by nearly 180° It was found that an increase in latitude in one occurred simultaneously with an approximately equal decrease at the other This could not have been due to local conditions nor to defective star places, but it must have been due to a motion of the pole of rotation which in approaching one place receded from the other

Chandler found that the motion of the pole of rotation about the pole of figure required about 14 months where Euler's theory had led astronomers to expect a ten-month period The longer period was soon explained by Newcomb as due to the fact that Euler's theory was based on an ideal body absolutely unyielding and unchangeable in shape, a thing unknown in nature. The elastic yielding of the earth and the mobility of the ocean water lengthen the period from 10 months to 14

There is also a motion of the pole of rotation in the body of the Earth due to the fact that the pole of figure itself is not invariable but undergoes a displacement due to seasonal variations in barometric pressure, snow-load, etc. The period of these seasonal changes is obviously one year.

The amplitudes of both the annual and the fourteen-month variations are of the order of magnitude of 0″·1. The quantities sought are small and difficult to measure, but it appears that both components of the polar motion are subject to unpredictable changes Since the maximum deviation of the pole from its mean position is about 0″·3, which is small in comparison with the usual deflections of the vertical, the reduction of the observed astronomical latitudes to some more or less conventional mean value is not a very vital matter in ordinary geodetic work (It should be noted that the motion of the pole affects longitudes and azimuths also) The interest of the subject is more on the astronomical and geophysical side. Many interesting problems into which we cannot here enter are raised by this phenomenon and still await complete solution

The International Geodetic Association (*see* § 10 of this article) organized in 1899 an International Latitude Service with six special latitude observatories, all on the parallel of 39° 08′, three of which have remained in continuous operation. The advantage of having them all in the same latitude is that the same stars may be used at all of them and uncertainties in the star places do not affect the conclusions The observations may in fact be used to correct the star places

(7.) ASTRONOMICAL METHODS OF DETERMINING THE FIGURE OF THE EARTH

There are several astronomical methods of determining the flattening of the Earth For the most part they determine the flattening by means of the observed mechanical effects produced by the Earth's equatorial protuberance These effects are most noticeable in connection with the Earth's nearest neighbour, the Moon The equatorial bulge produces periodic perturbations in the Moon's celestial longitude and latitude, and secular changes in the motion of the Moon's perigee and of the node of its orbit on the ecliptic The Moon in turn acting on the equatorial bulge of the Earth produces the greater part of the slow displacement of the equinoxes known as precession, the Sun contributes a fairly large part of the observed precession and the planets a small remainder From any one of the effects mentioned above the flattening of the Earth may be deduced There are theoretical difficulties in all of the methods Perhaps the flattening deduced from the precession is as satisfactory as any, it agrees substantially with the flattening of the International Ellipsoid of Reference, namely 1/297 The tendency of the flattening deduced by the other lunar methods is to come out a trifle greater than this

These methods all deal with the average flattening without reference to local irregularities The flattening or the equatorial radius—one or the other—may also be deduced by a calculation essentially similar in principle to that used by Newton to show that terrestrial gravitation and the force controlling the Moon's orbital motion are one and the same The result, however, is affected by the fact that the geoid is not a perfect ellipsoid of revolution

(8.) THE EÖTVÖS TORSION BALANCE

If we think of the elevation of the geoid above the terrestrial ellipsoid, or depression below it, as the case may be, as a mathematical function of the geographical coordinates (latitude and longitude) of a point on the ellipsoid, then this mathematical function itself may in theory be found by the application of Stokes' formula to gravity observations. Observations of the deflections of the vertical obviously give us the first derivatives of this function and enable us to build up the function itself by a process of integration The next stage in this line of thought is obviously a consideration of the second derivatives, quantities intimately connected with the curvature of the geoid It is possible to determine certain quantities connected with the curvature by means of the Eötvös torsion balance devised by the late Baron Roland Eötvos of Budapest.

The Eotvös balance is simple in principle, being merely a rod

suspended at the middle by a very delicate fiber In one form of the balance the principal masses are concentrated at the ends of the rod In another form, more used in practice, the mass at one end is at a different level from the mass at the other

If we consider only the general conformation of the geoid, it seems to differ in vertical elevation from an exact ellipsoid only by small and slowly changing amounts If we look, however, at the directions of the tangents to this surface as disclosed by a study of the deflections of the vertical, we find considerable irregularity; if we look to the curvatures as disclosed by the Eotvos balance, we find apparently wild irregularity This irregularity is due to the fact that the geoid (or any equipotential surface studied in practice by the balance) cuts into discontinuities of density, such as in the sides of hills, walls of buildings, irregularities in subsurface geologic structure, etc We know that the second derivatives, about which the balance gives us information and on which the curvature of the equipotential surfaces depends, is discontinuous at such discontinuities in density Near them the second derivative and the curvature, although not actually discontinuous, appear extremely irregular

The surface of the geoid has been compared to that of a withered apple This is something of an exaggeration, for actual concavities in the geoid, such as would be found in the apple, though possible are probably quite rare Moreover, the wrinkles, or more properly irregular undulations, in the geoid are so fine and change character so quickly that in the aggregate they mean comparatively little in the way of actual rise or fall of the geoid as compared with the terrestrial ellipsoid, nevertheless the comparison is suggestive. The details of all the wrinkles in the geoid, as the torsion balance gives them, are really too fine for the purpose of the geodesist They simply confuse him

(9.) NUMERICAL DATA CONNECTED WITH THE FIGURE OF THE EARTH

The following table gives the principal determinations of the mean figure of the Earth, beginning with the work of Méchain and Delambre undertaken to establish a basis for the metric system The table was taken chiefly from "La figure de la Terre" (*Revue de géographie annuelle*—Tome 11, 1908) by Capt (now Gen) Georges Perrier Other, somewhat different, numerical values may sometimes be found if other sources of information are used The discrepancies will usually be due to the use of relations between the foot, toise and meter different from those used in this table

Elements of the Earth's Mean Figure.

Author	Date	Semi-major axis (a)	Reciprocal of the flattening ($1/f$)
		Kilometers	
Commission générale des poids et mesures (for the metric system)	1799	6,375 739	334·29
Delambre	1810	6,376 428	311·5
do	1810	6,376 523	308 65
Walbeck	1819	6,376 895	302 78
Everest	1830	6,377 253	300 80
Schmidt	1831	6,376 950	297 65
Bessel	1841	6,377·307	299 15
Everest	1847	6,376 634	311·04
Airy	1849	6,377 491	299 32
James and Clarke	1856	6,377 036	297 72
Clarke	1858	6,378 294	294 26
do	1863	6,378 288	294·36
Pratt	1863	6,378 245	295 26
Clarke	1866	6,378 207	294 98
Fischer	1868	6,378 338	288 50
Clarke	1880	6,378 249	293·47
Harkness	1891	6,377·072	300 20
Helmert	1907	6,378·200	298·3
Hayford	1907	6,378 283	297·8
Hayford (1)*	1909	6,378 388	297 0
Hayford (2)†	1909	6,378 062	298·2

*Using deflections of the vertical corrected for topography and isostatic compensation

†Using deflections of the vertical left uncorrected and the spheroid determined to fit as nearly as possible to the uncorrected deflections

As has been remarked, the mean figure for the Earth as a whole is not necessarily the figure best adapted to a particular region. The following table gives some of the ellipsoids actually in use.

Spheroids Used for Geographic Purposes

Author and date	Semimajor axis (a)	Reciprocal of flattening ($1/f$)	Countries using spheroid
	Kilometers		
Clarke, 1866	6,378 206	294 98	United States, Canada, Mexico
Clarke, 1880	6,378·249	293·47	France, South Africa.
Everest, 1830	6,377 253	300 80	India
Plessis	6,376 523	308 64	France (mapping)
Bessel, 1841	6,377·397	299 15	Germany, Austria, Dutch East Indies
Kraijenhoff	6,376·050	300 65	Holland
Danish Survey	6,377·019	300	Denmark.

A spheroid with a flattening equal to that of the Bessel Spheroid, but with its major axis greater than the major axis of the Bessel Spheroid by 1 part in 10,000 has been extensively used by the Central Bureau of the International Geodetic Association for geodetic calculations relating to Europe This choice was made because many tables to facilitate computation have been based on the Bessel Spheroid, and these can be adapted to the increased major axis with comparative ease, whereas a change in the flattening would require a recomputation of the whole set of tables.

The following table may be useful for reference

Fundamental Elements of the International Ellipsoid of Reference

a = semi-major axis (equatorial radius) = 6,378,388 meters

f = ellipticity (flattening) = $\frac{a-b}{a}$ = 1/297 = 0 003, 367, 0034

Derived Quantities

b = semi-minor axis (polar radius) = 6,356, 911 946 meters

e^2 = square of eccentricity = $\frac{a^2-b^2}{a^2}$ = 0 006, 722, 6700

Length of quadrant of the equator = 10,010,148 4 meters
Length of quadrant of the meridian = 10,002,288 3 meters
Area of the ellipsoid = 510,100,934 sq km
Volume of the ellipsoid = 1,083,319,780,000 cu km
Radius of sphere having same area as ellipsoid = 6,371,227 7 meters
Radius of sphere having same volume as ellipsoid = 6,371,221 3 meters
Mass of the ellipsoid* = $5\ 988 \times 10^{21}$ metric tonnes

*Mean density taken as 5·527, the value found by both Boys, *Phil Trans A* vol 186 (1895) p 1, and Braun, "*Denkschriften der Akademie der Wissenschaften zu Wien,*" *Mathematisch-naturwissenschaftliche Klasse*, 64, 1896, p 187

The range of uncertainty in these quantities is largely a matter of opinion Probably the semi-major axis is correct within 50 meters and the reciprocal of the flattening within half a unit or less But the question of how closely the adopted ellipsoid of reference represents the actual geoid is by no means exhausted even when we have stated to our own satisfaction the probable range of error of the parameters that determine the ellipsoid It is also of interest to know how far the geoid and the ellipsoid may deviate from one another To take an ideal case, let us suppose a perfectly ellipsoidal mass as large as the earth, its outer physical surface and the surfaces of equal density within being also equipotential surfaces Then let us suppose that the outer crust down to a certain depth shrinks and swells here and there so as to form oceans, continents and mountains like the existing ones, but with perfect isostatic adjustment always maintained The geoid, which formerly coincided with the outer surface, would go up with the continents and mountains and down with the ocean bottoms, but to a much less extent, the exact amount depending on the law of isostatic compensation For existing areas of elevation and depression and a depth of compensation of 100 km, the distance between the geoid and the ideal ellipsoid of closest fit (which need not be exactly our international ellipsoid) would be 50 meters or less If, however, isostatic compensation is imperfect to the extent of 10 or 15% of the total excess or deficiency of load, which is about the generally accepted estimate, and over wide

areas, the 50 meters might be more than doubled. We should expect, however, these extreme figures of 100 or 150 meters to occur only very exceptionally, say in the Himalayan region or near the great ocean deeps

Geoid contours were constructed by Hayford in connection with his earlier investigation of his figures of the Earth Within the United States he found a variation in the elevation of the geoid above the Clarke spheroid of 1866 amounting to 38 meters Similar investigations by others give results of the same order of magnitude This is somewhat greater than would be inferred from known differences of elevation and perfect isostasy with a depth of compensation of 100 km but is by no means more than might be expected in view of ignorance of the real depth of compensation and the known imperfectness of isostatic adjustment

The following are recent formulas for theoretical gravity at the surface of the earth, and the flattening derived from them In these formulas ϕ is the geographic latitude and λ the East longitude reckoned from Greenwich The unit is dynes per gram, or cm/sec^2 The date of publication of the formula is given in parentheses

Helmert (1915)

$$g_0 = 978\,052\,[1 + 0\,005285 \sin^2\phi - 0\,000007 \sin^2 2\phi + 0\,000018 \cos^2\phi \cos 2(\lambda + 17^\circ)],\ 1/296\,7$$

Bowie (1917)

$$g_0 = 978\,039\,[1 + 0\,005294 \sin^2\phi - 0\,000007 \sin^2 2\phi],\ 1/297\,4$$

Heiskanen (1928)

$$g_0 = 978\,049\,[1 + 0\,005293 - 0\,000007 \sin^2\phi + 0\,000019 \cos^2\phi \cos 2(\lambda - 0^\circ)],\ 1/297\,3$$

The fact that the coefficient of $\sin^2 2\phi$ is 0 000007 rather than 0 000006 means that the spheroid on which these formulas are based is depressed a very little in middle latitudes below an exact ellipsoid having the same axes The longitude term has the effect of turning this spheroid of revolution into a spheroid (approximately an ellipsoid) of three unequal axes The longest semi-axis of the equator, according to Heiskanen, lies in the meridian plane of Greenwich and is 121 meters longer than the mean The least equatorial semi-axis is in longitude $+90^\circ$ and is 121 meters shorter than the mean The validity of these longitude terms is closely connected with the apparent tendency of gravity at sea to be greater than that on land Geodesists are not yet agreed as to their validity or their geophysical interpretation, if real If they are accepted, the conception of isostasy must be modified and the geoid instead of being in general below the mean ellipsoid over the ocean would be above it

If we take the International Ellipsoid as the basis of a gravity formula and in addition adopt 978 050 cm/sec^2 for gravity at the equator, we get

$$g_0 = 978{\cdot}050\,[1 + 0\,005288 \sin^2\phi - 0\,000006 \sin^2 2\phi]$$

(10.) INTERNATIONAL GEODETIC ORGANIZATIONS

Geodesy is essentially an international science This was realized when in 1862 a Central European Geodetic Association (Mitteleuropaische Gradmessung) was organized on the initiative of Lieutenant-General Baeyer of Prussia The first general conference of the organization was held in 1864 with representatives of 13 States or countries, many of them being German States later united into the German Empire General conferences at intervals of three years were arranged for with a permanent committee directing the affairs of the organization between conferences At the next conference, in 1867, in recognition of widening scope the name was changed to European Geodetic Association (Europaische Gradmessung)

At the general conference in 1883 representatives of England and the United States were present This conference discussed matters of world-wide interest, such as a common prime meridian and an international time system At the next conference in 1886 the name International Geodetic Association (Internationale Erdmessung) was adopted to indicate a still wider scope, and a definite international convention was adopted providing for contributions from the member nations At the beginning of the same year F R Helmert became director of the Prussian Geodetic Institute He reorganized it in the years that followed, and exerted a powerful and beneficent influence on the work of the International Association, the headquarters of which remained associated with the Prussian Geodetic Institute The general conference of 1912 at Hamburg was the last held under this organization The outbreak of the World War prevented the holding of the general conference planned for 1915.

After the World War the International Geodetic and Geophysical Union was organized in connection with the newly created International Research Council The International Geodetic and Geophysical Union consists of various semi-independent sections, one of which, the section of Geodesy, took over the work of the former International Geodetic Association The new type of organization emphasizes the fact that geodesy is really a branch of geophysics The work of the International Latitude Service was taken over jointly by the Section of Geodesy and the newly formed International Astronomical Union, since the subject was of interest to both organizations Germany and Austria have so far remained outside the new organization, but there has been organized a Baltic Geodetic Commission, which includes representatives of Germany and of other nations bordering on the Baltic and deals with geodetic problems of common interest to them Some of the Baltic nations are members both of the Baltic Commission and of the International Geodetic and Geophysical Union.

For further information *see* 1. Bibliographies of Geodesy —Borsch, Otto, *Geodatische Literatur auf Wunsch der Permanenten Commission im Centralbureau zusammengestellt* (Berlin, 1889), Gore, James Howard, *A Bibliography of Geodesy*, *see* also Appendix No 8 to *Report of the U S Coast and Geodetic Survey for 1902* (Washington, 1903) 2 History of Geodesy —Beazley, C R, *The Dawn of Modern Geography*, 3 vol (London, 1897–1906), Butterfield, A D, *A History of the Determination of the Figure of the Earth from Arc Measurements* (Worcester, Mass, 1906), Delambre, J B J, *Grandeur et figure de la Terre* (posthumous work ed by G Bigourdan, Paris, 1912), Delambre, J B J, *Histoire de l'astronomie ancienne*, 2 vol (Paris, 1817), Muller, Quodvultdeus, *Geschichte der Breitgradmessungen bis zur peruanische Gradmessung* (Doctoral thesis, Rostock, 1871), Todhunter, Isaac, *A History of the Mathematical Theories of Attraction and the Figure of the Earth from the time of Newton to that of Laplace*, 2 vol (London, 1873) 3 General Works —Clarke, A R, *Geodesy* (Oxford, 1880), Helmert, F R, *Die mathematischen und physikalischen Theorieen der hoheren Geodasie*, 2 vol (Leipzig, 1880–84), Hosmer, George L, *Geodesy, including Astronomical Observations, Gravity Measurements and the Method of Least Squares* (New York, 1919), Jordan, Wilhelm, *Handbuch der Vermessungskunde*, vol 3, 4th ed 1897, Perrier, Georges, "La Figure de la Terre," being vol II (1908) of the *Revue de Géographie annuelle* 4 Books on special subjects —Bowie, William, *Isostasy* (New York, 1927), Messerschmidt, J B, *Die Schwerebestimmung an der Erdoberflache* (Brunswick, 1908) 5 Serial Publications —*Verhandlungen der Internationalen Erdmessung* (Comptes-Rendus de l'Association géodésique internationale), Berlin, G Reimer, various dates to 1914, *Travaux de la Section de Géodésie de l'Union géodésique et géophysique internationale* (Paris, 1924–), *Bulletin Géodésique* (Paris, 1924–), *Gerlands Beitrage zur Geophysik* Stuttgart (Vols I and II), and Leipzig (Vol III and following), *Monthly Notices of the Royal Astronomical Society, Geophysical Supplement* (London, 1922–), *Zeitschrift fur Geophysik* (Brunswick, 1925–)

(W D LA)

GEOFFREY (*c* 1152–1212), archbishop of York, was a bastard son of Henry II, king of England He was distinguished from his legitimate half-brothers by his consistent attachment and fidelity to his father He was made bishop of Lincoln at the age of twenty-one (1173), but though he enjoyed the temporalities he was never consecrated and resigned the see, under papal pressure, in 1182 He then became his father's chancellor, holding a large number of lucrative benefices in plurality Richard nominated him archbishop of York in 1189, but he was not consecrated till 1191, or enthroned till 1194 Geoffrey's history is chiefly one of quarrels, with the see of Canterbury, with the chancellor William Longchamp, with his half-brothers Richard and John, and especially with his canons at York This last dispute kept him in litigation before Richard and the pope for many years He led the clergy in their refusal to be taxed by John, and was forced to fly the kingdom in 1207 He died in Normandy on Dec 12, 1212

See Giraldus Cambrensis, *Vita Galfridi;* Stubbs's prefaces to *Roger de Hoveden,* vols iii and iv. (Rolls Series)

GEOFFREY (1158–1186), duke of Brittany, fourth son of the English king Henry II and his wife Eleanor of Aquitaine, was born on Sept 23, 1158. In 1167 Henry suggested a marriage between Geoffrey and Constance (d 1201), daughter and heiress of Conan IV, duke of Brittany (d 1171) Conan assented, perhaps under compulsion, to this proposal but surrendered the greater part of his unruly duchy to the English king Having received the homage of the Breton nobles, Geoffrey joined his brothers, Henry and Richard, who, in alliance with Louis VII of France, were in revolt against their father, but he made his peace in 1174, afterwards helping to restore order in Brittany and Normandy, and aiding the new French king, Philip Augustus, to crush some rebellious vassals In July 1181 his marriage with Constance was celebrated, and practically the whole of his subsequent life was spent in warfare with his brother Richard In 1183 he made peace with his father, who had come to Richard's assistance, but a fresh struggle soon broke out for the possession of Anjou, and Geoffrey was in Paris treating for aid with Philip Augustus, when he died on Aug 19, 1186 He left a daughter, Eleanor, and his wife bore a posthumous son, the unfortunate Arthur (*q v*)

GEOFFREY, surnamed MARTEL (1006–1060), count of Anjou, son of the count Fulk Nerra (*q v*) and of the countess Hildegarde or Audegarde, was born on Oct 14, 1006 During his father's lifetime he was recognized as suzerain by Fulk l'Oison ("the Gosling"), count of Vendôme, the son of his half-sister Adela Fulk having revolted, he confiscated the countship, which he did not restore till 1050 On Jan 1, 1032, he married Agnes, widow of William the Great, duke of Aquitaine, and taking arms against William the Fat, eldest son and successor of William the Great, defeated him and took him prisoner at Mont-Couer (Sept 20, 1033) He then tried to win recognition as dukes of Aquitaine for the sons of his wife Agnes by William the Great, who were still minors, but Fulk Nerra promptly took up arms to defend his suzerain William the Fat, from whom he held the Loudunois and Saintonge in fief against his son In 1036 Geoffrey Martel had to liberate William the Fat, on payment of a heavy ransom, but the latter having died in 1038, and the second son of William the Great, Odo, duke of Gascony, having fallen in his turn at the siege of Mauzé (March 10, 1039) Geoffrey made peace with his father, and had his wife's two sons recognized as dukes He had interfered in the affairs of Maine, though without much result, for having sided against Gervais, bishop of Le Mans, who was trying to make himself guardian of the young count of Maine, Hugh, he had been beaten and forced to make terms with Gervais in 1038 In 1040 he succeeded his father in Anjou and was able to conquer Touraine (1044) and assert his authority over Maine (*see* ANJOU) He was four times married, but left no children, and was succeeded in the countship of Anjou by Geoffrey the Bearded, the eldest of his nephews He died at Angers on Nov 14, 1060

See Louis Halphen, *Le Comté d'Anjou au XIe siècle* (1906) A summary biography is given by Celestin Port, *Dictionnaire historique, géographique et biographique de Maine-et-Loire* (3 vols, Paris-Angers, 1874–78), vol ii, pp 252–253, and a sketch of the wars by Kate Norgate, *England under the Angevin Kings* (2 vols, 1887), vol i chs iii iv

GEOFFREY, surnamed PLANTAGENFT (or PLANTEGENET) (1113–1151), count of Anjou, was the son of Count Fulk the Young and of Eremburge (or Arembourg) of La Flèche, he was born on Aug 24, 1113 He is also called "le bel" or "the handsome," and received the surname of Plantagenet from the habit which he is said to have had of wearing in his cap a sprig of broom (*genêt*) He married (June 2, 1129) Matilda, daughter of Henry I of England, and widow of the emperor Henry V He died on Sept 7, 1151, and was buried in the cathedral of Le Mans By his wife Matilda he had three sons Henry Plantagenet (*see* HENRY II), Geoffrey, and William (*See* also ANJOU)

See Kate Norgate, *England under the Angevin Kings* (2 vols, 1887), vol i chs v–viii, Célestin Port, *Dictionnaire historique, géographique et biographique de Maine-et-Loire* (3 vols, Paris-Angers, 1874–78), vol ii. pp 254–256 There is a biography of Geoffrey written in the 12th century by Jean, a monk of Marmoutier, *Historia Gaufredi, ducis Normannorum et comitis Andegavorum,* published by Marchegay et Salmon, "Chroniques des comtes d'Anjou" (*Société de l'histoire de France,* 1856), pp 229–310

GEOFFREY DE MONTBRAY (d 1093), bishop of Coutances (*Constantiensis*), a right-hand man of William the Conqueror, was a type of the great feudal prelate, warrior and administrator at need He knew, says Orderic, more about marshalling mailed knights than edifying psalm-singing clerks Obtaining, as a young man, in 1048, the see of Coutances, by his brother's influence (*see* MOWBRAY), he raised from his fellow nobles and from their Sicilian spoils funds for completing his cathedral, which was consecrated in 1056 With bishop Odo, a warrior like himself, he was on the battle-field of Hastings, exhorting the Normans to victory, and at William's coronation it was he who called on them to acclaim their duke as king His reward in England was a mighty fief scattered over twelve counties He accompanied William on his visit to Normandy (1067), but, returning, led a royal force to the relief of Montacute in September 1069 In 1075 he again took the field, leading with bishop Odo a vast host against the rebel earl of Norfolk, whose stronghold at Norwich they besieged and captured

Meanwhile the Conqueror had invested him with important judicial functions In 1072 he had presided over the great Kentish suit between the primate and bishop Odo, and about the same time over those between the abbot of Ely and his despoilers, and between the bishop of Worcester and the abbot of Ely, and there is some reason to think that he acted as a Domesday commissioner (1086), and was placed about the same time in charge of Northumberland The bishop, who attended the Conqueror's funeral, joined in the great rising against William Rufus next year (1088), making Bristol, with which (as Domesday shows) he was closely connected and where he had built a strong castle, his base of operations He burned Bath and ravaged Somerset, but had submitted to the king before the end of the year He appears to have been at Dover with William in January 1090, but, withdrawing to Normandy, died at Coutances three years later In his fidelity to Duke Robert he seems to have there held out for him against his brother Henry, when the latter obtained the Cotentin

See E A Freeman, *Norman Conquest* and *William Rufus;* J H. Round, *Feudal England,* and, for original authorities, the works of Orderic Vitalis and William of Poitiers, and of Florence of Worcester, the Anglo-Saxon Chronicle, William of Malmesbury's *Gesta pontificum* and Lanfranc's works, ed Giles, Domesday Book (J H R)

GEOFFREY OF MONMOUTH (d 1154), bishop of St Asaph and creator of the Arthurian legend, was born about the year 1100 He received a liberal education under his paternal uncle, Uchtryd, at that time archdeacon, and subsequently bishop, of Llandaff In 1129 Geoffrey appears at Oxford among the witnesses of an Oseney charter He subscribes himself "Geoffrey Arturus" A first edition of his *Historia Britonum* was in circulation by the year 1139, although the text which we possess appears to date from 1147 This famous work professes to be a translation from a Celtic source, "a very old book in the British tongue" which Walter, archdeacon of Oxford, had brought from Brittany Walter the archdeacon is a historical personage, whether his book has any real existence may be fairly questioned There is nothing in the matter or the style of the *Historia* to preclude us from supposing that Geoffrey drew partly upon confused traditions, partly on his own powers of invention, and to a very slight degree upon the accepted authorities for early British history The romancer achieved an immediate success He was patronized by Robert, earl of Gloucester, and by two bishops of Lincoln, he obtained, about 1140, the archdeaconry of Llandaff "on account of his learning", and in 1151 was promoted to the see of St Asaph

Before his death the *Historia Britonum* had already become a model and a quarry for poets and chroniclers The list of imitators begins with Geoffrey Gaimar, the author of the *Estorie des Engles* (*c* 1147), and Wace, whose *Roman de Brut* (1155) is partly a translation and partly a free paraphrase of the *Historia* In the next century the influence of Geoffrey appears in the *Brut* of Layamon, and in the rhyming English chronicle of Robert of

Gloucester Among later historians who were deceived by the *Historia Britonum* it is only needful to mention Higden, Hardyng, Fabyan (1512), Holinshed (1580) and John Milton Still greater was the influence of Geoffrey upon Warner in *Albion's England* (1586), and Drayton in *Polyolbion* (1613) The *Historia Britonum* provided the material for the earliest English tragedy, *Gorboduc* (1565), the *Mirror for Magistrates* (1587), and Shakespeare's *Lear.*

But in the work of expanding and elaborating this theme the successors of Geoffrey went as far beyond him as he had gone beyond Nennius; but he retains the credit due to the founder of a great school For the development of the tradition *see* ARTHURIAN LEGEND Of the twelve books into which it is divided only three (Bks IX, X, XI) are concerned with Arthur Earlier in the work, however, we have the adventures of Brutus, of his follower Corineus, the vanquisher of the Cornish giant Goemagol (Gogmagog); of Locrinus and his daughter Sabre (immortalized in Milton's *Comus*); of Bladud the builder of Bath; of Lear and his daughters, of the three pairs of brothers, Ferrex and Porrex, Brennius and Belinus, Elidure and Peridure The story of Vortigern and Rowena takes its final form in the *Historia Britonum;* and Merlin makes his first appearance in the prelude to the Arthur legend Besides the *Historia Britonum* Geoffrey is also credited with a *Life of Merlin* composed in Latin verse The authorship of this work has, however, been disputed, on the ground that the style is distinctly superior to that of the *Historia* A minor composition, the *Prophecies of Merlin,* was written before 1136, and afterwards incorporated with the *Historia,* of which it forms the seventh book

For a discussion of the manuscripts of Geoffrey's work, *see* T D Hardy, *Descriptive Catalogue* (Rolls Series, No 26. vol 1, 1862); for those in the British Museum, H. L D. Ward, *Catalogue of Romances* (vol 1, 1883), and those in Leyden, L V. Delisle, *Bibliothèque de l'École de Chartes* (LXXI, 1910), A Griscom (*Speculum* vol 1, Mediaeval Academy of America, 1926) has studied some of the mss The Latin text of the *Historia* (ed San Marte [A Schulz] Halle, 1854) follows J. A Giles, *Galfredi Monumentensis Historia Britonum* (Caxton Society, 1844) which is based on 16th century editions. Eng trans, *History of the Kings of Britain,* ed L Paton (Everyman Series, 1912) For biography, *see* W L Jones, "Geoffrey of Monmouth" in the *Transactions of the Cymmrodorion Society* (1899) *See* also A de la Borderie, *Études historiques bretonnes* (1883), W E Mead, *Outlines of the History of the Legend of Merlin* (1899), G Heeger, *Trojanersaga der Britten* (1886), F Lot, *Études sur Merlin* (Rennes, 1900); R H Fletcher, "Two Notes on the *Historia,*" in the *Publications of the Modern Languages Association of America* (Baltimore, 1901), and *The Arthurian Material in the Chronicles* (Harvard Studies and Notes, 1906), *Vita Merlini* (ed J J Parry, Illinois Studies, 1925) The subject has been dealt with exhaustively by E K Chambers, *Arthur of Britain,* with bibliography (1927) (H W C D; X)

GEOFFREY OF PARIS (d *c* 1320), French chronicler, was probably the author of the *Chronique métrique de Philippe le Bel,* or *Chronique rimée de Geoffroi de Paris* This work, which deals with the history of France from 1300 to 1316, contains 7,918 verses Various short historical poems have also been attributed to Geoffrey, but there is no certain information about either his life or his writings

The *Chronique* was published by J. A Buchon in his *Collection des chroniques,* tome IX (Paris, 1827), and it has also been printed in tome XXII. of the *Recueil des historiens des Gaules et de la France* (1865) *See* G Paris, *Histoire de la littérature française au moyen âge* (Paris, 1890); and A Molinier, *Les Sources de l'histoire de France,* tome III (Paris, 1903)

GEOFFREY THE BAKER (d. *c* 1360), English chronicler, is also called Walter of Swinbroke, and was probably a secular clerk at Swinbrook in Oxfordshire He wrote a *Chronicon Angliae temporibus Edwardi II. et Edwardi III*, which deals with the history of England from 1303 to 1356 From the beginning until about 1324 this work is based upon Adam Murimuth's *Continuatio chronicarum,* but after this date it contains information not found elsewhere, and closes with a good account of the battle of Poitiers The author obtained his knowledge about the last days of Edward II from William Bisschop, a companion of the king's murderers, Thomas Gurney and John Maltravers Geoffrey also wrote a *Chroniculum* from the creation of the world until 1336. His writings have been edited with notes by Sir E. M. Thompson as the *Chronicon Galfridi le Baker de Swynebroke* (Oxford, 1889).

GEOFFRIN, MARIE THERÈSE, *née* **RODET** (1699–1777), French hostess, was born in Paris on June 2, 1699 She married, on July 19, 1713, Pierre François Geoffrin, a rich manufacturer and lieutenant-colonel of the National Guard, who died in 1750 It was not till 1748, when Mme Geoffrin was nearly 50, that she became a power in Parisian society and started her two dinners a week, one on Monday for artists, and one on Wednesday for her friends the encyclopaedists and other men of letters She received many foreigners of distinction, Hume and Horace Walpole among others Walpole spent much time in her society before he was finally attached to Mme. du Deffand, and speaks of her in his letters as a model of common sense She was indeed somewhat of a small tyrant in her circle. She had adopted the pose of an old woman earlier than necessary, and her coquetry, if such it can be called, took the form of being mother and mentor to her guests, many of whom were indebted to her generosity for substantial help Although her aim appears to have been to have the *Encyclopédie* in conversation and action around her, her advanced views did not prevent her from observing the forms of religion, and she was extremely displeased with any of her friends who were so rash as to incur open disgrace, Marmontel, for instance, losing her favour after the official censure of *Bélisaire* A devoted Parisian, Mme Geoffrin rarely left the city, so that her journey to Poland in 1766 to visit the king, Stanislas Poniatowski, whom she had known in his early days in Paris, was a great event in her life Her experiences induced a sensible gratitude that she had been born *"Française"* and *"particulière"* She died in Paris on Oct 6, 1777

See *Correspondance inédite du roi Stanislas Auguste Poniatowski et de Madame Geoffrin,* edited by the comte de Mouy (1875), P de Ségur, *Le Royaume de la rue Saint-Honoré, Madame Geoffrin et sa fille* (1897), A Tornezy, *Un Bureau d'esprit au XVIIIe siècle le salon de Madame Geoffrin* (1895), and Janet Aldis, *Madame Geoffrin, her Salon and her Times, 1750–1777* (1905).

GEOFFROY, ÉTIENNE FRANÇOIS (1672–1731), French chemist, born in Paris on Feb 13, 1672, was first an apothecary and afterwards practised medicine After studying at Montpellier he accompanied Marshal Tallard on his embassy to London in 1698 and thence travelled to Holland and Italy Returning to Paris he became professor of chemistry at the Jardin du Roi and of pharmacy and medicine at the Collège de France, and dean of the faculty of medicine He died in Paris on Jan. 6, 1731. His name is best known in connection with his tables of affinities (*tables des rapports*), which he presented to the French Academy in 1718 and 1720 These were lists, prepared by collating observations on the actions of substances one upon another, showing the varying degrees of affinity exhibited by analogous bodies for different reagents, and they retained their vogue for the rest of the century, until displaced by the profounder conceptions introduced by C. L. Berthollet Another of his papers dealt with the delusions of the philosopher's stone, but nevertheless he believed that iron could be artificially formed in the combustion of vegetable matter His *Tractatus de materia medica,* published posthumously in 1741, was long celebrated

His brother CLAUDE JOSEPH, known as Geoffroy the younger (1685–1752), was also an apothecary and chemist who, having a considerable knowledge of botany, devoted himself especially to the study of the essential oils in plants.

GEOFFROY, JULIEN LOUIS (1743–1814), French critic, a native of Rennes, Brittany, was editor of *L'Année littéraire* from 1776 to 1792 and was a bitter critic of Voltaire. During the Terror he went into hiding, only returning to Paris in 1799, when he became dramatic critic of the *Journal des Débats.* He died in Paris on Feb. 27, 1814.

GEOFFROY SAINT-HILAIRE, ÉTIENNE (1772–1844), French naturalist, was the son of Jean Gèrard Geoffroy, procurator and magistrate of Étampes, Seine-et-Oise, where he was born on April 15, 1772 Destined for the church he entered the college of Navarre, in Paris, where he studied natural philosophy under M. J Brisson; and in 1788 he obtained one of

the canonicates of the chapter of Sainte Croix at Étampes, and also a benefice. Science, however, offered him a more congenial career, and he gained from his father permission to remain in Paris, and to attend the lectures at the Collège de France and the Jardin des Plantes, on the condition that he should also read law. He accordingly took up his residence at Cardinal Lemoine's college, and there became the pupil and soon the esteemed associate of Brisson's friend, the abbé Hauy, the mineralogist Having, before the close of the year 1790, taken the degree of bachelor in law, he became a student of medicine, and attended the lectures of A F de Fourcroy at the Jardin des Plantes, and of L. J M Daubenton at the Collège de France His studies at Paris were at length suddenly interrupted, for, in August 1792, Hauy and the other professors of Lemoine's college, as also those of the college of Navarre, were arrested by the revolutionists as priests, and confined in the prison of St Firmin Through the influence of Daubenton and some others Geoffroy on August 14 obtained an order for the release of Hauy in the name of the Academy; still the other professors of the two colleges, save C F Lhomond, who had been rescued by his pupil J. L. Tallien, remained in confinement. Geoffroy, foreseeing their certain destruction if they remained in the hands of the revolutionists, determined if possible to secure their liberty by stratagem By bribing one of the officials at St Firmin, and disguising himself as a commissioner of prisons, he gained admission to his friends, and entreated them to effect their escape by following him All, however, dreading lest their deliverance should render the doom of their fellow-captives the more certain, refused the offer, and one priest only, who was unknown to Geoffroy, left the prison Already on the night of September 2 the massacre of the proscribed had begun, when Geoffroy, yet intent on saving the lives of his friends and teachers, repaired to St Firmin At 4 o'clock on the morning of September 3, after eight hours' waiting, he by means of a ladder assisted the escape of twelve ecclesiastics, not of the number of his acquaintance, and then the approach of dawn and the discharge of a gun directed at him warned him, his chief purpose unaccomplished, to return to his lodgings Leaving Paris he retired to Étampes, where, in consequence of the anxieties of which he had lately been the prey, and the horrors which he had witnessed, he was for some time seriously ill At the beginning of the winter of 1792 he returned to his studies in Paris, and in March of the following year Daubenton, through the interest of Bernardin de Saint Pierre, procured him the office of sub-keeper and assistant demonstrator of the cabinet of natural history, vacant by the resignation of B G E Lacépède By a law passed in June 1793, Geoffroy was appointed one of the twelve professors of the newly constituted museum of natural history, being assigned the chair of zoology In the same year he busied himself with the formation of a menagerie at that institution

In 1794 through the introduction of A H Tessier he entered into correspondence with Georges Cuvier, to whom, after the perusal of some of his manuscripts, he wrote "Venez jouer parmi nous le rôle de Linné, d'un autre législateur de l'histoire naturelle" Shortly after the appointment of Cuvier as assistant at the Muséum d'Histoire Naturelle, Geoffroy received him into his house The two friends wrote together five memoirs on natural history, one of which, on the classification of mammals, puts forward the idea of the subordination of characters upon which Cuvier based his zoological system It was in a paper entitled "Histoire des Makis, ou singes de Madagascar," written in 1795, that Geoffroy first gave expression to his views on "the unity of organic composition," the influence of which is perceptible in all his subsequent writings, nature, he observes, presents us with only one plan of construction, the same in principle, but varied in its accessory parts

In 1798 Geoffroy was chosen a member of the great scientific expedition to Egypt, and on the capitulation of Alexandria in August 1801, he took part in resisting the claim made by the British general to the collections of the expedition, declaring that, were that demand persisted in, history would have to record that he also had burnt a library in Alexandria. Early in January 1802 Geoffroy returned to his accustomed labours in Paris. He was elected a member of the academy of sciences of that city in September 1807 In March of the following year the emperor, who had already recognized his national services by the award of the Cross of the Legion of Honour, selected him to visit the museums of Portugal, for the purpose of procuring collections from them, and in the face of considerable opposition from the British he eventually was successful in retaining them as a permanent possession for his country In 1809, the year after his return to France, he was made professor of zoology at the faculty of sciences at Paris, and from that period he devoted himself more exclusively than before to anatomical study In 1818 he gave to the world the first part of his celebrated *Philosophie anatomique*, the second volume of which, published in 1822, and subsequent memoirs account for the formation of monstrosities on the principle of arrest of development, and of the attraction of similar parts When, in 1830, Geoffroy proceeded to apply to the invertebrata his views as to the unity of animal composition, he found a vigorous opponent in Georges Cuvier, and the discussion between them, continued up to the time of the death of the latter, soon attracted the attention of the scientific throughout Europe. Geoffroy, a synthesist, contended, in accordance with his theory of unity of plan in organic composition, that all animals are formed of the same elements, in the same number, and with the same connections. homologous parts, however they differ in form and size, must remain associated in the same invariable order. With Goethe he held that there is in nature a law of compensation or balancing of growth, so that if one organ take on an excess of development, it is at the expense of some other part, and he maintained that, since nature takes no sudden leaps, even organs which are superfluous in any given species, if they have played an important part in other species of the same family, are retained as rudiments, which testify to the permanence of the general plan of creation It was his conviction that, owing to the conditions of life, the same forms had not been perpetuated since the origin of all things, although it was not his belief that existing species are becoming modified Cuvier, who was an analytical observer of facts, admitted only the prevalence of "laws of co-existence" or "harmony" in animal organs, and maintained the absolute invariability of species, which he declared had been created with a regard to the circumstances in which they were placed, each organ contrived with a view to the function it had to fulfil, thus putting, in Geoffroy's considerations, the effect for the cause

In July 1840 Geoffroy became blind, and some months later he had a paralytic attack From that time his strength gradually failed him He resigned his chair at the museum in 1841, and died at Paris on June 19, 1844

Geoffroy wrote *Catalogue des mammifères du Muséum National d'Histoire Naturelle* (1813), not quite completed, *Philosophie anatomique*—t 1, *Des organes respiratoires* (1818), and t. II, *Des monstruosités humaines* (1822), *Systeme dentaire des mammifères et des oiseaux* (1st pt, 1824), *Sur le principe de l'unité de composition organique* (1828); *Cours de l'histoire naturelle des mammifères* (1829), *Principes de philosophie zoologique* (1830), *Études progressives d'un naturaliste* (1835), *Fragments biographiques* (1832); *Notions synthetiques, historiques et physiologiques de philosophie naturelle* (1838), and other works, also part of the *Description de l'Égypte par la commission des sciences* (1821–1830), and, with Frédéric Cuvier (1773–1838), a younger brother of G Cuvier, *Histoire naturelle des mammifères* (4 vols, 1820–1842); besides numerous papers on such subjects as the anatomy of marsupials, ruminants and electrical fishes, the vertebrate theory of the skull, the opercula of fishes, teratology, palaeontology and the influence of surrounding conditions in modifying animal forms

See *Vie, travaux, et doctrine scientifique d'Étienne Geoffroy Saint-Hilaire, par son fils M Isidore Geoffroy Saint-Hilaire* (Paris and Strasburg, 1847), to which is appended a list of Geoffroy's works, and Joly, in *Biog universelle*, t XVI (1856)

GEOFFROY SAINT-HILAIRE, ISIDORE (1805–1861), French zoologist, son of the preceding, was born in Paris on Dec 16, 1805 He received his M D in 1824, and from 1830–33 taught zoology at the Athénée In 1832 was published his great teratological work, *Histoire générale et particulière des anomalies de l'organisation chez l'homme et les animaux* (3 vols). He was elected a member of the Academy of Sciences in Paris

in 1833, was in 1837 appointed to act as deputy for his father at the Faculty of Sciences in Paris, and in the following year was sent to Bordeaux to organize a similar faculty there He became successively inspector of the Academy of Paris (1840), professor of the museum on the retirement of his father (1841), inspector-general of the university (1844), a member of the royal council for public instruction (1845) and professor of zoology at the Faculty of Sciences (1850) He died in Paris on Nov 10, 1861

Besides the above works, he wrote *Essais de zoologie générale* (1841), *Vie . . d'Étienne Geoffroy Saint-Hilaire* (1847), *Acclimatation et domestication des animaux utiles* (1849), *Lettres sur les substances alimentaires* (1856) and *Histoire naturelle générale des règnes organiques* (3 vols, 1854–62), and various papers on zoology, comparative anatomy and palaeontology

GEOGRAPHICAL ARTICLES. The articles on the various territories in this *Encyclopædia* are prefaced by a geographical sketch giving the chief characteristics of the area in question. This, in the case of the continents, is general, and for particular details the reader is referred to some article of more restricted scope In the case of countries the geography is given first and references made to later sections where *Geology* and *Archaeology* and *Antiquities* may add something of importance to the understanding of the territory In the British Isles each county has its own heading and the important cities and towns have likewise separate entries In the United States the main article is concerned with the general geography, etc , and each State is treated separately. The chief towns also have entries as in the case of other countries.

Where divisions or special districts of continents had, before the World War, a well-established name which has since been officially changed, the old name is given a place with a cross-reference to the new designation Changes of government and administration, mandates and changes of territorial allocation have been dealt with in the same way

In addition to the articles to be found under well-known geographical names attention may be drawn to such comprehensive articles as ARCTIC REGIONS, METEOROLOGY, STEREOGRAPHY, and TIDES. Articles on natural phenomena such as MONSOON, EARTHQUAKE, HURRICANE, etc , carry cross-references to articles on the territories and waters where they are commonly found Mountain ranges have, in some instances, their own articles (ALPS, HIMALAYA, etc), as is also the case with the world's chief rivers.

Every subdivision of geographical study has been treated, either under its own head or that of a related subject In every case where confusion might possibly arise cross-references have been inserted The many archipelagos of the Pacific, have, for example, been treated comprehensively in the article PACIFIC ISLANDS but each group (and the main islands separately) has its own heading where the geography and physical features are given, with a cross-reference to the regional article

GEOGRAPHICAL SOCIETIES. The *Congrès International pour les Progrès des Sciences Géographiques* first met in 1871 The *Royal Geographical Society of London*, founded in 1830, had joined to it in the following year the *African Association* (1788), the successor of the *Saturday Club;* the *Palestine Association* (1805) became merged with it in 1834 It publishes *Journal* (1832–80), *Proceedings* (1857–92) and *Geogr Journal* (1893 *seq*). The *Hakluyt Society* (1846) has printed more than 136 volumes of rare voyages and travels *The Alpine Club* (1858), whose publications are *Peaks, Passes and Glaciers* (1859–62) and *Journal* (1863 *seq*), meets in London The *Royal Scottish Geographical Society* (1884) has its centre at Edinburgh and issues the *Scottish Geographical Magazine* Newcastle has the *Tyneside Geographical Society* and Manchester also has a *Geographical Society* (1884) Aberystwyth, Wales, has a Geographical Society (1900), and publishes *Geography* AUSTRALIA Adelaide, *Roy Geogr Soc of Australasia, S Austral Br* (1885), *Proc* Brisbane, *Roy Geogr Soc of Australasia*, Queensland (1885), *Queensland Geogr Journal* Melbourne, *Roy Geogr Soc of Australasia, Victoria Br* (1883), incorporated with *The Hist Soc of Victoria* (1921), *Victorian Geogr Journ* Sydney, *Geogr Soc of New S Wales, Austral Geographer* (1928) SOUTH AFRICA: Johannesburg, *Geogr Soc of S Africa* (1917), *S Afr Geogr. Journ.* CANADA Quebec, *Soc de Géogr de Quebec* (1877), *Bull.* INDIA Bombay, *Roy Asiatic Soc , Bombay Br.* (1871). EGYPT: Cairo, *Soc. Khédiviale de Géogr.* (1875), *Bull.* (1876 *seq*), changed to *Soc. Roy de Géogr. de'Égypte* (1917), *Bull , Mem.* UNITED STATES: Chicago, *Geogr Soc.* (1898), *Bull.* (1898 *seq*), *Assoc. of Amer. Geographers* (1904), *Annals* New York, *Amer Geogr. Soc. of New York* (1851), *Bull.* (1852–57), *Journ.* (1859 *seq*), later *Bull* (1901–15), continued as *The Geogr. Rev* (1916–20); *Proc* (1862–65) and 137 separate publications. Philadelphia, *Geogr Soc* (1893), *Bull* Washington, *Nat. Geogr. Soc* (1888), *Nat Geogr Magazine* (1888 *seq*), *Soc of Women Geographers* (1925), *Bull* AUSTRIA Vienna, *Geogr. Ges.* (1856), *Mitteil* (1857 *seq*), *Abhandl Verein der Geographen a der Univ* (1874), *Jahresber ; D u Österreich Alpen Ver.* (1869), *Ztschr. u Jahrb* (1869 *seq*), *Ver f Landeskunde,* etc (1864), *Jahrb , Monatsblatt* BELGIUM. Antwerp, *Soc Roy de Géogr.* (1876), *Bull* Brussels, *Soc Roy belge de Géogr.* (1876), *Bull.* BULGARIA *Sofia, Bargarsko Geografsko Družestvo* (1918), *Geografska Bibliotcka* CZECHOSLOVAKIA Prague, *Ceskoslov společnost zeměpisná* (1894), *Sbornik* DENMARK Copenhagen, *Kng. Danske Geogr Selskab* (1876), *Geogr Tidsskrift* (1876 *seq*). FINLAND Helsinki, *Suomen Maantieteellinen Seura-Geogr Sallskapet i Finland* (1888), *Jahrbuch,* now *Terra* (1922 *seq*), *Fennia* (1889 *seq*), *Acta Geogr* (1927) FRANCE Bordeaux, *Soc. de Géogr Commerciale* (1874), *Bull , Revue* (1911 *seq*) Lyons, *Soc de Géogr* (1873), *Bull.* (1875 *seq*). Marseilles, *Soc de Géogr* (1876), *Bull* (1877 *seq*) Montpellier, *Soc languedocienne de Géogr* (1875), *Bull* (1878 *seq*) Nancy, *Soc de Géogr. de l'Est* (1878), *Bull* (1878 *seq*) Paris, *Soc. de Géogr* (1821; 1827), *Bull* (1900 *seq*), *La Géographie; Soc de Géogr. Commerciale* (1873), *Bull , Revue Econ française; Assoc de Géogr. français* (1920), *Bull , Bibl géogr ann ; Assoc des Amis,* etc , *de Géogr. Physique* (1922), *Cahiers.* Toulouse, *Soc de Géogr.* (1882), *Bull* Branches of the *Soc de Géogr* are also at Bar-le-Duc, Béthune, Douai, Lille and Tours Algiers, *Soc de Géogr ,* etc. (1896), *Bull* (1896 *seq*) GERMANY Berlin, *Ges fur Erdkunde* (1828), *Monatsber* (1839–53), *Ztschr* (1853 *seq*), *Verhandl* (1873–1901), *Ztschr* (1866 *seq*), *Bibl Geogr* (1891–1912), *D. Geographentag* (1881), *Verhandl , Central Ver f. Handelsgeogr ,* etc (1878) Bremen, *Geogr Ges* (1876), *D. Geogr Blatter* Dresden, *Ver f Erdkunde* (1863), *Jahresber.* (1865–1901), *Mitteil* (1905 *seq*) Frankfort, *Ver f Geogr ,* etc. (1835), *Jahresber* Freiburg i B , *Geogr Ges* (1925) Giessen, *Ges f Erd u Volkerkunde* (1896), *Geogr Mitteil* Gotha, *Verband D Schulgeographen* (1912), *Geogr Anzeiger* Greifswald, *Pommersche Geogr Ges* (1882), *Jahresber , Jahrbuch* (1924 *seq*) Halle, *Ver. f Erdkunde* (1873), *Mitteil* Hamburg, *Geogr. Ges* (1873), *Mitteil , Jahresber* Hanover, *Geogr Ges* (1878), *Jahresber* Jena, *Geogr Ges* (1882), *Mitteil* Karlsruhe, *Badische Geogr Ges* (1880–96, 1925), *Verhandl.* (1880–86) Kiel, *Ver. zur Pflege der Landeskunde* (1890), *Heimat* (1890 *seq*) Leipzig, *Ges f Erdk* (1861), *Jahresber ,* continued as *Mitteil* (1861 *seq* –1911 *seq*), *Veroffentlichungen, Ver Geographen der Univ* Lubeck, *Geogr Ges* (1882), *Mitteil.* (1882 *seq*) Magdeburg, *Geogr. Ges* (1927), *Mitteil* Munich, *Geogr. Ges* (1869), *Jahresber , Mitteil* (1904 *seq*), *Landeskundl Forschungen, Ges. f bayerische Landeskunde* (1920), *Veroff , Deutsch u Osterreichischer Alpenverein* (1901) Nuremberg, *Geogr Ges* (1920), *Mitteil , Jahresber.* Rostock, *Geogr Ges.* (1909), *Mitteil* (1910 *seq*), with branches at Wismar (1921), Schwerin (1922), Gustrow (1923) Stuttgart, *Wurtt, Ver. f Handelsgeogr* (1882), *Jahresber , Wurtt Schwarzwald Ver* (1884), *Aus dem Schwarzwald* Wurzburg, *Geogr Ges* (1925), *Mitteil* GREECE Athens, *Greek Geogr Soc* (1919) HUNGARY Budapest, *Magyar Földrajzi Társaság* (1872), *Földrajzi Közlemények* ITALY. Florence, *Soc di Studi geogr e colon* (1884), *Rivista Geogr Italiana.* Milan, *Soc Ital di Geogr Commerciale* (1879), *L'Esplorazione Commerciale* (1879 *seq*) Rome, *Soc Geogr Ital* (1867), *Bol.* (1868 *seq*), *Memorie* LATVIA: Riga, *Latvijas Geogr Biedriba* (1923) NETHERLANDS: Amsterdam, *Kng. Nederl Aardrijkskundig Genoot* (1873), *Tijdschrift* (1874 *seq*) The Hague, *Nederl. Ver vor Econ Geogr* (1909), *Tijdschrift* NORWAY Oslo, *Det*

norske geogr. Selskab (1889), *Norsk Geogr. Tidsskrift* POLAND Warsaw, *Polskie Towarzystwo Geograficzne* (1918), *Przeglad Geogr* PORTUGAL: Lisbon, *Soc de Geogr* (1875), *Bol.* (1876 *seq*) RUMANIA. Bucharest, *Soc Regală Română de Geogr.* (1875), *Bul., Dic. geogr, Marele Dict geogr al Rom* (1898–1902 *seq*). SPAIN. Madrid, *R Soc Geogr.* (1876), *Bol* (1876 *seq*), *Revista, Colección Geogr* SWEDEN Stockholm, *Svenska Sallskapet f Antrop och Geogr* (1873), *Tidskrift* (1873–77), *Geogr Sekt tidskrift* (1878–80), *Ymer* (1881 *seq*), *Annaler,* (1919 *seq*); *Geografiska forbundet.* Goteborg, *Geogr Forenningen* (1908), *Meddelanden* SWITZERLAND Basel, *Geogr-ethnol. Ges* (1923) *Berne, Geogr Ges* (1873), *Jahresber* (1879 *seq*) Geneva, *Soc de Géogr* (1858), *Le Globe, Bull. et Mém*, etc Neuchâtel, *Soc de Géogr* (1885), *Bull* St Gall, *Ostschweiz Geogr-Kom Ges* (1879), *Mitteil, Verband Schweiz Geogr Ges* TURKEY: Constantinople, *Geog. Soc* U S S R: Leningrad, *Russk geografič obšč* (1845), *Izvestija* R G O, etc, *Bull* (1865 *seq*). Branches of R G O are at Irkutsk (East Siberian Br), Yakutsk, Omsk, Orenburg, Tiflis, *Geogr Soc of Georgia, Geogr Review,* and Vladivostok Moscow, *Obščestvo Ljubiteleĭ Estestvoznanija* (1863), Division for Geogr (1892 *seq*), *Zemlevedenie,* discontinued temporarily YUGOSLAVIA Belgrade, *Geografsko Društvo* (1916), *Glasnik* ALGERIA *Algiers, Soc de Géogr. d'Alger et de l'Afrique du Nord* (1896), *Bull.* (1896 *seq*) MOROCCO Casablanca, *Soc de Géogr de Maroc* (1915), *Bull* JAPAN Tokyo, *Geogr Soc* (1879), *Journ of Geogr* MEXICO *Soc de Geogr y Estad, Bol* (1839 *seq*) CUBA Havana, *Soc Geogr de Cuba* (1928), *Revista* COSTA RICA San José, *Soc de Geogr e Hist* (1925) ARGENTINA Buenos Aires, *Soc Argentina de Estudios Geogr Gaea* (1921), *Gaea* BOLIVIA La Paz, *Soc Geogr* (1889), *Bol* Santa Cruz de la Sierra, *Soc de Estudios Geogr e Hist* (1903), *Bol* Sucre, *Soc Geogr* BRAZIL Rio de Janeiro, *Soc de Geogr, Revista* (1883) COLOMBIA Bogotá, *Soc Geogr* (1903), *Bol* ECUADOR Quito, *Soc Geogr* (1922) PERU Lima, *Soc Geogr* (1888), *Bol*

GEOGRAPHY, the exact and organised knowledge of the distribution of phenomena on the surface of the Earth (γῆ, the Earth, and γράφειν, to write) It deals with the form and motion of the planet so far as a knowledge of these is necessary for fixing positions on the surface and explaining the incidence of solar radiation, more fully with the forms of the lithosphere or stony crust of the Earth, the extent of the water envelope or hydrosphere, the movements of the water and of the all-surrounding atmosphere, the distribution of plants and animals and very fully with that of the human race, and with all the interactions and relationships between these distributions

Geography is a synthetic science, largely dependent for its data on the results of specialized sciences such as astronomy, physics, geology, oceanography, meteorology, biology and anthropology and always having respect to the natural regions of the world The characteristic task of geography is to investigate the control exercised by the forms and vertical relief of the surface of the lithosphere directly or indirectly on the various mobile distributions Viewed in this light geography is a unified and definite science of wide outlook and comprehensive grasp It is essential to classify its subject matter so as to give prominence to facts in their relationships and to the natural order in which they occur

This article first sketches the progress of geographical discovery, then deals with the growth of geographical theory and finally indicates the general principles of geography as they are understood at the present time

I. PROGRESS OF GEOGRAPHICAL DISCOVERY

Although geographical discovery must have started from every isolated centre of ancient civilization it is only possible to deal here with the stream of exploration which, starting 3 900 years ago in the eastern Mediterranean where a wedge of Asia unites Africa with Europe, has spread down the ages until to-day it has reached almost to every part of the Earth's surface on land and sea This sketch touches only the main outlines of the progress of discovery, its object being to indicate the changes which have occurred through the centuries in the motives and the methods as well as in the objectives of exploration

Widening the Mediterranean Horizon.—The Egyptians had explored and conquered large tracts of land before the 14th century B C, both southward up the Nile and northeastward to the borders of Assyria, but the first sea-going explorers seem to have been the Phoenicians who made Sidon a commercial port as early as 1400 B C and later raised Tyre to equal fame The merchant adventurers of Tyre and Sidon explored the whole coast of the Mediterranean, founding the colony of Carthage before 800 B C They and other colonizers on the shores of the Iberian peninsula sailed northward along the Atlantic coast, probably trading direct with Cornwall for tin, and to the south going far along the west coast of Africa They certainly reached the Azores as Carthaginian coins of the 4th century B C have been found on the island of Corvo. With the support of Egypt they traded also on the Red Sea reaching lands yielding gold and ivory probably on the coast of Africa or Arabia It is probable that they also reached India from the Red Sea Herodotus heard in Egypt that in the days of King Nicho (600 B C) a Phoenician fleet sent from the Red Sea southward along the African coast had returned to Egypt by the Pillars of Hercules Herodotus was the earliest of the Greek travellers to give a full and trustworthy narrative of his peregrinations in Asia as far as Persia, in Egypt and north Africa, on the Black Sea coasts as far as the Caucasus and in Italy (480–440 B C)

The maritime trade of the Greek City States and their colonies became more important than that of the Phoenicians soon after the fifth century B C Greek ships sailed beyond the Mediterranean, opening up the Black Sea on the east and the borders of the Atlantic on the west Massilia (on the site of the modern Marseille) was a colony of Greeks from Phocaea and thence a voyage of great importance was made by Pytheas about 330 B C His own narrative is lost and the facts have to be gathered from references by Strabo 300 years later to criticisms of the voyage in lost books of the Greek geographers Pytheas was probably the first navigator to fix the position of the lands he reached by crude astronomical observations and he seems to have been a keen observer of places and people He coasted the Bay of Biscay, and the east of Britain as far as Orkney where he heard a report of Thule, a more northern land, and a confused hint of the Arctic regions On a later voyage he coasted the east side of the North Sea and probably entered the Baltic During the same years the conquests of Alexander the Great opened to the Greek world a knowledge of the continent of Asia as far as the northern plain of India, and his general Nearchus conducted a fleet from the mouth of the Indus to the Persian Gulf, the first voyage in the Indian Ocean to be described in a manner comparable with the record of the land journey of Xenophon a century earlier when after the death of Cyrus he led the 10,000 from Mesopotamia across the plateau of Armenia to the Black sea In the following centuries the Ptolemies, Greek kings of Egypt, encouraged exploration and about 115 B C Eudoxus under their auspices explored the Arabian sea, and planned to circumnavigate Africa, but could not get support for so daring a project

The rise and extension of the Roman Empire involved scouting expeditions before and surveys after the conquest of each province of the lands bordering on the Mediterranean in Europe, Asia and Africa Conquering generals described the tribes they subdued and the regions they occupied and Julius Caesar won renown as a writer no less than as a fighter Each province of the empire was bound to Rome by the imperishable causeways which still form the skeleton of the road map of Europe Pliny and Seneca say that Nero (about A D 60) sent two centurions to follow up the Nile from Egypt, and they were stopped by great marshes, probably those of the Sudan about 19° N The practical advantages of discovery appealed to the Roman mentality more powerfully than the abstract theories which fascinated the Greeks and Hippalus who about A D 79, learning from the Arabs of the regular seasonal changes of the monsoons, made these winds serve him as the means of establishing a trade route between the Red Sea and India across the open ocean instead of hugging the coast as of yore This trade continued to develop and a century

later Pausanias makes it appear that direct communication had even been opened up with China. In the time of Justinian (483–565) two Nestorian monks made the journey from Constantinople overland to China and succeeded in introducing the first silkworms into the Mediterranean lands.

After the fall of the Roman Empire and the incursion of barbarians from the north a wave of Arab domination surged over the Asiatic and African provinces and swept far into the southern peninsulas of Europe. The geographical learning of the Greeks and Romans enshrined in the writings of Ptolemy of Alexandria (A.D. 150) passed to the Arabs and was forgotten in Christian Europe where the conception of the globe degenerated to that of a flat disc with Jerusalem at the centre The Arabs trading with India, China and the east coast of Africa acquired a sound knowledge of the Indian Ocean and a fair idea of the interior of Africa before the year 1000 Among the well-known geographical writers of this period were Abu Zaid, Masudi, Istakhri and Idrisi.

Meanwhile the Northmen from the fjords of Scandinavia were harrying the coasts of northern Europe and even making their way into the Mediterranean Most of the vikings pushed southwards for plunder and conquest, but some turned northward to hunt the fur and ivory yielding animals of the northern seas Othar of Helgeland discovered the North Cape and rounding it proceeded as far as the White Sea in the middle of the 9th century Later he visited the court of Alfred the Great and it was the English king who first reduced to writing the discoveries of the earliest Polar explorer and introduced to literature the midnight sun of the Arctic summer The commerce of the Arabs and of the less warlike of the Northmen interlaced at several points and their trade routes ran overland between the Black Sea and the Baltic. Late in the 9th century Iceland was colonized from Norway and in 985 Eric the Red, sailing westward, discovered Greenland and soon afterwards his son Leif Ericsson sailing thence to the southwest came on a new land which he named Vinland, and was thus the first European to reach America If news of this event percolated southwards the distracted Europe of the Middle Ages had other things to think of and only vague legends or the scribbling of fanciful islands on the vacant Atlantic margins of the mediaeval maps justify the suggestion that it did A horror of the unknown territories, still more of unknown oceans, settled on the mind of mediaeval Europe. The church, not yet roused to missionary effort, was keen in the encouragement of the Crusaders who were recruited from every country of Europe to drive the Infidels from the Holy City. In this way the culture and graceful luxury of the caliphs became known to the rough courts of the western kings, and the attention of the merchants of the growing Italian city-states, Genoa and Venice in particular, was concentrated on the Far East as the source of all wealth.

The domination of Central Asia from the Caspian to the Pacific by the Mongol emperors made very long overland journeys practicable at the close of the middle ages and Venetian merchants had thus established contact with China before Marco Polo set out in 1265 for Peking, the capital of Kubla Khan The story of his seventeen years' sojourn in the Far East and of his journeyings by land and sea in central Asia, China, the Malay Archipelago, and India was the greatest work of travel of the middle ages and for the first time it made the venerable civilization and the rich products of the Orient familiar to the people of Europe. Many of his statements were derided by contemporaries but his substantial veracity and remarkable powers of observation have been vindicated by modern travellers and students Missionaries, whose activity increased as that of the crusaders diminished, pushed far afield in Asia and their records contain some grains of geographical value amongst a vast quantity of superstitious and ignorant chaff One only need be mentioned here; Friar Oderic of Pordonone who, early in the 14th century, visited India, the Malay Archipelago, China and Tibet where he was the first European to enter Lhasa, not yet a forbidden city A Moslem contemporary Ibn Batuta was the greatest of the Arabian travellers who left accounts of their journeys. Between 1325 and 1353 he explored Arabia and Persia and spent eight years in the service of the Mogul ruler of Delhi, going on to China and the Malay Archipelago. He also visited the east African coast as far south as Mombasa and Kilwa and crossed the desert from the Red sea to Syene on the Nile; finally he explored west Africa by land reaching Timbuktu and the Niger.

COMMERCE AND EXPLORATION

Many travellers in the early part of the 15th century made notable journeys throughout the mainland of Asia and the Eastern archipelago impelled by the growing demand for the silks, spices and other valuable products of the tropics From Spain Ruy Gonzalez de Clavijo journeyed to the court of Timur at Samarkand; from Italy Nicolo Conti later in the century spent 25 years in the Far East reaching China, Java and Sumatra.

The Opening of the Oceans.—In the 15th century the use of the magnetic compass became general amongst the Mediterranean mariners giving them for the first time confidence in navigation out of sight of land or when the stars were hidden, and leading to the introduction of the *portulani* or compass charts of the coasts Latitude at sea began to be measured by the astrolabe or other cumbrous instrument for observing the altitude of the sun, but longitude was long destined to remain a matter of guesswork. The Italian merchants continued to foster trade with the east through the land routes controlled by the Muslim nations though the rise of the Turks made this increasingly difficult In the west the Portuguese took the lead in developing maritime enterprise in the hope of perhaps finding a route to the Indies by the south of Africa and with the more immediate object of founding a great Portuguese overseas empire Prince Henry of Portugal with the spirit of a crusader determined to overcome the Muslim power in North Africa and explore the coast southward in order to find a way by which to get in touch with Abyssinia the half mythical Christian kingdom of Prester John, behind the country of the Moors. The Portuguese missionary Covilham (*q v*) succeeded in reaching Abyssinia in 1487 from Egypt but was not allowed to return Effective contact with that country had to wait for some years Meanwhile the Order of Christ, of which Prince Henry was the head, received a papal grant of lands to be discovered, and funds were raised for the good work by trading in slaves captured on the coast.

The Azores, 800 miles out in the open Atlantic, had been vaguely known before, but were rediscovered and settled in 1432, while successive expeditions stimulated by the Prince crept by degrees along the Sahara coast to the fertile lands beyond, in 1462, after his death, they reached Sierra Leone and a few years later explored the whole Guinea coast Then discovery became rapid In 1481 the equator was crossed, in 1484 Diago Cam passed the mouth of the Congo and in 1486 Bartholomew Diaz (*q v*) by a splendid effort fetched a wide sweep far out of sight of land and reached Mossel Bay In returning he saw the southern point of Africa and named the Cape of Storms This was the greatest landmark in the history of exploration The King of Portugal seeing the wealth of the Indies within his grasp changed the name to Cape of Good Hope and Vasco da Gama (*q v*) realized the hope in 1498 by sailing round the Cape to the Arab port of Mombasa whence with the aid of local pilots he reached India and fulfilled the dream of ages. Camoens, who himself made the voyage 70 years later, celebrated the achievement in his great poem the Lusiad

Toscanelli as early as 1474 had pointed out from Ptolemy's maps that the east coast of Asia might be reached more easily by sailing due west than by going south and then east and north. Christopher Columbus (*q v*), a native of Genoa who had much experience of navigating the Atlantic and had sailed to Iceland, became possessed with the idea of making this voyage. He spent many years in the endeavour to find a patron, and in 1492 had almost persuaded the King of England and the King of Spain to embark on the enterprise, the King of England hesitated the longer and Columbus with Spanish ships made an easy passage from the Azores to the islands which he named the West Indies Following a suggestion of the Pope a meridian line running down the middle of the Atlantic was fixed by treaty between Spain and Portugal, the former country agreeing to restrict exploration to

the western hemisphere so marked out and the latter country to the eastern hemisphere. Columbus after other voyages to the West Indies died in 1506 in the belief that he had reached the islands off the coast of Asia. The merchants of Bristol had often sent out their ships some week's sail to the westward into the Atlantic in search of legendary islands and in 1497 John Cabot, no doubt inspired by the success of Columbus, persevered until he found the coast of Labrador and Newfoundland, thus repeating the old Norse discovery of North America and, though the quest was not then pursued, pegging out a claim to England's oldest colony. The companions of Columbus continued to cruise among the West Indies and quickly traced out the shores of the Spanish Main to the south, and the limits of the Caribbean Sea to west and north. In 1513 Balboa caught the first glimpse of an inaccessible ocean to the west from "a peak in Darien" and recognized that Asia was still far off In 1500 Vicente Pinzon (*q v*) sent from Spain to explore the coast southward from the Orinoco, first sighted land near Pernambuco and following it northward round Cape San Roque discovered the mouth of the Amazon His shipmate, Amerigo Vespucci (*q v*), a clever man who took part in several voyages of discovery, described this voyage and by a curious chance his Christian name in its latinized form was attached for ever to the continents of America By making a westward sweep in a voyage to the Cape of Good Hope, Cabral hit on the coast of Brazil in the same year and this accounts for the presence of the Portuguese-speaking Brazilians in the midst of the Spanish-speaking republics of South America The Spaniards realizing that America was a solid obstacle between Europe and Asia pushed forward to discover a passage by the south. In 1515 de Solis reached the River Plate which seemed to offer a way through Ferdinand Magellan (*q v*) five years later showed that it was only an estuary and, proceeding southward he found and passed through the tortuous strait which bears his name, so piercing the barrier of America Persevering in face of every difficulty which could befall an explorer he pushed on across the awful and incredible breadth of the Pacific Although he met his death in the Philippine Islands in 1521, his ship the "Victoria" under Sebastian del Cano with a handful of survivors returned to Spain in 1522 by the Cape of Good Hope after the greatest voyage that ever was, for it accomplished the first circumnavigation Amongst his rewards Del Cano received the world as his crest with the proud motto *Primus circumdedisti me* The Spanish and Portuguese between them soon completed the rough outlines of Africa and the two Americas; but the sixteenth century saw their maritime power challenged by the enterprise of France and the Protestant Powers of England and Holland whose sailors disregarded alike Papal Bulls and the private agreements between Spain and Portugal

The northern peoples claimed their share in the new world and in the sea routes to the east. French fishermen following in the track of Cabot early began to frequent the Grand Banks of Newfoundland and the king of France in 1524 sent out Verazzano, a Florentine, who explored the coast of North America between the lands discovered by Cabot in the north and by the Spaniards in the South He found no way through, and ten years later a French expedition under Jacques Cartier set out to search the Gulf of St Lawrence for a way to the Far East In a second voyage in 1535 he ascended the St Lawrence to the present site of Montreal and, although only the name of Lachine Rapids remains of this attempt to reach China that way, he spent two years in the effort to start the French colony of Canada

Queen Elizabeth saw a wave of enthusiasm for discovery sweep over England, rousing sailors, soldiers, merchants, parsons, philosophers, poets and politicians to vie with each other in promoting expeditions overseas for the glory of their country and their own fame and profit The gallants of the court were ever ready to command the expeditions for which the shrewd city merchants found the means, while quiet scholars like Richard Hakluyt promoted the work by recording the great deeds of earlier as well as contemporary adventurers His *Principall Navigations* first published in 1589 are to this day delightful reading and, supplemented by *Hakluytus Posthumus or Purchase his Pilgrimes* published in 1625, form the only record of many great expeditions On the continent similar compilations such as those of the Italian Ramusio (1583–1613) and the splendidly illustrated Dutch volumes of De Bry (1590–1634) played a similar stimulating part In England as elsewhere at first the object was to find a westward route to the Far East. Richard Chancellor tried for a North East Passage and though he got no farther than the White Sea he went on by land to Moscow and opened up direct trade with Russia, leading to the formation of the Muscovy Company, the first of many chartered companies for exploration and trade In 1576 Martin Frobisher (*q v*) made a spirited attempt to find a North West Passage to China and reached the coast of Labrador at its northern extremity John Davis (*q v*) one of the greatest Arctic explorers who ever lived, took up the quest in 1585, and in successive years he navigated the broad strait which bears his name to 72° N finding open sea to the northward and hope of an ultimate passage westward Francis Drake, setting out to trace a route from the other side, made the second circumnavigation of the world in 1577–80 He went by Magellan's Strait, after passing which he was blown southward to 56° S, and satisfied himself that the Atlantic and Pacific Oceans met south of Tierra del Fuego Drake proceeded northward and explored the Pacific coast of North America to 48° in vain search of a passage to the east. Eventually he returned by the Philippines and the Cape of Good Hope Cavendish repeated this voyage in 1586–88, adding to the confidence with which long voyages were undertaken and John Hawkins, though less fortunate, again showed the flag in the Pacific before the end of the century

Walter Raleigh, Humphrey Gilbert and many more took part in exploring the North American Atlantic coast and in 1599 Queen Elizabeth granted a charter to the East India Company which initiated direct trade with India and prepared the way for the British Empire in the east Spanish exploration from the Pacific ports of their American possessions was renewed, partly no doubt in order to anticipate English discoveries In 1577 Alvarez de Mendana sailing from Callao crossed the Pacific and discovered the Solomon islands Pedro Sarmiento in 1579 went south from Callao and surveyed the Strait of Magellan with a view to fortifying it and so holding for the Spaniards what they then supposed to be the only entry to the Pacific The Dutch made many attempts to find a northern passage to China in the last decade of the sixteenth century Willem Barents, after discovering Spitsbergen, was wrecked on the north coast of Novaya Zemlya and after wintering there made a heroic journey by boat along the coast, on which he died, but his crew returned safely in 1596

In the 17th century the search for a northern passage to the Far East still went on The work of Davis was followed by that of Henry Hudson who in 1607 reached a latitude of 81° N in the Spitzbergen region and in 1610 he discovered the inland sea now known as Hudson Bay Baffin came later reaching 78° N in 1616, and naming Smith Sound to the north of the great bay called after him at the end of Davis Strait. A charter for the Hudson's Bay company was granted in 1670

THE SEARCH FOR THE SOUTH LAND

A belief in a southern continent surrounding the pole and extending into temperate and tropical latitudes had found expression in the maps of European cartographers since the time of Magellan whose Tierra del Fuego was held to be part of it Many explorers were drawn by the magnet of this illusion into the unknown parts of the great oceans Pedro Fernandez de Quiños and Luiz Vares de Torres were sent out in 1605 by the Viceroy of Peru to take possession of the supposed Southern continent and on reaching the New Hebrides Quiños believed he had gained his goal and took possession with great ceremony of "Australia del Espiritu Santo," the first appearance of the name Australia on the map In returning Torres passed through the Strait which bears his name discovering the northern end of Australia and exploring part of the coast of New Guinea The great period of Dutch voyages began with the formation of the Dutch East India Company in 1602 though Dutch merchant adventurers, sailing by the Cape of Good Hope, were active on the coast of Japan by 1600 and soon after were successful rivals to the Portuguese already established in India and the Malay Archi-

pelago. The Company in 1614 determined to find a way into the Pacific south of Magellan Strait and sent out Jacob Lemaire in the "Eendracht" and Willem Schouten in the "Hoorn" These ships passed south of Tierra del Fuego proving that it was no part of a southern continent, named Staten Land (not recognising it as an island), and navigating Strait Lemaire saw and named Cape Horn on January 31, 1615 Lemaire and Schouten crossed the Pacific, sailed along the north coast of New Guinea and reached the Moluccas Other Dutch mariners working from the north discovered the west coast of Australia, still supposed to be a projection of a vast southern continent, Dirk Hartog reaching 26° S on that coast in 1616 Anthony Van Diemen, governor of the Dutch East Indies, resolved in 1642 to explore the coast of the Southern Continent and sent out Abel Janszoon Tasman to carry out the task The voyage was the greatest contribution to maritime exploration since Magellan He sailed westward across the Indian Ocean to Mauritius, then in a great sweep southward and eastward he came on high land which he named after Van Diemen though it is now known as Tasmania Sailing farther east he came on the west coast of another lofty land which he named Staten Land, believing it to be part of the Southern Continent continuous with Schouten's Staten Land off South America It was really New Zealand He sailed on to the Fiji Islands and returned along the north coast of New Britain and New Guinea to Batavia In 1643 he went out again with three ships when he explored in some detail the south coast of New Guinea and the north and west coasts of Australia which he called New Holland In 1699 William Dampier, a noted buccaneer in his early days, made an important voyage on H M S "Roebuck" along the west and north of Australia and the north of New Guinea, rediscovering and naming New Britain His voyages were remarkable for his extraordinarily keen observations of natural phenomena in some respects he was the pioneer of scientific exploration The Dutchman Roggeveen in 1721 and the Frenchman Bouvet in 1738 set out expressly to discover and annex the South Land and the latter took an ice-clad islet of the South Atlantic to be part of it

By the middle of the eighteenth century the methods of navigation had greatly improved and the introduction of the quadrant gave new precision to determinations of latitude The great bugbear of long voyages was scurvy, supposed to be an inevitable result of life on board the small craft of those days and often fatal to the larger part of the crew In the second half of the eighteenth century scientific geographers in Europe secured a more systematic system of exploration in which adventure, though still encountered, was subordinated to research Already in the first year of the century the astronomer Halley had been sent in command of a British war-ship to the South Atlantic in order to study the variation of the compass In 1764 John Byron was sent on a circumnavigation for discovery and on his return a larger expedition was despatched under Samuel Wallis and Philip Carteret and was absent from 1766 to 1769 discovering Tahiti and many other islands in the Pacific A French expedition under Bougainville followed and for half a century there was keen rivalry between France and Great Britain in the Pacific Meanwhile the Royal Society had planned an expedition to observe the transit of Venus of 1769 from some point in the Pacific and approached the Admiralty to obtain a ship to be placed under the command of Alexander Dalrymple a civilian and a fervent believer in the existence of a vast temperate southern continent The expedition was sanctioned in time to instruct Wallis to look out for a suitable position in the Pacific, but the Admiralty by a stroke of unconscious genius gave the command to James Cook and thereby created a new era in exploration and raised the fame of British maritime enterprise to a unique place in the esteem of the world Cook was accompanied by the great naturalist Joseph Banks, D C Solander (a student of Linnaeus) and two astronomers The expedition, which was absent from 1767 to 1770, did all that was required of it and much more It discovered many island groups in the Pacific, sailed round New Zealand proving it to be no part of the Southern Continent and surveyed much of the east coast of Australia so accurately that the charts are still serviceable A second voyage was determined on, to settle the question of the Southern Continent and Cook set out again in the "Resolution" and "Adventure" in 1772 The voyage lasted until 1775, Cook penetrated far to the south of the Antarctic Circle at several points proving beyond question that there was no habitable land, save a few sterile islands south of the known continents, but his most important discovery was that scurvy was preventible by proper diet and care Immediately on his return a third great voyage was planned to endeavour to find a passage by sea from the North Pacific to the Atlantic, the old ghost of a North West Passage still walked Cook sailed in 1776, visited Kerguelen Island in the South Indian Ocean which had been discovered three years before and proceeded to survey the northern extremity of the west coast of North America passing through Bering Strait until stopped by the ice in 70° N Thus Cook had spanned the earth through more than 140 degrees of latitude as well as through all longitudes On retiring to Hawaii for the winter Cook was killed by the natives in 1779, but Edward Clarke his second in command spent another season in the effort to penetrate the Arctic Sea from Bering Strait and returned to England in 1780 Cook's voyage round the Antarctic continent was supplemented by a great Russian expedition under Bellingshausen in 1819–1821, and by a group of hardy American and British sealers in the first third of the nineteenth century, chief among them Weddell who in 1823 reached 73° S in the sea named after him, and Biscoe in 1831–32 who made a complete circumnavigation discovering the most southerly land so far known

Port Jackson, the present Sydney, was founded as the first settlement in Australia in 1788 and the coasts were explored by such daring boat-travellers as Flinders and Bass, the latter proving that Tasmania was an island in 1795 Cook was followed on the west coast of North America in 1792–1794 by Vancouver who extended northward from Cape Mendocino the work of Spanish explorers and made exact surveys along the coast The French expedition of La Pérouse in two ships spent the years 1785 to 1788 in crossing and recrossing the widest part of the Pacific but never returned and many efforts were made to discover its fate, the most extensive being that made by Entrecasteaux in 1791–1793

The 18th century saw the completion of the great task of outlining the continental shores, even those of the Arctic Sea had been traced out by Russian travellers like Bering (by birth a Dane), Dezhneff and Chelyuskin, whose name remains on the most northerly cape of the old world The Spaniards had made known the broad lines of the geography of South America, Central America and the southern part of North America, the central and northern portions of which had been penetrated in all directions by French and British pioneers The interior of Australia remained totally unknown as were the Arctic regions north of 80° N and the Antarctic south of the Polar Circle In the Old World Asia had been traversed in all directions although large areas remained unvisited between the trade routes and the tracks of explorers. China was mapped by Jesuit missionaries in the early years of the century, and the accurate mapping of India was in full swing before its close Africa was the least known of the continents and the French geographer D'Anville despairing of reconciling the conflicting accounts of the interior drawn from tradition and the stories of Arab traders, who had undoubtedly penetrated far into the interior, swept the map clear of all features which had not been seen by European travellers and left a blank of 'Unexplored Territory" within the coast line from Morocco and Abyssinia on the north to Cape Colony and Natal on the south James Bruce explored the Blue Nile from its source in Abyssinia to its junction with the White Nile and before his death a strong effort was made in England by the founding of the African Association which enabled John Ledyard to make a great journey across the Sudan from east to west and Mungo Park to trace much of the course of the Niger Scientific geography was powerfully advanced by the determination of the size and figure of the earth by the measurement of arcs of the meridian near Quito on the equator by a French commission under C M de la Condamine in 1735–43 and another in the far north under P L M de Maupertuis in Lapland in 1738

THE NINETEENTH CENTURY

Exploration.—The progress of geographical discovery by exploration and by research entered on a new phase with the nineteenth century. Instruments for fixing position had been perfected, the sextant was handier and more accurate than the old quadrant, the chronometer, first used on Cook's second voyage, made good determinations of longitude possible at last, the institution of the "Nautical Almanac" with resultant improvements in the art of navigation and the amelioration of life on shipboard had banished the fear of scurvy Most of all, the introduction of steam power speeded up and gave certainty to ocean travel, and tropical hygiene made life safe on land Submarine cables facilitated the exact fixing of the position of important bases and photography replaced the labour of the artists carried on the earlier expeditions

The first society devoted exclusively to geographical discovery was the African Association which was founded in London in 1788, and passed on its functions to the Royal Geographical Society, which was established in 1830, with a world-wide outlook and had a roll of 6,000 fellows in 1928. There are nearly one hundred geographical societies scattered over the countries of the world, their function being to advance geography by encouraging and rewarding explorers and investigators, publishing the results of their work, and maintaining the public interest in all that concerns geography (*See* GEOGRAPHICAL SOCIETIES)

Exploration in the 19th century can only be sketched in the most general way by referring to a few outstanding explorers amongst the hundreds who did sound and distinguished work Sir John Ross in 1818 reached the mouth of Smith Sound beyond Baffin bay and seeking a north-west passage, his nephew James Clark Ross reached the North Magnetic Pole in Boothia peninsula in 1831

Sir John Franklin set out in 1845, lured by the fatal fascination of the Passage, and when he failed to return there set in the rush of Arctic exploration known as the Franklin search Out of much that was weak, foolish and incompetent in direction there arose in execution heroes and geniuses like Sir Leopold McClintock who developed the method of man-hauled sledging and shone amongst those who explored the coasts and channels of the Arctic archipelago Americans vied with British in the search and a high place must be given to Elisha Kent Kane who in 1853 pushed through Smith Sound and some of his parties reached 80° N In 1872 Weyprecht and Payer on an Austrian expedition discovered Franz Josef Land In 1875–77 the last of the old fashioned British naval polar expeditions in two ships with hundreds of men was sent out under Sir George Nares to reach the North Pole It failed to get through Smith Sound but Albert H Markham in a sledge journey pushed on to 83° 20′ N In 1878 Baron A E Nordenskjold in the Swedish ship "Vega" made the long sought North-East Passage along the coast of Siberia and circumnavigated Europe and Asia In 1882 a series of circumpolar stations for scientific observations was set up by international agreement, the honour of occupying the most northerly point fell to the American expedition under A W Greely and from his base Lockwood got to 83° 24′ N Fridtjof Nansen in 1888 crossed the interior of Greenland for the first time and by travelling on ski and inventing new devices for camping and cooking revolutionised polar travel Five years later by a still more daring and original plan he drifted in the "Fram" across the Arctic Sea and got to 86° 28′ N In 1903–1905 Roald Amundsen, another Norwegian, in the "Gjoa" was the first to carry a ship through the half-forgotten North West Passage Invaluable work has been done by American, Italian, British and especially by Danish explorers including Mylius Erichsen, Knud Rasmussen and Lange Koch in northern Greenland, and the labours of the American Robert E Peary in a series of approximations carried on with infinite skill and patience from 1886 onwards at last brought him in 1909 the honour of attaining the North Pole

The Antarctic regions were explored for the last time with sailing ships in 1838–43 when a French expedition under Dumont D'Urville discovered Adélie Land south of Australia, an American expedition under Charles Wilkes coasted the pack-ice surrounding the Antarctic continent for 2,000 miles, and a British expedition under James Clark Ross, elaborately equipped for magnetic observations, broke through the girdle of pack-ice for the first time and discovered the south running coast of Victoria Land, Mounts Erebus and Terror in 78° S and the Great Ice Barrier The Antarctic seas remained unvisited, except for a southward dash by the "Challenger" in 1874, until Scottish and Norwegian whalers went in search of new whaling grounds in 1892–95 Scientific expeditions equipped mainly by private enterprise under the inspiration of the International Geographical Congress of 1895 went out from Belgium under Gerlache in 1897, spending the Antarctic night for the first time drifting in the pack-ice south of South America, and from London under Borchgrevink in the "Southern Cross" spending the winter upon the Antarctic continent for the first time in 1898–99 These were succeeded by four simultaneous purely scientific expeditions in 1901–04, the British national expedition in the "Discovery" under Robert F Scott of the British Royal navy initiating Antarctic sledging, taking advantage of Nansen's methods, and penetrating far into the frozen continent. The German expedition under Erich v Drygalski in the "Gauss," the Swedish expedition under Otto Nordenskjold in the Antarctic and the private Scottish National Expedition under William Bruce in the "Scotia" were all commanded by men of science, and did much valuable scientific work

In 1907–08 Ernest H Shackleton in a private expedition in the "Nimrod" succeeded by the innovation of using ponies for transport in getting to within 97 geographical miles of the South Pole and turned only because his provisions were exhausted, while other parties climbed Mount Erebus and reached the Magnetic Pole In 1912 Scott in the great "Terra Nova" expedition succeeded in reaching the Pole by Shackleton's route only to find that he had been anticipated by a month by Roald Amundsen who had made a dash on ski with dog-sledges from a more easterly base. Meanwhile an Australian expedition under Douglas Mawson, with J K Davis in command of the "Aurora" explored a great stretch of coast from King George Land to Queen Mary Land and penetrated far into the icy interior

In Asia three great regions remained practically unexplored well into the nineteenth century, viz , Arabia, the mountains and tablelands north and east of India and the deserts of Central Asia beyond them The northern half of Arabia was traversed in many directions by European travellers prominent amongst them Palgrave in the middle of the century followed by C Doughty, W Blunt, C Huber and others, by T E Lawrence during the World War and later by Gertrude Bell To the north of India the great effort was to penetrate the Himalayas and explore Tibet Most of the work was done by officers of the survey of India like Everest, the two Stracheys and Godwin Austen Private explorers also had their part, foremost among them the French missionaries Huc and Gabet in 1844–46, who reached Lhasa from China, the great botanist Joseph D Hooker who explored Sikkim in 1848–49, mountaineers including the three brothers Schlagentweit in 1854–57, W M Conway, Douglas Freshfield, the Duke of the Abruzzi, F de Filippi, Dr and Mrs Workman, and finally the Mt Everest expedition of 1926, members of which possibly reached the summit of the loftiest mountain of the earth Officers of the Indian army and civilians of the Indian service have spent much spare time in expeditions into and across the mountains and so have big game hunters like St George Littledale in 1894–95, and scholars like W W Rockhill in 1889–91 In earlier years native surveyors made some important journeys in Tibet, at that time practically inaccessible to Europeans The last of the great problems of Asiatic geography to be solved was the complex of mountain ranges and river-valleys between India and China involving the middle course of the Brahmaputra which was finally settled by Rawlings and Bailey in 1914

In Central Asia north of the great plateau Russian travellers visited the Khanates of Bokhara and Samarkand and many scientific expeditions ranged the vast spaces Chief among them were those of Prjevalsky between 1871 and 1885 traversing nearly the whole breadth of the continent and defining the great system of internal drainage and its mountain rampart His work was supplemented and extended by many of his countrymen and in a high

degree by the Swedish scholar Sven Hedin from 1894 onwards Francis Younghusband and other British officers made great journeys in the deserts of Gobi and Takla Makan and the remains of ancient cities attracted the Archaeological Survey of India for which Aurel Stein made important journeys.

Africa had been left at the end of the 18th century with the map of its interior a blank, leaving the lower course of the Nile, the middle of the Niger and the mouths of the Congo and Zambezi as openings to the mysteries of the interior The Niger was traced to its mouth at an early date and between 1822 and 1827 Denham and Clapperton made difficult journeys in the Sahara and Sudan and discovered Lake Chad for the African Association In 1849 David Livingstone, the greatest of all African travellers, began his missionary journeys from Cape Colony and explored the Kalahari desert discovering the salt lake Ngami Convinced that mission work was of little use until the continent was opened up, he spent the rest of his life in settling the puzzling hydrography of Central Africa He traced the course of the Zambezi by 1855 Later he pushed his way northward, discovering Lake Nyassa, exploring Lake Tanganyika and at the time of his death in 1873 he was intently following the north-flowing Lualaba in the hope that it would prove to be the ultimate source of the Nile The Nile problem, under the encouragement of the Royal Geographical Society attracted many scientific and adventurous explorers Richard F Burton and John H Speke in 1858 discovered the vast Victoria Nyanza on the high plateau under the equator collecting the head waters which issued from it as the White Nile, and pushing southwards reached Lake Tanganyika in the great rift which cleaves Africa from north to south In 1864 Baker exploring the Sudan discovered the Albert Nyanza another feeder of the Nile and details of the geography of the Sudan were worked out by the patient labours of scientific men like Gerhard Rohlfs, Georg Scheinfurth and Junker between 1869 and 1871. H M Stanley, who as a newspaper correspondent, had been sent out by the *New York Herald* to "find Livingstone" in 1871 found also that he himself was a born explorer, and in a magnificent journey lasting from 1873 to 1879 he crossed Africa from east to west, proving that Livingstone's Lualaba ran not to the Nile but to the Congo and following that huge equatorial river to the sea The formation of the Congo State under the King of the Belgians led to the rapid exploration of the Congo basin largely by Belgian officers, and the launching of a German colonial policy in 1884 brought many German explorers and men of science into eastern and western Africa. The race for the extension of spheres of influence solved the geographical problems of the once dark continent before the end of the century, French officers (General Lyautey prominent among them), completing our knowledge of the western Sahara and Sudan

Australia was practically completely explored by the white settlers under their own governments within the 19th century Flinders was the first to sail round Australia the coast of which he laid down in 1801–03 The eastern mountain chain shut off the first settlers in New South Wales from the west but when the range was crossed rivers were found flowing inland and a vague theory of a great inland sea attracted explorers Oxley traced part of the Lachlan river in 1816, the fine pastures of the Darling Downs were discovered in 1827 and the Murray river was followed to the sea in 1828 The search for new pastures was the main motive for discovery until after 1850 when prospective new gold fields became a rival lure The formation of the Swan River Settlement in 1834 and of Adelaide in 1836 gave new points of attack on the interior and in 1840 E J Eyre travelled on foot round the shore of the Great Australian Bight which separated them In 1844 Ludwig Leichhardt made a splendid journey of 3,000 miles across tropical Australia from east to west including the southern shore of the Gulf of Carpentaria and in the following year Charles Sturt, leaving the east coast farther south, penetrated to the very centre of the continent Sturt succeeded in crossing the continent from south to north in 1862 after two abortive attempts and his route was afterwards followed by an overland telegraph line In 1861 Robert O'Hara Burke and Wills crossed the continent with the aid of camels but perished on the return, a calamity which drew many expeditions into the wilderness to learn their fate From 1874 for more than 30 years Western Australia was the scene of exploration in search of pasture and of gold, beginning with the journeys of John Forrest, A C. and F. J Gregory, P E Warburton and Ernest Giles and culminating in the great 5,000 mile march of David Carnegie in 1895–97. Journeys of pure scientific research were also made, foremost amongst them those of Baldwin Spencer Except in the polar region little remains for the twentieth century to do in the way of geographical discovery.

THE TWENTIETH CENTURY

Up to 1914 travel as developed in the nineteenth century had enabled explorers to reach the poles and cross every great blank in the map of the continents. Tentative experiments had been made with newer methods of transport and investigation but it was only when the war ended and geographers could look about again that the new processes, matured by the intensity of life-or-death experience, became available for the new period which is now with us Motor engines took the place of steam in the later Norwegian polar expeditions. Shackleton, Scott and Mawson had made attempts to use motor cars and modified aeroplanes in the Antarctic but with no real success and experiments with radio-telegraphy had tantalized rather than helped some of them Explorers since 1918 have found to their hand a full equipment for the new era of geographical research The crossing of the Sahara by a French expedition under G M Haardt and L. Audouin-Dubreuil in 1923 proved the power of special types of motor cars to traverse roadless deserts, and the establishment of a trans-desert motor service between Damascus and Baghdad shows that the eastern deserts also can be traversed in this way Valuable scientific results bearing on the early history of life on the globe were obtained in Mongolia by the expeditions of the Natural History Museum of New York in 1923 and 1924 under R C. Andrews who resumed the work in the Gobi desert with the help of motor caravans in 1928.

Frequent flights have shown that no ocean or mountain range interposes a bar to aeroplanes Alan Cobham in flying from Cairo to Cape Town in 1926 and in encircling Africa in 1928 showed that valuable geographical information could be gleaned from the air in the tropics and Roald Amundsen with Lincoln Ellsworth, an American of means, reached 88° N. in a flying boat in 1925 and returned safely after spending 25 days upon the Arctic ice-floes. In 1926 the American aviator Byrd reached 90° N in an aeroplane, circled the North Pole and returned without alighting to his base in Spitsbergen A few days later Amundsen and Ellsworth with the Italian air-pilot Nobile flew in the air-ship "Norge" (which had just flown from Rome to Spitsbergen) to and across the North Pole, landing in Alaska Nobile's further expedition to the North Pole, which started from Rome with Spitsbergen again as base in May 1928, proved that such attempts are still hazardous The "Italia" became a wreck in the Arctic and several members of Nobile's party perished

By means of a number of overlapping photographs taken from a great height a British Air Service company has mapped a large area in Rhodesia and it has been found by the British Ordnance Survey that many features, such as ancient camps and roads, imperceptible on the ground, are clearly visible when viewed from a great height Photography has also been introduced successfully in surveying from the ground, results of extreme accuracy both for horizontal and vertical angles having been obtained by K. Mason with the photo-theodolite in the Shaksgam valley of the Himalayas in 1926 Other methods have been used with success in the official survey of Canada and in other countries Radio-telegraphy affords a means of fixing longitudes in any part of the world on land or sea

Little remains to be done by explorers on land, they must give place there to highly trained surveyors; but even the broad features of the configuration of two-thirds of the surface of the lithosphere are still vaguely guessed at under the veil of the hydrosphere A British expedition in the "Challenger" broke ground in all the oceans in 1872–76 when about 500 deep soundings were made laboriously with hemp lines several miles in length, each

sounding taking a whole working day. In the succeeding decades sounding machines using fine stranded wire enabled the telegraph ships to run many sections across the deepest oceans where submarine cables were required at the rate of half a dozen soundings per day During the great war a method of sounding by the echo from the bottom of a noise made at the surface was perfected and in 1926–27 the German research ship "Meteor" under Captain Spiess made an expedition planned by Alfred Mertz in the South Atlantic during which 67,000 separate and almost instantaneous soundings were taken while the ship was under way at intervals of 20 minutes day and night

II. HISTORY OF GEOGRAPHICAL THEORY

Early Greek Ideas.—The earliest conceptions of the earth, like those held by primitive peoples of to-day, are difficult to discover and almost impossible to grasp. The first definite geographical theories to affect the western world were those evolved, or at least first expressed, by the Greeks The earliest theoretical problem of geography was the form of the earth The natural supposition that the earth is a flat disc, circular in outline, had in the time of Homer (before 900 B C) acquired a special definiteness by the introduction of the idea of the river Oceanus bounding the whole

Thales of Miletus is claimed as the first exponent of the idea of a spherical earth; but, although this does not appear to be warranted, his disciple Anaximander (*c* 580 B.C) put forward the theory that the earth had the figure of a solid body hanging freely in the centre of the hollow sphere of the starry heavens The Pythagorean school of philosophers adopted the theory of a spherical earth, arguing that a sphere being the most perfect solid figure was the only one worthy to circumscribe the dwelling place of man The division of the sphere into parallel zones of climate was suggested by Parmenides (*c.* 450 B C). These ideas did not influence the Ionian school of philosophers, who preferred to deal with facts demonstrable by travel rather than with speculations Thus Hecataeus (*c* 500 B C), claimed by H F. Tozer as the father of geography on account of his general treatise on the earth, did not advance beyond the primitive conception of a circular disc He systematized the form of the land within the ring of ocean—the οἰκουμένη or habitable world—by recognising two continents. Europe to the north, and Asia to the south of the midland sea. Herodotus (*c.* 450 B C) equally oblivious of the sphere, criticized and ridiculed the circular outline of the οἰκουμένη which he held to be longer from east to west than it was broad from north to south (hence the modern designation of *longitude* and *latitude*), and he divided the land into three continents—Europe, Asia and Africa. Beyond the limits of his personal travels Herodotus applied the characteristically Greek theory of symmetry to complete, in the unknown, outlines of lands and rivers analogous to those which had been explored Symmetry was in fact the first geographical theory, and the effect of Herodotus's hypothesis that the Nile must flow from west to east before turning north in order to balance the Danube running from west to east before turning south, lingered in the maps of Africa down to the time of Mungo Park

Aristotle (384–322 B C) must be given the distinction of founding scientific geography. He demonstrated the sphericity of the earth by three arguments (1) that the earth must be spherical, because of the tendency of matter to fall together towards a common centre· (2) that only a sphere could always throw a circular shadow on the moon during an eclipse and (3) that the shifting of the horizon and the appearance of new constellations, or the disappearance of familiar stars, as one travelled from north to south, could only be explained on the hypothesis that the earth was a sphere Parmenides had pictured a torrid zone uninhabitable by reason of heat, two frigid zones uninhabitable by reason of cold, and two intermediate temperate zones fit for human occupation, but Aristotle was the first of the philosophers who defined the temperate zone as extending from the tropic to the Arctic circle.

The fitting of the οἰκουμένη to the sphere was the second theoretical problem of geography Aristotle was inclined to view the habitable world as a very long and relatively narrow band almost encircling the globe in the north temperate zone, but his argument as to the narrowness of the sea between West Africa and East Asia from the occurrence of elephants at both extremities, is difficult to understand

The word *geography* did not appear before Aristotle and he may have used it, but H Berger considers that the expression was introduced by Eratosthenes Aristotle was certainly conversant with many facts, such as the formation of deltas, coast-erosion, and to a certain extent the dependence of plants and animals on their physical surroundings He formed a comprehensive theory of the variations of climate with latitude and season, and was convinced of the necessity of a circulation of water between the sea and rivers, though, like Plato, he held that this took place by water rising from the sea through crevices in the rocks, losing its dissolved salts in the process He speculated on the differences in the character of races of mankind living in different climates and correlated the political forms of communities with their situation on a seashore, or in the neighbourhood of natural strongholds.

Problem of the Antipodes.—Pythagoras (*c* 530 B C) had speculated as to the existence of antipodes, and when the first approximately accurate measurement of the globe and estimates of the length and breadth of the οἰκουμένη were made by Eratosthenes (*c* 250 B C) the fact that, as then known, the habitable world occupied less than a quarter of the surface of the sphere was clearly recognised It was natural, if not strictly logical, that the river Oceanus should be extended from a narrow stream to a world-embracing sea, and here again Greek theory, or rather fancy, gave its modern name to the greatest feature of the globe The old instinctive idea of symmetry probably led the Stoic philosophers represented by Crates of Mallus (*c* 150 B C) to place an οἰκουμένη in each quarter of the sphere in order to satisfy the love of nature for life, the three unknown world-islands being those of *Antoeci*, *Perioeci* and *Antipodes* This was a theory not only attractive to the philosophical mind, but eminently adapted to promote exploration It had its opponents, however, for Herodotus had shown that sea-basins like the Caspian existed cut off from the ocean, and it is still a matter of controversy how far the pre-Ptolemaic geographers believed in a water-connection between the Atlantic and the Indian oceans

Roman Geographers.—Strabo (50 B C.–A D 24) followed Eratosthenes rather than Aristotle, but with sympathies which went out more to the human interests than to the mathematical basis of geography He compiled a very remarkable work dealing, in large measure from personal travel, with the countries surrounding the Mediterranean He may be said to have set the pattern which was followed in succeeding ages by the compilers of "political geographies" Pomponius Mela (*c* A D 40), following Strabo, held that the southern temperate zone contained a habitable land, which he designated by the name *Antichthones* Claudius Ptolemaeus (*c* A D 150), concentrated in his writings the final outcome of all Greek geographical learning and passed it across the gulf of the middle ages by the hands of the Arabs, to form the starting point of the science in modern times His geography was based broadly on the work of his predecessor, Marinus of Tyre, and on that of Hipparchus, the follower and critic of Eratosthenes It was the ambition of Ptolemy to describe and represent accurately the surface of the οἰκουμένη, for which purpose he took immense trouble to collect all existing astronomical determinations of the latitude of places, all estimates of longitude, and to make every possible rectification of distances by land or sea His work was mainly cartographical in its aim, and theory was as far as possible excluded The symmetrically placed hypothetical islands in the great continuous ocean disappeared and the οἰκουμένη acquired a new form by the representation of the Indian ocean as a larger Mediterranean completely cut off by land from the Atlantic. The *terra incognita* uniting Africa and Farther Asia was an unfortunate hypothesis which discouraged exploration Ptolemy used the word geography to signify the description of the whole οἰκουμένη on mathematical principles, while chorography signified the fuller descrip-

tion of a particular region, and topography the very detailed description of a smaller locality The Caliph al-Mamun (*c* AD 815), the son and successor of Harun al-Rashid, caused an Arabic version of Ptolemy's great astronomical work to be made, which is known as the *Almagest* The geography of Ptolemy was also known and is constantly referred to by Arab writers The Arab astronomers measured a degree on the plains of Mesopotamia, thereby deducing a fair approximation to the size of the earth, and the caliph's librarian, Abu Jafar Muhammad ben Musa, wrote a geographical work, now unfortunately lost, composed on the model of that of Ptolemy

The Middle Ages.—The Middle Ages saw geographical knowledge die out in Christendom, although it retained a certain vitality in Islam The verbal interpretation of scripture led Lactantius (*c* AD 320) and other ecclesiastics to denounce the spherical theory of the earth as heretical, and as all learning was confined to the church, Greek science gave place to primitive ignorance as shown in the monkish wheel-maps The journey of Marco Polo, the increasing trade with the east and the voyages of the Arabs in the Indian Ocean prepared the way for the reacceptance of Ptolemy's ideas even amongst churchmen when the sealed books of the Greek original were translated into Latin by Angelus in 1410

Revival of Geography.—The old arguments of Aristotle and the old measurements of Ptolemy were used by Toscanelli and Columbus in urging a westward voyage to India and mainly on this account did the crossing of the Atlantic rank higher in the history of scientific geography than the laborious feeling out of the coast line of Africa But not until the voyage of Magellan shook the scales from the eyes of Europe did modern geography begin to advance Discovery had outrun theory, the rush of new facts made Ptolemy practically obsolete in a generation

The earliest evidence of the reincarnation of a sound theoretical geography is to be found in the text-books by Peter Apian and Sebastian Munster Apian in his *Cosmographicus liber,* published in 1524 and subsequently edited and added to by Gemma Frisius under the title of *Cosmographia,* based the whole science on mathematics and measurement He followed Ptolemy closely, enlarging on his distinction between geography and chorography This slender distinction was made much of by most subsequent writers until Nathanael Carpenter in 1625 pointed out that the difference was simply one of degree, not of kind Sebastian Munster, on the other hand, in his *Cosmographia universalis* of 1544, paid no regard to the mathematical basis of geography, but following the model of Strabo, described the world according to its different political divisions, and entered with great zest into the question of the productions of countries, and into the manners and costumes of the various peoples Thus early began the separation between mathematical and political geography

The Seventeenth Century.—Throughout the 16th and 17th centuries the rapidly accumulating store of facts as to the extent, outline and mountain and river systems of the lands of the earth were put in order by the generation of cartographers of whom Mercator was the chief, but the writings of Apian and Munster held the field for a hundred years without a serious rival Meanwhile the new facts were the subject of original study by philosophers and by practical men without reference to classical traditions Bacon argued keenly on geographical matters and was a lover of maps

Philip Cluver's *Introductio in geographiam universam tam veterem quam novam* was published in 1624 Geography he defined as "the description of the whole earth, so far as it is known to us" It is distinguished from cosmography by dealing with the earth alone, not with the universe, and from chorography and topography by dealing with the whole earth, not with a country or a place The first book, of fourteen short chapters, is concerned with the general properties of the globe; the remaining six books treat in considerable detail of the countries of Europe and of the other continents Each country is described with particular regard to its people as well as to its surface

In 1625 Nathanael Carpenter, Fellow of Exeter College, Oxford, published a little book, *Geographie delineated forth in Two Bookes, containing the Sphericall and Topicall parts thereof.* It is discursive in its style and verbose, but it is remarkable for the strong common sense displayed by the author, his comparative freedom from prejudice, and his firm application of the methods of scientific reasoning to the interpretation of phenomena Basing his work on the principles of Ptolemy, he brings together illustrations from the most recent travellers, and does not hesitate to take as illustrative examples, the familiar city of Oxford and his native county of Devon. He divides geography into *The Spherical Part,* or that for the study of which mathematics alone is required, and *The Topical Part,* or the description of the physical relations of parts of the earth's surface, preferring this division to that favoured by the ancient geographers into general and special

Varenius.—A much more important work in the history of geographical method is the *Geographia generalis* of Bernhard Varenius, a German medical doctor of Leyden, who died at the age of twenty-eight in 1650, the year of the publication of his book Although for a time it was lost sight of on the continent, Sir Isaac Newton thought so highly of this book that he prepared an annotated Latin edition which was published in Cambridge in 1672, with the addition of the plates which had been planned by Varenius, but not produced by the original publishers Dugdale in his English translation (1733) says "The reason why this great man took so much care in correcting and publishing our author, was because he thought him necessary to be read by his audience, the young gentlemen of Cambridge, while he was delivering lectures on the same subject from the Lucasian Chair" The treatise of Varenius is a model of logical arrangement and terse expression, it is a work of science and of genius, one of the few of that age which can still be studied with profit The English translation renders the definition thus "Geography is that part of *mixed mathematics* which explains the state of the earth and of its parts, depending on quantity, viz, its figure, place, magnitude and motion, with the celestial appearances, etc By some it is taken in too limited a sense, for a bare description of the several countries, and by others too extensively who along with such a description would have their political constitution" But Varenius, though he was reluctant to include the human side of geography in his system, allowed it as a concession to custom His division of geography was into (1) General or universal, dealing with the earth in general, and explaining its properties without regard to particular countries, and (2) Special or particular, dealing with each country in turn from the chorographical or topographical point of view General geography was divided into—(1) the absolute part, dealing with the form, dimensions, position and substance of the earth, the distribution of land and water, mountains, woods and deserts, hydrography (including all the waters of the earth) and the atmosphere, (2) the relative part, including the celestial properties, *i e*, latitude, climate, zones, longitude, etc, and (3) the comparative part, which "considers the particulars arising from comparing one part with another", but under this head the questions discussed were longitude, the situation and distances of places, and navigation Varenius does not treat of special geography, but gives a scheme for it under three heads—terrestrial, celestial, human This system of geography founded a new era, and the book was the unchallenged standard for more than a century

The Eighteenth Century.—The next marked advance in the theory of geography was made nearly simultaneously by the studies of the Swedish chemist, Torbern Bergman, acting under the impulse of Linnaeus, and by those of the German philosopher, Immanuel Kant Bergman's *Physical Description of the Earth* was published in Swedish in 1766, and translated into English in 1772 and into German in 1774 It is a plain, straightforward description of the globe, and of the various phenomena of the surface, dealing only with definitely ascertained facts in the natural order of their relationships, but avoiding any systematic classification or even definitions of terms.

The problems of geography had been lightened by the destructive criticism of the French cartographer D'Anville, who had purged the map of the world of the last remnants of unverified tradition, and rendered it richer by the dawn of the new era of scientific travel, when Kant brought his logical powers to bear

upon them Kant's lectures on physical geography were delivered in the university of Konigsberg from 1765 onwards Geography appealed to him as a valuable educational discipline, the joint foundation with anthropology of that "knowledge of the world" which was the result of reason and experience In this connection he divided the communication of experience from one person to another into two categories—the narrative or historical and the descriptive or geographical, both history and geography being viewed as descriptions, the former in order of time, the latter in order of space Physical geography he viewed as a summary of nature, the basis not only of history but also of "all the other possible geographies," of which he enumerates five, viz, (1) *Mathematical geography,* which deals with the form, size and movements of the earth and its place in the solar system, (2) *Moral geography,* or an account of the different customs and characters of mankind according to the region they inhabit, (3) *Political geography,* the divisions according to their organized governments, (4) *Mercantile geography,* dealing with the trade in the surplus products of countries, (5) *Theological geography,* or the distribution of religions Here there is a clear and formal statement of the interaction and causal relation of all the phenomena of distribution on the earth's surface, including the influence of physical geography upon the various activities of mankind from the lowest to the highest Notwithstanding the form of this classification Kant himself treats mathematical geography as preliminary to, and therefore not dependent on, physical geography Physical geography itself is divided into two parts general, which has to do with the earth and all that belongs to it —water, air and land, and particular, which deals with special products of the earth—mankind, animals, plants and minerals

The Nineteenth Century.—Alexander von Humboldt (1769–1859) was the first modern geographer to become a great traveller The impulse given to the study of natural history by the example of Linnaeus, the results brought back by Banks, Solander and the two Forsters, who accompanied Cook in his voyages of discovery, the studies of De Saussure in the Alps, and the lists of desiderata in physical geography drawn up by that investigator, combined to prepare the way for Humboldt who advanced the theory of geography mainly by his insistence on the great principle of the unity of nature In his *Cosmos* and other works he brought all the "observable things" which the eager collectors of the previous century had been heaping together regardless of order or system, into relation with the vertical relief and the horizontal forms of the earth's surface Thus he demonstrated that the forms of the land exercise a directive and determining influence on climate, plant life, animal life and on man himself The idea was not new for Kant himself had given it full expression, but Humboldt's concrete illustrations and the remarkable power of his personality enabled him to enforce these principles with immediate and lasting effect The treatises on physical geography by Mary Somerville and John Herschel fully showed the effect produced in Great Britain by the stimulus of Humboldt's work Humboldt's contemporary, Carl Ritter (1779–1859) extended and disseminated the same views, and in his interpretation of "Comparative Geography" he laid stress on the importance of forming conclusions, not from the study of one region by itself, but from the comparison of the phenomena of many places Impressed by the influence of terrestrial relief and climate on human movements, Ritter was led deeper and deeper into the study of history and archaeology His monumental *Vergleichende Geographie,* which was to have made the world its theme, died out in a wilderness of detail in twenty-one volumes before it had covered more of the earth's surface than Asia and a portion of Africa

During the rapid development of physical geography many branches of the study of nature, which had been included in the cosmography of the early writers, the physiography of Linnaeus and even the *Erdkunde* of Ritter, had been so much advanced by the labours of specialists that their connection was apt to be forgotten The science of geography, passed on from antiquity by Ptolemy, re-established by Varenius and Newton, and systematized by Kant, included within itself definite aspects of all those terrestrial phenomena which are now treated exhaustively under the heads of geology, meteorology, oceanography and anthropology, and the inclusion of the requisite portions of perfected results of these sciences in geography is simply the gathering in of fruit matured from the seed scattered by geography itself The study of geography was advanced by improvements in cartography, not only in the methods of survey and projection, but in the representation of the third dimension by means of contour lines introduced by Philippe Buache in 1737, and the more remarkable because less obvious invention of isotherms introduced by Humboldt in 1817

Theories of Nature.—Teleology or the argument from design had been a favourite form of reasoning among Christian theologians and, as worked out by Paley in his *Natural Theology,* it served the useful purpose of emphasizing the fitness which exists between all the inhabitants of the earth and their physical environment It was held that the earth had been created so as to fit the wants of man in every particular This argument was tacitly accepted or explicitly avowed by almost every writer on the theory of geography, and Carl Ritter distinctly recognized and adopted it as the unifying principle of his system As a student of nature, however, he did not fail to see, and as a professor of geography he always taught, that man was in very large measure conditioned by his physical environment

The evolutionary theory, more than hinted at in Kant's "Physical Geography" and worked out by the researches of Charles Darwin, Alfred Russel Wallace and Joseph Dalton Hooker, from their observations as travelling naturalists, has become the unifying principle in geography The conception of the development of the plan of the earth from the first cooling of the surface of the planet throughout the long geological periods, the guiding power of environment on the circulation of water and of air on the distribution of plants and animals, and finally on the movements of man, give to geography a philosophical dignity and a scientific completeness which it never previously possessed The influence of environment on the organism may not be quite so potent as it was believed to be, in the writings of Henry Thomas Buckle for instance, and certainly man, the ultimate term in the series, reacts upon and greatly modifies his environment yet the fact that environment does influence all distributions is established so that it cannot be moved In this way also the position of geography, at the point where physical science meets and mingles with mental science is explained and justified The change which took place during the 19th century in the substance and style of geography may be well seen by comparing the eight volumes of Malte-Brun's *Géographie universelle* (Paris, 1812–1829) with the twenty-one volumes of Elisee Reclus's *Geographie Universelle* (Paris, 1876–1895) and the new and larger edition planned by Vidal de la Blache as the work of many authors including A Demangeon and Pierre Denis, shows that development is still going on It has been usual to assign to Oscar Peschel (1826–1875) the credit of having corrected the preponderance which Ritter gave to the historical element, and of restoring physical geography to its old pre-eminence As a matter of fact each of the leading modern exponents of geography—such as Ferdinand von Richthofen, Hermann Wagner, Friedrich Ratzel William M Davis, Albrecht Penck, A de Lapparent, Elisee Reclus, E de Martonne, G G Chisholm, Halford Mackinder and Ellsworth Huntington, has his individual point of view

The Twentieth Century.—The theory of geography developed by a series of efforts to cope with accumulations of new facts of discovery In the earlier centuries a traveller required little more than sound health and adventurous spirit to enable him to make discoveries which have crowned his name for all time but in the twentieth century this is no longer the case In order to discover facts of importance the traveller must now be himself a geographer grounded in the principles of the science which have crystallized out of the labours of the past. Extensive wanderings have given place to intensive studies and wisely-directed researches The elementary teacher of geography can no longer be content to repeat lists of features and haphazard remarks as to notable things, but must have a foundation of systematic

knowledge This was not generally realized until the nineteenth century was near its end Professors of geography had indeed existed for many years in Germany, France and some other continental countries, but they lectured to few students, and it was only in the last decade after great advances had been made in continental universities that the universities of Great Britain and the United States admitted geography into their curricula In 1892 the efforts of Douglas Freshfield through the Royal Geographical Society secured the appointment of lecturers on geography in Oxford and Cambridge Progress in the development of a school of geography in these universities has been steady and in each there are now several instructors on the subject under a Reader preparing students for a Geographical Tripos awarding Honours degrees The four universities of Scotland, most of the constituent colleges of the University of London, the newer provincial English universities and the University of Wales have appointed Professors or Readers of geography who, despite (1928) the financial difficulties, endeavour to develop interest of a high order. The United States had three professors of geography in 1897. W M Davis at Harvard, R F Tarr at Cornell and W Libbey at Princeton, by their efforts, and especially by the brilliant work of Davis, a demand was created for trained geography teachers which led to immense development In 1924 there were fully equipped departments of geography, several of them with 15 or more instructors, in the universities of California, Chicago, Clark (at Worcester, Mass), Michigan (Ann Arbor), Ohio, State and Ohio (Athens), while fifty other universities had less complete equipment, and, in all, university instruction in geography was being given to 14,000 students annually

III. THE PRINCIPLES OF GEOGRAPHY

Any part of geography may serve as a starting point from which by a series of approximations the whole field of the science may be surveyed The best line of approach for an advanced student leads from simple fundamental facts step by step to the most complex interactions, and the following scheme may be taken as expressing the views of modern geographers

The Earth as a Functioning Organism.—To begin with, the earth may be viewed hypothetically as a smooth, homogeneous, solid ball, spinning as it wheels round the sun Mathematical physics assigns polarity as an inevitable result of rotation The ends of the axis differ from every other point on the surface by being relatively at rest One of these points, from which the stars would appear to turn in the direction of the hands of a watch is called the North Pole, the other, from which the stars appear to rotate counter clockwise, the South Pole These are points of reference by which positions in latitude can be fixed by angular measurements of the elevation above the horizon of the points in the sky vertically over them Rotation regulates the succession of day and night affording a measure of time and so of position in longitude The angle which the axis of rotation makes with the plane in which the earth revolves round the sun determines the position of the tropics and polar circles, the seasons, the varying duration of daylight and darkness in different latitudes and the distribution of solar energy on the surface of the earth On such a hypothetical sphere the temperature of the solid surface follows the astronomical zones of climate, solar radiation predominating in the Torrid zone, terrestrial radiation in the Frigid zones, and in any latitude the temperature would be the same at every point

These simple conditions do not occur in fact The lithosphere is composed of diverse rocks, each kind of which has its own specific heat and conductivity so that the rate of heating and cooling varies and different temperatures result under the same radiation The surface of the lithosphere is not smooth but ridged into heights and hollows of every size and shape and the process of elevation and depression is always at work Alternate heating and cooling by radiation from the sun and to space splinter the outer surface of the rocks and the pull of gravity causes the detritus to slip down the steep slopes and accumulate below The earth is not all solid lithosphere but is partially enveloped in a hydrosphere which gathers in the great hollows and leaves the crests of the great ridges projecting thus producing the division of the surface into sea and land Solar radiation falling on the mobile water alters its density and so sets up a circulation between the heated tropics and the chilled polar areas, while the rotation of the earth causes a deviation of the slow moving currents towards the right in the Northern hemisphere and towards the left in the Southern hemisphere, the coast lines and the inequalities of the sea-bed also direct the movement of the currents so that they carry warmth from the tropics far towards the polar regions, along certain coasts, and coolness from the polar regions far towards the tropics along others, destroying the uniformity of the mathematical zones of temperature in the sea

The differential attraction of the sun and moon sets up tidal waves in the hydrosphere which like the currents impinge upon and rub against the shores, and a similar though less noticeable strain is also produced in the lithosphere The terraqueous globe is completely enveloped by the atmosphere of air which rests in uneasy equilibrium on land and sea alike. The air, interpenetrated in its lower layers by water-vapour from the hydrosphere, is set into lively circulation by solar radiation which is greatest in the tropics and by terrestrial radiation which preponderates in the polar regions, the general flow to north and south being deviated by the earth's rotation so as to have a westerly component in the pole-seeking winds and an easterly component in the equator-seeking winds Since heat is more readily added to and removed from air by contact with heated and cooled surfaces than by direct radiation, the atmosphere is subject to a more powerful stimulus over land than over the sea as land heats and cools the more rapidly and to a greater degree On the other hand the varied surface of the land opposes more friction than the smooth water surfaces, and the theoretical circulation of the air is more characteristically developed on the oceans than on land Thus land or continental climates are extreme, while sea or oceanic climates are equable Wind, in virtue of the very high velocity it may attain, is a powerful agency for wearing the rocks and for carrying fine particles to great distances, and it exercises still greater power as the vehicle of water-vapour the precipitation of which as rain is closely conditioned by the configuration of the land over which it is carried Water, falling as rain on the higher slopes descends by gravity, collecting into runnels which eventually converge to rivers Running water, aided by the detritus it carries, cuts for itself ravines or valleys and finally it spreads the material (well ground in the journey) as alluvium on the plains and silt on the shore of the sea. River action is the chief agent in carving the scenery of the land from the uplifted masses of rock and next to it comes the action of glacial ice Wind also drives before it the surface water of the sea, checking, diverting or reinforcing the slow creep of the waters of the hydrosphere with the well marked currents which largely affect the temperature of the air and modify the crude extremes of astronomical climate zones on land as well as on sea Waves raised by the wind sharpen the sea's edge to gnaw and wear away the margins of the land The lower lands are sheathed in soil ground from the rocks of the mountains and the surface of most of the land is moistened by graduated rainfall and warmed or cooled by the prevailing wind according to the way in which the land-forms guide its flow

To this point the earth can be treated as the product of chemical and physical processes which leave it as a finished house built, furnished, warmed and lighted in readiness for its occupation by life The distribution of plant life on land and in the sea depends primarily on climate, especially on temperature and sunlight On land the presence of moisture is at least an equal factor, vegetation being stunted to herbs and shrubs in the cold moist lands bordering the polar and Alpine zones, strengthened into deciduous forests and grasslands in the temperate zones, reduced almost to nothing in the rainless parts of the tropical zones, and brought to the height of luxuriant profusion in the rainy forests of the equator The species of plants associated in the various regions are separated into special groups by barriers of mountain, desert or sea The distribution of animals is conditioned in turn by their entire dependence for food on plants, directly in the herbivora, indirectly in the carnivora Their species are equally conditioned by environment and natural barriers Both plants and

animals have the power in some degree of modifying the environment which controls them as exemplified by the change of lagoons into swamps and ultimately into meadows by plants and the formation of coral reefs by animals.

A far more complicated set of conditions governs the distribution of mankind over the land and the association of races and communities with particular regions Primitive races are conditioned by their environment almost as much as animals They are dependent on climate, plucking wild fruits or hunting game for food and completely isolated one from another by natural barriers The rising degrees of civilization exhibit a growing superiority to the thraldom of such conditions until the white race of the present day may be looked upon as escaping from geographical control which no longer raises barriers to movement or settlement.

Races of mankind grow to be associated with particular regions and aggregate into nations occupying separate countries Each nation, retentive of differing languages and conflicting religious ideals, creates and maintains boundaries natural or artificial, the protection or the alteration of which throughout the ages makes it necessary to call in history to explain the geography of to-day Still more complex are the conditions governing the discovery, production, transport and exchange of useful and desirable things between people of different nationality

THE SUBJECT MATTER OF GEOGRAPHY

Classification and Content of Geography.—So complex a science demands the labour of many specialists in order to advance it by the separate study of its interdependent parts There is a geographical aspect of all the sciences which are concerned with the earth and its phenomena and it follows that some knowledge of each of these sciences is required of the geographer in dealing with his proper subject Though one aspect of geography merges into and is interwoven with another, lines must be drawn to allow of a classification for practical purposes Each division of geography draws its data from some source which is no longer viewed as essentially geographical but is known as one of the abstract or natural or human sciences, and on the other hand each division of geography is capable of practical applications in the arts or interests of civilized life The degree of subdivision of the subject-matter of geography varies according to the share of attention which each has received, but the main divisions, now recognized, are four mathematical, physical, biological and human

Mathematical Geography.—This deals with dimensions, figure and movements of the earth Astronomical geography is a name sometimes given to the determination of position on the earth's surface by reference to the heavenly bodies and navigation is a practical application, the data of which are compiled in the British *Nautical Almanac* and similar publications of other governments The earth's surface can be truly represented on a small scale only on a sphere and the terrestrial globe showing the degree net or lines of latitude and longitude is an essential geographical instrument To represent the degree net, on a flat surface or map, mathematical projections are necessary and these must be of various kinds to suit different purposes as every projection necessarily distorts the form or the area of any portion of the surface of the globe The part of mathematical geography dealing with the size and figure of the earth is Geodesy which depends on astronomical positions and the exact determination of distances on the surface by triangulation from bases which are directly measured Geodetic operations do not necessarily do more than fix the degree net on the sphere, the process of topographical surveying serving to fill in details for maps on various scales, the production of which is the art of Cartography Maps are adapted for the representation of any uniformly-varying distribution by the use of isopleths, of which the most familiar forms are contour-lines and isotherms, and by the use of conventional signs and distinctive colouring Mathematical geography has also to do with the phenomena of the tides and of terrestrial magnetism while mathematical methods are essential in many departments of physical geography and in the treatment of all statistics distributionally The figure of the earth is very nearly a spheroid of revolution, the equatorial radius of which measures 20,926 200 feet and the polar radius 20,854,900 feet, while a degree of latitude crossing the equator measures 362,745 feet and one crossing the pole 366,480 feet The whole superficial area of the earth is approximately 196,940,000 square British statute miles

Physical Geography.—The words "physical geography" have often been loosely used as equivalent to Physiography or the description of all nature Here they are taken to mean the description of the forms of the lithosphere at their present stage of development and of the functions which these forms exercise in controlling the action of solar energy in the hydrosphere and atmosphere The origin of the forms themselves and their relations to living creatures are excluded except incidentally for purposes of classification It is evident that a physical geography is possible at any point of time in the life-history of the world during the unceasing process of development by the powers tending simultaneously to increase the differences of level in the lithosphere, by stresses set up in it as it cools, and to decrease these differences by solar energy acting through air and water so as to cut down the heights and fill up the hollows Physical geography falls into three divisions all depending on the laws of geophysics, viz — Geomorphology or treating of the forms of the lithosphere dependent in a special degree on geology, Oceanography or the conditions of the hydrosphere depending in a special manner on chemistry and physics, and Climatology or the condition of the atmosphere with respect to the earth's surface, depending largely on meteorology Attention is concentrated here on geomorphology as climatology and oceanography are dealt with in special articles

PLAN OF THE EARTH

Although the vertical distance between the highest point on the surface of the lithosphere and the lowest point on this surface amounts to about 12 miles the surface is moulded into such low relief, having respect to the terrestrial circumference of about 25,000 miles, that a correct model eight inches in diameter would appear almost smooth The surface is nevertheless impressed with a distinct system of depressions and elevations showing a rough symmetry in its plan Round the north pole there is a region of depression within the parallel of 80° N and round the south pole an area of elevation within the Antarctic circle All the rest of the surface is occupied by two great areas interlocking with each other, one of elevation, the other of depression The depressed area encircles the globe about 65° S and stretches northward in three great bays or world-hollows corresponding to the Pacific, the Indian and the Atlantic basins The floors of the world-hollows are gently undulated in their configuration for the most part but they exhibit considerable diversities of level, the deepest depressions occurring as a rule near the margins while gentle rises form a central low ridge along the narrow Atlantic hollow, and more or less parallel bands across the wide Indian and Pacific hollows The elevated area surrounds the north polar depression as a continuous ring and stretches southward with an easterly twist in three tapering world-ridges culminating respectively in the continents of North and South America, Europe and Africa and Asia and Australia From the depressed area the lower portion of the elevated area slopes upward with a gradient so steep compared with any prevailing on the floor of the depressed area as to form a sharp transition between the two, but near the top of the world-ridges there is a notable flattening into a broad gently shelving plain which leads to a culminating region of abrupt elevations and high plateaux

The two world areas are separated by the line of mean-sphere level which lies in such a position that if all the elevations projecting above it were shaved off parallel with the surface of the spheroid the material so cut off would suffice to fill all the hollows lying below it The average level of the depressed area is, so far as can be guessed in our present ignorance of its detailed configuration, rather more than two miles below the average level of the elevated area

The effort to visualize the plan of the lithosphere with reference to the line of mean sphere level is rendered difficult because it ignores the familiar divison of the earth's surface into land and sea The areal ratio between land and sea of course depends on the volume of the hydrosphere If that were just enough to fill

the world-hollows up to mean sphere level, the outlines of the restricted oceans would be similar to what they are at present, the outlines of the continents, although enlarged and smoothed, would be easily recognizable, and the areas of land and sea would be practically equal The volume of the hydrosphere is, however, such that the water covers the steep slopes of the world-ridges and reaches half way over the shelving plain so that the present coast line is in a position where a given rise or fall in level would make the greatest possible difference in the area of sea and land Only 28 per cent of the surface of the lithosphere projects as land through the hydrosphere into the atmosphere The volume of the hydrosphere is not fixed, a considerable portion of it exists as water flowing over or resting in hollows in the land, a considerable portion is withdrawn in the form of permanent ice in the polar regions and on high mountains, and a portion is diffused through the atmosphere in the form of vapour Thus, apart from movements of upheaval or subsidence in the solid crust the level at which the water stands against the land may vary from time to time under the action of climatic changes

The surface of the sea furnishes a convenient datum level from which to reckon heights and depths Speaking precisely, the surface of the sea, even when calm and at its mean tidal range, is not that of a spheroid concentric with the earth from which absolute measures of distance from that centre can be made, it is a surface of equilibrium, distorted from that of the spheroid by the gravitational attraction of the lithosphere which varies with the form of the crust and density of the rocks Except in geodetic measurements no allowance is made for distortion of surface

As new and much more exact measurements of the depths of the oceans are in progress it seems undesirable to repeat the approximations to the volumes of the heights and hollows of the lithosphere and the boundaries between its various areas based upon them by John Murray, H R Mill and Hermann Wagner It may suffice to say that the mean level of the lithosphere lies somewhere between 1,000 and 2,000 fathoms below sea-level Murray's term *abyssmal area* or Wagner's *oceanic plateau* may be applied to the whole of the depression below mean sphere level

Wagner's *continental slope* to the steep rise from mean sphere level to the outer margin of his *continental plateau* that includes the shelving plain of which the seaward portion retains Mill's name of *continental shelf* and the landward portion the *lowland plains*, while all above the level of 600 or 700 feet above sea-level may be termed the *culminating continental area* The four contours known as mean sphere level, the edge of the continental shelf, the coast line and the line of 650 feet above the sea (which is the approximate mean level of the surface of the terraqueous globe) have a definite physical meaning and are not a mere arbitrary choice While physically the outer edge of the continental shelf is situated at the abrupt change of gradient between the continental slope and the shelving plain, which is not always at the same depth, it is usually found so near 600 feet that generally speaking it is well defined by the contour line of 100 fathoms or of 200 metres, now shown on all bathymetrical maps Wider or narrower, this shelf surrounds all the continents and in its wider parts often bears groups of islands which are to be classed as parts of the continents although separated from the nearest mainland by shallow seas

Homology of the Continents.—The three great world-ridges which radiate southward and eastward from the north polar region bear each a pair of continents, either separate or united, all of which exhibit a certain homology or approximation to a common type Each pair consists of a north-western and a south-eastern partner separated by a group of islands and south-pointing peninsulas The outline of a typical continent approaches a triangle, widest in the north The central portion is a low plain dipping southward and eastward in the southern part and northward and eastward in the northern part On the east there is a broad highland area of ancient rocks the eroded remnant of a folded mountain system, and beyond that on the east is a broad coastal plain On the west of the central plain there is a high continuous chain of mountains folded up out of geologically recent rocks and enclosing an elevated plateau, while beyond on the west there is a very narrow coastal plain On the western world-ridge this type is well exemplified by South America, and North America diverges but little from it except by being broader in the south where it merges into the West Indian archipelago On the eastern world-ridge Asia and Australia diverge considerably from the type both in outline and orientation, but there is the contrast of mountain and plateau with a low central plain and, to some extent, lower heights may be traced on the other side, while the Malay Archipelago uniting the two partners is on a far larger scale than the West Indies The continents of the central world-ridge, Europe and Africa, are much farther from the type Like the other northern partners of the pairs, Europe is the more diversified into peninsulas and gulfs while Africa like the other southern partners has a smoother outline practically without minor sinuosities, but here plateaux take the place of folded mountains except for the Atlas system in the north The exact configuration of Antarctica crowning the isolated southern elevation has still to be discovered, but high mountains bordering the coast of Victoria Land certainly buttress a great plateau to the west Greenland though united to the American World Ridge may from some of its aspects be also claimed as a continent in itself New Guinea, Borneo and Sumatra as the largest members of the Malay Archipelago belong to the continental system of Asia and Australia

Islands.—Two classes of islands are recognised the first, termed continental, and usually found on the continental shelf, are incidents of sea-level and a comparatively slight rise of the shelving plain or a fall of the ocean would unite them with the neighbouring mainland A few other islands, of which Madagascar is the largest, are classed as continental on account of their rocks being geologically characteristic of the large land masses In contrast with these are oceanic islands which never formed part of a continent but rise more or less abruptly from the floor of the oceans They are classified by their origin into volcanic islands consisting of erupted lava or ashes and coral islands composed of limestone derived from the calcareous supports of polyps produced by their physiological action on sea water

Coasts.—The line along which the sea meets the land is from every point of view the most important which is shown on a map Coast lines have been classified in many ways with reference both to their form and their origin One distinction is between the coasts of regions where the land has long been stationary as regards sea level, and those of regions where depression or upheaval is taking place On stationary coasts the effect of wave-erosion is to form broad shelving beaches of sand or gravel where the land is low or the rocks soft and to produce narrow beaches where the land is high or the rocks hard, the beach in each case being cut out of the land by wave action and erosion in its upper part and built up from the sea bed by the deposit of detritus or sediment in its lower part On sinking coasts the sea has invaded the lower valleys of the land forming wide funnel-shaped estuaries for the rivers where the land is low and narrow winding fjords or rias where the land is high On rising coasts the shore-line, being newer, is less indented than in other types, and shelf-like raised beaches may be found backed by the old wave eroded cliffs The minuter classification of coast-lines on this basis is complicated by alternations of elevation and depression or tilting of the land masses

Land Forms.—Richthofen and Penck, the founders of geomorphology, have elaborated the classification of land-forms with reference both to origin and configuration and many volumes have been written on the subject Fundamentally the typical form of the land is a slope or inclined plane which may stand at any angle from the horizontal to the vertical Such slopes may be grouped together in many ways, giving rise to a great variety of form-elements amongst which Penck recognizes six as primary These are (1) the Plain or gently inclined uniform surface, (2) the Scarp or steeply inclined slope, (3) the Valley consisting of two lateral parallel or slightly diverging slopes inclined towards a narrow strip or plain at a lower level which itself dips downwards in the direction of its length (4) the Mount or slope falling away on every side from a particular place which may be a small area as in the case of a volcanic cone, or a line as in the case of a ridge or a mountain chain (5) the Hollow or converse of a mount,

being a slope digging inwards on all sides to a point or a relatively small plain, and (6) the Cavern or space entirely surrounded by a land surface The character of a region depends on the size and grouping of these form elements and any particular landscape may be a complex of several of them Only a plain can extend as a single unit for hundreds of miles in every direction and at any elevation above sea-level All the other form elements are restricted to comparatively small areas or extend in length only as relatively narrow strips The varieties of mountains and valleys necessitate a very complex classification if full account is to be taken of them

Mountains.—From the morphological point of view it is most important to distinguish the association of forms as the mountain-mass or group of mountains radiating from a centre, with valleys furrowing their flanks and spreading towards every direction, the mountain-chain or line of heights forming a long narrow ridge or series of ridges separated by parallel valleys, the dissected plateau or highland, divided into mountains of circumdenudation by a system of wide and deeply-cut valleys, and the isolated peak usually a volcanic cone or a hard rock mass left projecting after the softer strata which embedded it have been worn away The distribution of mountains is closely related to the great structural lines of the continents of which they form the culminating region Lofty mountains folded up from comparatively recent geological strata form the backbones of North America (the Rocky Mountains and the western Coast Ranges), South America (the Andes), Europe (the Pyrenees, Alps, Carpathians and Caucasus), and of Asia in the mountains of Asia Minor converging on the Pamirs and diverging thence in the Himalayas and the vast ranges of central and eastern Asia north of the Tibetan plateau

Functions of Land Forms.—The simplest function of land-forms in the economy of the earth as a machine worked by solar energy is the guiding of loose material descending from a higher to a lower level under the pull of gravity The slope and state of the surface of the land determine the path by which rock fragments, broken off by alternate expansion and contraction due to heating and cooling by radiation, will slip or roll and the distance to which they can be carried On a uniform scarp detritus falling from above comes to rest near the bottom thus gradually reducing the slope by forming a talus or scree at the base Where the surface is broken by valleys and plains the heaping up of rolling stones and sand add greatly to the variety of the scenery So far the sun, gravity and the land forms could work if there were no atmosphere but the process of erosion is enormously accelerated when solar energy acts through the agency of air and water

OROGRAPHICAL ASPECTS

Orographic Control of Rainfall.—The sun's heat raises water-vapour from the hydrosphere and sets up a system of winds which carry it over the land When vapour-laden air is raised in the atmosphere by any cause it cools and the vapour condenses to fall as rain, snow or hail When the uprising is due to storms of the cyclonic, squall or thunder type the place where the rain falls depends on the intensity of the meteorological disturbance and the path it takes, conditions which have no clear relation to the form of the land surface The dominance of orographic control asserts itself, however, in the much more common case of a steady sea wind blowing in horizontally towards the land Vapour carried by such a wind does not condense over the sea and to a very slight extent on low islands or level plains, but when it encounters rising ground the wedge-like action of the land compels the air to rise and as the slope increases in steepness the rate of rising is accelerated, cooling becomes rapid and rain falls more and more heavily as the height increases until if the range is high enough all available moisture is deposited as rain on the slopes, or as snow on the summits and the air descends on the other side as a drying wind In these circumstances the windward slope is abundantly watered; the leeward lands are arid On lower hills the maximum rainfall occurs just over the summit as the air continues to rise by inertia for a little way after the summit is passed So close and intimate is the relation between rainfall and land forms that a map of the rainfall of western Europe, to take a typical example, is a close repetition of the orographical map

Orographic Control of Glaciers and Rivers.—When snow is the material dragged down by gravity from the mountain tops, its plastic nature, even when compressed by its own weight into ice, causes it to flow along the valley lines extremely slowly until the glacier meets the sea or melts in a valley giving rise to a stream or river Glaciers effect a certain amount of erosion and polishing on their beds and leave very characteristic marks The clay formed in this process with the boulders which fell on the ice from above heap great moraines on the lower ground which often produce an entirely new configuration of the surface

When rain falls on a hillside it runs over the surface in trickles which follow the steepest and shortest path downwards, gradually wearing a deeper bed for themselves, meeting where the slopes converge and forming definite streams In their steep torrential course the streams foam along carrying boulders and rock-rubbish with them which continually deepen the channel in which they flow Where an abrupt change of level takes place the stream plunges over as a waterfall, where a hollow in the ground is encountered the stream fills it up forming a lake whence the water overflows at the lowest point and proceeds along the steepest path to the sea, or in an arid region to a salt lake with no outlet As the slope of the land diminishes its control of the flow becomes feebler, the current slackens, the material carried along by the water is dropped by degrees until only fine mud is moved by the slow current which meanders on its plain, shifting its course with every flood, and if the tides at its mouth are not too strong, gradually building a delta out to sea The course of a river and of the ramified tributaries coming into it is absolutely dictated by the primitive land forms, but by degrees the river system entrenches itself in the land, always deepening its valleys, until rivers become the strongest and most permanent lines in nature The deepest drainage line is termed the *thalweg*, literally "dale-way" of a river The area sending the rain which falls upon it to one river is termed the basin, the drainage area or the gathering ground of that river, and the line which divides it from neighbouring drainage areas is termed a watershed, water-parting or divide Taking all the continents into account it has been calculated that rather more than half the land area drains into the Atlantic and Arctic Sea the greater part of America sloping eastward and northward and most of Europe, Asia and Africa sloping westward and northward, leaving little more than one-quarter of the land surface to send its rivers in equal measure to the Indian Ocean and the vast Pacific The rainfall of the remainder of the land-surface, amounting almost to one-quarter of its area, does not reach the sea at all but is intercepted by lakes in arid regions where the evaporation so far exceeds the rainfall of the drainage areas in question that the rivers cannot fill up the lake basins to overflowing Regions of internal drainage occur in each of the continents in accordance with climatic conditions the origin of which is still obscure In the case of Lake Titicaca in South America and of the great Salt Lake of Utah, Lakes Van and Urumia in Armenia, and the many salt lakes of Tibet the position is on a high plateau shut in by mountain ranges which shut off the rain-bearing winds In the case of the Aral Sea, Lake Balkhash and Lob Nor in Asia and of Lakes Eyre and Torrens in Australia the elevation is moderate, and in the case of the Caspian Sea, the Dead Sea in Asia and the shotts of the Sahara in Africa, is considerably below the level of the sea

Fluvial Reaction on Orography.—While the *thalwegs* of a river system tend to become permanently established on the primitive drainage lines the watersheds are liable to slow change If the downward slopes on either side of a watershed are of unequal gradient the stream flowing down the steeper slope is stronger and, if the rocks are of equal hardness, it erodes its bed more rapidly and eventually cuts a way backward on to the gentler slope capturing the upper tributaries which formerly flowed down the other side and so enlarging its own drainage-area at the expense of that of its neighbour As a river valley deepens, the sides are cut back by the smaller tributaries and their slope reduced. This is most marked when the climate is rainy as the rain wash helps to bring down the smaller detritus and gradually works out a U-shaped cross-section In an arid

climate the valley is usually narrow and its sides are steep, the cross-section approaching that of a V in the canyons of Arizona.

The Geographical Cycle.—There is nothing more remarkable in geography than the adjustment of a great river system to a land that has remained stable for a long period. Before full adjustment has been attained the river bed may be broken in places by waterfalls or interrupted by lakes After adjustment the slope of the river-bed diminishes gradually without a break in its symmetrical descent from source to sea; a gorge takes the place of a waterfall, a meadow that of a lake The action of rivers on the land has been made the basis of a system of physical geography by W M Davis who classifies land surfaces in terms of the three factors—structure, process and time Of these the most important is time during which the process is acting on the structure A land may thus be characterized by its position in the geographical cycle or cycle of erosion, as young, mature or old, the last term being reached when the base level of erosion is attained By a re-elevation of a peneplain the rivers of the old land surface are restored to activity and start the geographical cycle anew

GEOGRAPHICAL TERMS

Biogeography takes account of the distribution of living organisms on the surface of the globe. As a matter of practical convenience the term is usually limited to the land surface, leaving the life in the sea to be treated as a subdivision of oceanography The biogeography of the land is divided into Phytogeography which deals with the distribution of plants and Zoogeography which is concerned with the distribution of animals The distribution of plants is controlled mainly by soil, climate and barriers to the natural spread of seed The older students of biogeography devoted most attention to the distribution of species and divided the surface of the earth into regions in which similar species preponderated The difficulty of deciding the boundaries of such areas lies in the fact that each small group of allied species requires a geographical classification of its own By making various compromises different phytogeographers have put forward schemes of subdivision of which that of Oscar Drude is typical. Drude adopted the climate zones as his chief units dividing them according to the continents, (1) the Arctic-Alpine Zone including all regions bordering perpetual snow, (2) the Boreal Zone including the temperate parts of the three northern continents, (3) the Tropical Zone divided into that of America and that of Africa and Asia, (4) the Austral Zone including the very dissimilar subregions of South America, South Africa and Australia, and (6) Oceanic including all oceanic islands Zoogeographers have, in like manner, endeavoured to divide the earth's surface into faunal regions according to the occurrence of similar species. P L. Sclater's divisions take account of a large number of facts, they are (1) Palaearctic including Europe with Africa north of the Atlas range and Asia north of the Himalayas, (2) Ethiopian including Africa south of the Atlas and Madagascar, (3) Oriental including southern Asia and the northern half of the Malay Archipelago, (4) Australian including the southern islands of the Malay Archipelago, Australia, New Zealand and Polynesia, (5) Nearctic or North America and (6) Neotropical or South America

Ecology.—In the last thirty years biogeographers have devoted increasing attention to ecology which means the relation of organisms or groups of organisms to their environment, and as the factors of environment are very largely geographical the ecological as distinct from the floristic or faunistic distribution of plants and animals is now an object of active geographical research The associations of plants which thrive in the same environment give a distinctive character to a district, and the variable factors are so numerous that any complete classification of the districts must be complicated The subject is dealt with in great detail from the botanical point of view in PLANTS: *Ecology*. Here it is enough to indicate the broad outlines of successive ecological zones (each susceptible of minute sub-division) from the pole to the equator based on the habit and luxuriance of growth of the several associations They are (1) Polar Ice Desert where there is practically no life (2) Frozen Tundra, the surface of which thaws in summer and bears mosses and dwarf herbage, the growing period being short, moisture being abundant and temperature low, this merges through temperate bogs and moorlands to (3) Temperate Forests of evergreen or deciduous trees where the growing season is longer, rainfall and temperature are moderate, (4) Temperate Steppe or prairie where rainfall is scanty and temperature extreme while grasses and bulbous plants predominate. (5) Arid Desert with rainfall at a minimum and range of temperature at a maximum allowing only the sparsest growth of plants specially modified to conserve moisture (6) Tropical Bush where the growing period is restricted by drought; high temperature and light rainfall favour grass and shrubs and (7) Equatorial Forest where great heat and abundant moisture encourages the most exuberant vegetation as the growing season is continuous throughout the year. Each plant association and the animals which accompany it tends to get into adjustment with the geographical environment and to extend its district as far as natural barriers permit. Any change brought about from without, such as the incursion of new species or the destruction of some of those established disturbs the balance of life and may lead to very remarkable changes The study of the flora and fauna of primitive lands separated by barriers opposing various degrees of resistance to the migration of species led Darwin, Wallace and Hooker to develop the theory of the evolution of species by natural selection The same phenomena seen in the light of ecology enable geologists to sketch the distribution of land and sea in the various geological periods, this study is known as palaeogeography

Human Geography.—This takes cognizance of the distribution of mankind and of human societies in relation to all the conditions of geographical environment, bearing the same relation to anthropology that biogeography does to biology In the view of some writers this is the whole theme of geography which they define as the study of the earth in its relation to man, other writers look on it only as a division of biogeography and they would define it as the ecology of the human species The view taken in this article is that just as the phenomena of life require biogeography to be considered not as part of physical geography but as superimposed upon it, so the phenomena of mind require that human geography be regarded, not as a part of biogeography, but as superimposed upon it as a higher storey of the great structure of geography the foundations of which are physical and mathematical Friedrich Ratzel developed the subject in his *Anthropogeographie* which has long been the standard presentation His students have applied the principles he laid down to elucidate many detailed problems Those who have made original contributions of this kind in English include Ellen Churchill Semple, Mark Jefferson, Ellsworth Huntington and J Russell Smith in America and Marion I Newbigin, Halford Mackinder and H J Fleure in Great Britain In France the subject has been handled in a slightly different orientation by Vidal de la Blache and with great fullness, charm and clarity by Jean Brunhes whose *Géographie Humaine* has been translated into English by Isaiah Bowman and R E. Dodge. All authorities agree in dealing with human geography on the basis of the control exercised upon man in his settlements and in his movements by geographical conditions especially the relief of the land, climate and the distribution of plants and animals, but all also recognize the reaction of man on his environment which increases towards completeness with the civilization of the higher races The study of human geography involves the use of statistics, such as census reports and registration returns of births, marriages and deaths in order to take account of the ever-changing relation of populations to inhabited areas This specialized study acquired the name of Demography in the middle of the nineteenth century.

Ethnography considers the different races of mankind and their subdivisions with reference to the areas they inhabit, their languages, cultural development and religions.

Political Geography takes account of the relation of organized groups of people to the region they inhabit In the case of nomadic tribes with no permanent tie to any particular portion of land, political geography hardly exists, but it becomes important as soon as people settle on some position favourable to their needs under the control of chiefs or committees The smaller units may

confederate or coalesce to form larger organizations under more powerful leadership each controlling a larger area recognized as a country. As time proceeds countries, once small and possibly separated by vast stretches of empty territory, grow in size until their boundaries meet and they fill the whole continent on which they are situated. Political geography has mainly to do with the boundaries and mode of government of countries.

Historical geography may thus be taken as an introduction to political geography A typical country is a natural region with fixed boundaries occupied by a homogeneous nation of one race, speaking one language and content to live under one code of laws In such a country patriotism, which is a product of geographical conditions, and loyalty, which is a racial instinct, are one, and this harmony produces a stable, independent and powerful nation In many cases contiguous countries differ from each other in race, language and religion, thus conditions favourable to the growth of rivalry and misunderstanding already exist The efforts of a homogeneous state to extend its boundaries or to protect them from the aggression of a neighbouring state have led to the development of military geography

Often differences of race and language occur within a country, alien elements being grouped together voluntarily or otherwise under one government, then diverse loyalties tend to weaken the spirit of patriotism without developing that of international brotherhood The boundaries are not always natural, coastlines, mountain ranges, watersheds or rivers forming only a part of them, and sometimes these are hard to delimit Boundaries in undeveloped countries are often most satisfactory when defined by the meridians and parallels of pure mathematical geography which traverse all physical features with indifference Most often boundaries are fixed by treaties so as to attempt to take account of historical facts or ethnographical conditions, or it may be to secure a share of certain favourable territories at the cost of dividing people of one race and language between two countries to one of which they are alien The question of national boundaries is the most difficult part of political geography

Commercial Geography.—This deals with production, transport and exchange of useful commodities J S Keltie proposed the name applied geography for this aspect but that name is too wide and should equally include political geography. It rests as largely on economics as political geography does on history Primitive tribes living in a tropical forest afford the simplest example of what might truly be called economic geography or even human ecology, for depending only on wild fruits and the hunting of animals the savage is in harmony with the rest of nature and the power of environment is complete As civilization advances man begins to react on his environment, introducing flocks of domestic animals to the grass-lands, cultivating the soil in order to replace the native flora by roots and fruit and grain and fibre-plants, digging for minerals, smelting metals, devising tools and machinery As division of labour extends trade becomes essential, means of transport have to be found, commerce established The control of physical geography, at first dominant in dictating sites of settlement and lines of communication, gives way with the improvement of processes until cost of production, manufacture and distribution is the final arbiter as to whether raw material shall be brought to the site of power or power to the source of raw material or both to convenient centres for distribution G G Chisholm's *Commercial Geography* is the standard English text book

Regional Geography.—The attempt made in the foregoing sections to unravel the various threads interwoven in the fabric of geography is apt to spoil the pattern in the reader's mind unless they are put together again in a concrete synthesis For this reason the early teaching of geography should begin not with general principles but with the example of a familiar locality from which the world beyond may be opened out as it was opened to the early explorers, and gradually explained as it was explained by the early theorists who fitted facts together in logical order The scope and bearing of geography can only be fully grasped by the systematic study of a definite region, a river-basin as taken by T H Huxley in the introduction to his *Physiography* or an island, a mountain group, a country or even a continent A. J Herbertson, when professor of geography at Oxford, laid great stress on regional geography and made a successful attempt to divide the world into natural regions of large extent. The degree of detail must be adjusted inversely to the size of the area under review, but the order of treatment and the inter-relation of the different aspects are the same whatever the magnitude of the work The material for regional studies is enormous but it is doubtful whether it is anywhere complete. The scheme for a regional survey of the British Isles on the basis of the Ordnance Survey map of 1 inch to the mile (H R Mill in *Geographical Journal* 7 [1896], 345 and 15 [1900] 205, 353) proposed the map-sheet as the unit for the preliminary description which should take account also of the Geological Survey maps on the same scale, the hydrographic charts of the coast, the unmapped data of the Meteorological Office, the Census Reports, the Statistics of the Ministry of Agriculture, the Ministry of Health and the Board of Trade When these official sources were dealt with new surveys would be required to take account of plant associations in uncultivated districts, of native fauna, of local industries and customs and much besides It was proposed to generalise the sheet-descriptions in groups of natural regions and finally to digest the whole into a treatise on the geography of the British Isles The project remains a fragment On a grander scale the American Geographical Society under the guidance of Isaiah Bowman has undertaken a regional study of Latin America of which a stimulating instalment on the Central Andes by A G Ogilvie appeared in 1922 The regional idea has been fruitful in developing the most recent geographical research in all parts of the world, especially in France and in Germany where the work of Gustav Braun on the Baltic lands and that of Fritz Machatschek on the Sudetic region are models of their kind, while A Hettner's treatment of the continents in his *Landerkunde* is a perfect application of the regional idea to the largest areas

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GEOID: *see* GEODESY

GEOK-TEPÉ, a former fortress of the Turkomans, in the Turkmenistan S S R, lat 38° 12′ N, long 57° 58′ E, in the oasis of Akhal-tekke, on the Transcaspian railway, 28 m N W of Askabad It consisted of a walled enclosure 1¾ m in circuit, the wall being 18 ft high and 20 to 30 ft thick In December 1880

the place was attacked by 6,000 Russians under General Skobelev, and after a siege of twenty-three days was carried by storm, although the defenders numbered 25,000 A monument and a small museum commemorate the event

GEOLOGICAL ARTICLES. In addition to the general article GEOLOGY, which treats of the history of the science and gives a sketch of its physical and stratigraphical divisions, there are in this *Encyclopædia* long articles treating of special branches, especially PETROLOGY, PALAEONTOLOGY, MINERALOGY, CRYSTALLOGRAPHY, ORE-DEPOSITS, METAMORPHISM, VOLCANOES, the GLACIAL PERIOD Each of the more important varieties of rocks and mineral species is described in separate articles; since, however, geologists and mineralogists have introduced an enormous number of unnecessary names for minor varieties of rocks and minerals, as well as for the smaller subdivisions of the stratified rocks, it has not been found possible to have separate articles for all of them but in the index references are given to the places where they are described or referred to The longer articles contain selected bibliographies of the classics of the subject and modern works in which full details will be found. For each of the major subdivisions of the stratified rocks (geological systems), a separate article is provided: *e g*, CAMBRIAN, TRIAS, EOCENE, while accounts of the geology of the principal countries of the world will be found in the articles on those countries

GEOLOGICAL SOCIETIES. This account also includes mineralogical and palaeontological societies and institutions The first *International Congress of Geology* took place at Bologna in 1878 The *Geological Society of London*, founded in 1807 and incorporated in 1826, is the largest and most important in Great Britain; it has published *Proceedings* (1834–1846), *Transactions* (1811, etc), and a *Quarterly Journal* (1845, etc). The *Geologists Association* was instituted in 1858, and issues *Proceedings* (1859, etc) The *Mineralogical Society* (1876) has united with it the *Crystallogical Society*, it issues the *Mineralogical Magazine* (1876, etc) The *Palaeontographical Society* was founded in 1847 for the delineation and description of British fossils, it issues *Publications* (4to, 1847, etc) The *Royal Geological Society of Cornwall* (1814) devotes special attention to the mining interests of the county, and publishes *Transactions* (1818, etc). It holds its meetings at Penzance The *Geological Society of Edinburgh* (1834) issues *Transactions* (1870, etc) The *Royal Geological Society of Ireland* (1832) principally studied the geology of the country It published a *Journal* (1837, etc) There are also the *Geological Associations* of Leeds (1874) and Liverpool (1880), *Trans*, and the *Societies* of Liverpool (1859), *Proc*, and Manchester (1838), *Trans*

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GEOLOGY, in the broadest sense, has for its object the elucidation of the history of the earth and its living inhabitants. For practical purposes, however, it is necessary to adopt somewhat arbitrary limitations The earliest stages in the development of the earth belong to astronomy and cosmogony, whereas, at the other end of the scale, geology in some of its aspects merges into history and geography, as well as into the biological sciences, including anthropology and ethnology It may perhaps be said that the province of geology begins at the period when the earth acquired a permanent solid crust, from that time onward it studies the development of the physical features of the earth, the composition and structures of the rocks composing it, and the evolution of animals and plants from their unknown beginnings It will thus be seen that geology is a very comprehensive subject, closely linked to numerous other sciences, and capable of being regarded from many different points of view, but for most purposes it can be divided more or less clearly into four distinct branches, or five if, as is usual, the cosmogonic aspect is included

1 *Cosmogony* deals with the relation of the earth to the solar system and to the universe, its origin and early stages

2 *Physical Geology* is the study of the forms of the earth's surface, their structure, their manner of origin, and the nature of the processes that have moulded and are still modifying it.

3 *Petrology* describes the composition of the rocks that now form the accessible portion of the crust, and their mode of origin

4 *Palaeontology* may be defined as the biology of fossils, the remains of former animals and plants now buried in the rocks

5 *Stratigraphical Geology* works out the history of the earth and its geography in past ages through the study of the rocks and the fossils that they contain

The present article includes sections dealing with the second and fifth of these categories, Cosmogony, Petrology and Palaeontology are relegated to separate articles

I. HISTORY OF THE SCIENCE

The earliest beginnings of geological thought, like those of many other sciences, are so mixed up with myth and legend and vague cosmical speculations, and so little founded on observation and induction, that a lengthy consideration of them would not be very illuminating from the scientific point of view, though of much interest in the development of philosophy and psychology However, even these myths and legends must have had their basis in the observation and interpretation of natural phenomena, so that they are in some sense geological

It so happens that the Mediterranean basin, the home of many of the early civilizations whose written records have come down to us, is an area in which geological phenomena are peculiarly well displayed and striking, and it may well be a matter of wonder that the acute thinkers of antiquity did not manage to arrive at a more reasonable and more correct interpretation of the facts than they did it is perhaps worth remembering that geology even in its modern forms depends far less on complicated instruments and appliances than almost any other science It is nearly all naked-eye observation of things on a large scale, and therefore might have been thought peculiarly well adapted to development at an early stage of civilization.

Many of the earlier philosophers of Greece and Rome were naturally dissatisfied with the vague and often obviously impossible theories of the meaning of natural phenomena embodied in the popular myths and traditions, and sought to find more reasonable explanations of them The opinions entertained in antiquity on these subjects may be conveniently grouped under two heads (1) geological processes in operation at the time, and (2) geological changes in the past

1 *Contemporary Processes*—Earthquakes, owing to their often disastrous character, received much attention from the Greeks and Romans. Aristotle, in his *Meteorics*, quotes the views of older writers and rejects them in favour of his own idea that

earthquakes are due to wind within the earth, produced by the warmth of the sun and internal heat. He looked upon earthquakes and volcanic phenomena as closely connected, the eruption being due to the final escape of the wind that caused earthquakes. Very similar and equally crude ideas were put forward by Lucretius, who also followed Anaximenes in attributing earthquakes in part to falls of rock within the earth Strabo recognized that Vesuvius was a dormant volcano, though there was then no record of an eruption, he continued to believe in wind as the active agent in underground disturbances He cites in his *Geography* a number of cases of sinking and rising of land and he recognized that some islands are volcanic, while others were originally part of the mainland The most detailed account of earthquakes that has come down to us from antiquity is in the *Quaestiones Naturales* of Seneca He was much interested in an earthquake at Naples in AD 63 and distinguished several different motions of the ground, up and down, oscillatory and vibrational He held firmly to the old idea that the most important factor was wind, while admitting the possibility of some shocks being due to collapse of caverns Volcanoes he supposed to be due to this wind meeting stores of sulphur and other combustibles, which were set on fire by friction

The action of rivers also, being of much importance to mankind, was observed with more or less care Herodotus noted the great amount of silt brought down annually by the Nile, and pertinently remarked "Egypt is the gift of the river," which is perfectly true Aristotle displays considerable knowledge of the drainage system on the north side of the Mediterranean basin He refers to the mountains as condensers of rain and snow and shows that the largest rivers rise in the highest ground He also points out how river deposits are encroaching on the sea, and mentions specially in this connection some parts of the Black Sea, where after sixty years it became necessary to use ships of much lighter draught, as the water had become much shallower and would soon be converted into dry land Strabo also discussed the formation of plains and deltas by rivers

2 *Processes of the Past*—It so happens that at many places around the Mediterranean there are found deposits at high levels containing abundance of shells very like the present inhabitants of that sea These naturally attracted attention at an early date, and are often referred to in classical writings as proofs of elevation of the land or a former much wider extension of the sea Xenophanes of Colophon (614 BC) noticed the occurrence of sea-shells among the mountains, Xanthus the Lydian (464 BC) found scallops and cockles far from the sea in Armenia and Phrygia Herodotus, Eratosthenes, Strato and Strabo noted vast quantities of fossil shells in Egypt, along with beds of salt, as proofs of a former extension of the sea Aristotle recognized clearly that areas once covered by the sea are now dry land, and that land may one day reappear where there is now sea He regarded these changes as periodic, but requiring a long lapse of time and therefore likely to escape our notice In a famous passage in his *Metamorphoses* Ovid affirms the interchange of land and sea, the wearing away of mountains, the disappearance of rivers, the submergence of land owing to earthquakes, the formation and disappearance of islands, the uprise and extinction of volcanoes

From these selected examples it might appear that the classical writers had accumulated a good deal of observational material, but in point of fact most of the conclusions that they drew as to ultimate causes were mere speculation and guesswork It can hardly be said that scientific geology made any real progress throughout these ages

Mediaeval and Early Geologists.—During the dark ages that followed the collapse of the Latin culture of the Roman Empire before the invasion of the Germanic barbarians geology naturally made no progress, and even the great scholastic philosophers of the 13th century were apparently not much interested in natural phenomena What science they knew was mainly derived from Greece and Rome The Arabs however collected and translated the literature, and a treatise ascribed to Avicenna contains some very modern ideas on the origin of mountains

After the general revival of classical studies, the problems of geology, as dealt with in the ancient writings, once more began to attract attention, especially in Italy In that country fossil shells are very abundant, and several different theories of their origin were put forward Some writers regarded them as mere freaks of nature *"lapides sui generis,"* which had never been alive, others considered them to be relics of the universal deluge More practicable theories soon began to prevail Leonardo da Vinci (1452–1519) maintained that they had once been normal living organisms, and that what is now land had formerly been covered by the sea. Girolamo Frascatorio (1483–1553) claimed that a single temporary deluge was inadequate to produce the observed effects, but that the mountains in which the shells are found must have been uplifted from the sea

But it was the Catholic ecclesiastic, Nicholas Steno (Stensen) (1631–87) at one time Bishop of Hamburg and Vicar-Apostolic of Denmark, afterwards resident in Florence, who must be regarded as the founder of modern geology and mineralogy After making a world-wide reputation as an anatomist, he turned to the study of fossils, and in 1669 published a small tract with the not very lucid title *De solido inter solidum naturaliter contento* in which he developed his ideas as to the past history of the earth as derived from his study of the rocks, dealing with many of the fundamental problems of physical geology and stratigraphy on quite modern lines

The Italian geological school of this period also included Antonio Vallisneri (1661–1730) who had a wide knowledge of fossils, and Lazzaro Moro (1687–1740) who made an extensive study of stratigraphy but attached too much weight to volcanic accumulation as the source of sedimentary deposits

The Cosmogonists and Their Successors In other countries however, and especially in England, the study of geology ran on rather different lines Instead of a patient accumulation of facts and inferences from those facts alone many writers indulged in fanciful speculation and wildly extravagant theories of cosmogony, mostly founded on sheer imagination During the last twenty years of the 17th century there appeared a number of writings which attracted attention mainly by their sensationalism, both in England and abroad As examples may be mentioned the works of Thomas Burnet and William Whiston Hardly less fanciful in his theories, although a much better observer, was John Woodward whose *Essay towards a Natural History of the Earth* appeared in 1695 His large and valuable collection of fossils is still religiously preserved intact in the Sedgwick Museum at Cambridge, in accordance with the terms of his will Woodward published a catalogue of this collection in 1728–29 under the title *An attempt towards a Natural History of the Fossils of England* It is to be noted that at this time the term *fossil* included minerals as well as organic remains and the Woodwardian Collection contains some very fine mineral specimens

A striking contrast is afforded by another group of geologists in France and Germany, who gave to the world the first really practical ideas as to the evolution of the earth The first of them was René Descartes (1596–1650) who ascribed the origin of the earth and the other planets to the cooling of an originally incandescent mass like the sun, leading to the formation of a solid crust over a still hot nucleus

The ideas of Descartes were enlarged and systematized by Wilhelm Gottfried Leibnitz (1646–1716) whose work has had a permanent value In his great tract, the *Protogaea,* published only in 1749, he traced the passage of the earth from an incandescent mass of vapour to a molten globe, which by further cooling acquired a solid crust, perhaps now surviving in part as some of the most ancient rocks He thought that as cooling went on great cavities might be left, filled with air and water, these cavities by collapse might give rise to valleys, while the more solid parts formed the mountains Water escaping from the cavities might form the sedimentary deposits Leibnitz also attached much importance to fossils as indices of past changes and alternations of land and sea

Of much greater importance however in the development of geology was the work of G L L de Buffon (1707–88) who had a much wider acquaintance with rocks and fossils He accepted the ideas of Descartes and Leibnitz as to planetary evolution, but

in his first geological work (1749) he supposed that fossils had all been deposited in a universal ocean, which was later swallowed by the cavities within the earth Thirty years later, in his famous *Epoques de la Nature*, he endeavoured to draw up a chronology of the earth, dividing it into six periods of unequal length, based on the supposed rate of cooling from the incandescent stage

Modern Geologists.—With the work of James Hutton (1726–97), which is rather difficult reading, and its lucid exposition by John Playfair (1748–1819), we at last come to the beginnings of modern geology James Hutton was originally a medical man who studied at Edinburgh and Paris and took his doctor's degree at Leiden Later he took to farming in Berwickshire and eventually went to live in Edinburgh, where he published his *Theory of the Earth, with Proofs and Illustrations* (2 vols., 1795), an expansion of a paper read to the Royal Society of Edinburgh Owing to the obscurity of the style however the book did not receive full recognition till the appearance of a kind of commentary on it by Playfair, entitled *Illustrations of the Huttonian Theory*, published in 1802. This was so clear and striking as to gain a general acceptance for Hutton's ideas, which may perhaps be fairly summed up in the general formula that the processes that have been at work on the earth in the past are the same as those now in operation, and that it is not allowable to invoke any agents which cannot now be seen and proved to be effective This affords a strong contrast to the wild speculations of the cosmogonists and is in fact the foundation of the so-called Uniformitarian school of geology, which has prevailed almost without opposition ever since, although there is now a growing feeling that it has been pushed too far, though true in its main features Since the ideas of Hutton and Playfair have to a large extent become the commonplaces of physical geology, this subject is discussed more fully below (*see* II., PHYSICAL GEOLOGY) The work of Sir Charles Lyell (*see* below) was the direct consequence of Hutton's writings

To return for a while to the French school, it may perhaps be said that the founder of invertebrate palaeontology was Lamarck (1744–1829), who is universally regarded as one of the originators of the doctrine of evolution and continuous progress of living beings, as opposed to the theory of catastrophic destruction and repeated creations, which largely prevailed everywhere during his time This eminent naturalist turned his attention somewhat late in life to the study of fossils, which led him to formulate some geological ideas very similar to those of Hutton and Playfair, though arrived at quite independently However, he did not pay sufficient attention to the possibilities of earth-movement, and attributed even the highest non-volcanic mountains to the wearing away of elevated plateaux, and he attached an exaggerated value to the tides as geological agents As a biologist he brought fossils into the forefront of his theories as a means of working out the history of the earth and the succession of events

In a somewhat similar way the great comparative anatomist, Cuvier (1769–1832) is to be regarded as the founder of vertebrate palaeontology Cuvier's knowledge of comparative anatomy was so marvellous that he was literally almost able to reconstruct a whole animal from a single bone or tooth In a preliminary section of his great work, *Récherches sur les ossemens fossiles* (1821), he gave an outline of what he believed to have been the history of the globe This was frankly catastrophic, in the most extreme form of the doctrine, he believed that there was evidence for the occurrence in the past of cataclysms of world-wide extent, far surpassing even the conventional destructiveness of the Biblical deluge, he rejected entirely all ideas of organic continuity and postulated fresh creations of new forms of animals and plants It is interesting, to digress for a moment, to find that after a century of the quietistic Uniformitarianism of Hutton and Lyell, there are now signs of a return to a form of catastrophism, though without a complete destruction of life

During the latter half of the eighteenth century and the beginning of the nineteenth there was a violent and rather absurd controversy as to the origin of the igneous rocks, some writers continued to maintain, up to the middle of the eighteenth century, that volcanic phenomena are due to combustion and they attributed lava flows to the melting of ordinary rocks, such as clay and sandstone, by the heat of such combustion The true nature of vulcanicity will be discussed in detail later: it must suffice to say here that eruptions are due to the escape, under gas pressure, of portions of the heated interior of the earth in a molten state, giving rise to flows of lava and showers of ashes, with steam and other vapours. But in earlier days trouble arose over the nature of certain rocks found among the earlier formations while resembling the products of modern volcanoes, and also as to the origin of such rocks as granite which appear to have invaded newer formations while in a molten condition

The last and most famous of the geologists of this older school was Abraham Gottlob Werner (1749–1815) of Freiberg, Saxony Werner apparently was a magnificent teacher, although the doctrines he taught were erroneous, and he certainly deserves the utmost credit as the real founder of economic geology The Mining Academy at Freiberg has been in the forefront of the study of the metalliferous deposits ever since his day, but Werner's obstinate adherence to the worn-out doctrine of the aqueous origin of basalt had a disastrous effect on petrographical geology for many years

As early as 1752 J. E. Guettard (1715–86) had studied the extinct volcanoes of Auvergne and had shown that the basaltic lava, there so abundant, far from being a chemical precipitate, as supposed by Werner, was in reality poured out in a molten state at many different times and places Desmarest (1725–1815) followed this up a few years later by mapping the area in detail and working out the whole complicated history In Scotland Hutton proved the intrusive nature of granite and various "trap" rocks J F d'Aubuisson, who had written a memoir on the aqueous origin of the basalts of Saxony, was converted by a visit to Auvergne and even the great Leopold von Buch, at one time the most shining light of the Neptunist school, abandoned his Wernerian faith for the same reason From that time the igneous origin of both deep-seated intrusions and surface lava-flows was established

The Nineteenth Century.—In the early years of the nineteenth century geology began to receive in England an amount of attention not hitherto accorded to it A number of eminent men, keenly interested in the subject, but rather bored by the futile speculations of the cosmogonists and by the bitter personal Wernerian controversies, combined in 1807 to found the Geological Society of London. The avowed object of the founders was to steer clear of all preconceived notions and ready-made theories, and to collect the facts for future discussion

From about this same date, the beginning of the nineteenth century, the history of the development of geology becomes so complicated that it is impossible to follow up all the threads simultaneously, or within any reasonable compass to give a general account of the whole The various branches, such as physical geology, petrology, palaeontology and stratigraphy, began to have a more or less clearly defined separate existence, each with its own line of evolution and development, under the impulse of varying forces, such as the advance of physics and chemistry, the coming of evolution, the advance of geographical exploration and so forth, and all these various lines of progress ceased to be confined to one small corner of north-western Europe, but spread over the world Hence from this point onward the only possible course is to exercise some kind of selection The development of petrology and palaeontology will be sufficiently apparent from the articles on those subjects, while the closely allied subject of mineralogy has a history of its own—troubled by far fewer controversies What follows, therefore, is a brief sketch of the progress of general geology, especially on its physical and stratigraphical sides, in the British Isles during the nineteenth century, with occasional excursions into other parts of the world where needed by the context

One of the most remarkable figures in the whole history of geology is William Smith (1789–1839) a man of quite humble origin, who spent most of his life as a canal engineer in Somerset and as a land-agent near Scarborough. During a busy professional life he managed to find time to construct a geological map of England and Wales, and at the same time to work out the succession of the stratified formations of the country by means of

their contained fossils The majority of the rather rough-and-ready names that he coined for the different formations have remained to this day as the classical designations, and it is to be hoped that they may so continue to remain, a reminder to the stratigraphers of all countries of the birthplace of their science William Smith has aptly been called the "Father of British Geology," and his large coloured wall-map, dated 1815, compares to some extent with the latest productions of the Geological Survey and was a monumental achievement for one self-taught man

The work of the pioneers of physical and stratigraphical geology was admirably generalized and amplified by Sir Charles Lyell (1797–1875). He was able to travel extensively throughout his life, and to add by his own acute observations great masses of facts to the stores accumulated by his predecessors His *Principles of Geology* (3 vols , 1830–33), which rapidly passed into numerous editions, is one of the great books of the world On the physical side the line of thought is strictly Huttonian, an exposition of the doctrine of uniform causes, while on the biological side for many years Lyell maintained the permanence of species, but in later life he frankly became a convert to the doctrine of evolution, especially the form of it expounded by Darwin It is a question which of these great men was the more influenced by the other, the whole tendency of Lyell's work was in the direction of converting geology from a physical into a biological science, and he took little interest in mineralogy, apart from volcanic phenomena Lyell's *Principles* remains a classic of geology, and may still be profitably read About the same time the work of G P Scrope in Auvergne, following on the lines laid down by Guettard and Desmarest, established the modern science of vulcanology

Up to the first quarter of the nineteenth century very little was known about the older rocks constituting the western and the northern parts of Great Britain, though by 1830 the succession of the newer formations in the south and east had been fairly thoroughly worked out About this time Adam Sedgwick (1785–1873), Professor of Geology at Cambridge, and Sir Roderick Impey Murchison (1792–1871) began to investigate the rocks of Wales and the western Midlands Sedgwick started in the north-west in Caernarvonshire and succeeded in working out the succession of the slaty rocks far to the south-east of his starting point, calling them the Cambrian system Murchison on the other hand began in Shropshire and worked north-westwards, naming his rocks the Silurian system In general terms Sedgwick was working upwards in the succession of the stratified rocks and Murchison downwards, but the sequence was not quite simple The rocks there are thrown into wavy folds, by crumpling of the crust, so that there is some repetition of strata at the surface The natural result was that the respective systems of Sedgwick and Murchison overlapped Murchison claimed for his Silurian system nearly the whole of Sedgwick's Cambrian, leaving him only a remnant of unfossiliferous slates at the bottom, while Sedgwick on the other hand perhaps claimed too much for his Cambrian Lapworth proposed as a practical compromise that the beds mostly in dispute (Murchison's Lower Silurian) should be constituted into a separate system, called the Ordovician This is now universally accepted, though for many years Sir Archibald Geikie (1835–1924) valiantly upheld the Lower Silurian

The brilliant and original work of Charles Lapworth (1842–1920) exercised a profound influence on geology in the third quarter of the nineteenth century He established the order of succession of the different forms of the great group of fossils known as the graptolites, which were found to follow one another in a definite evolutionary order, each in a layer of rock (of very variable thickness in different places, be it understood), which Lapworth called the *zone* of that particular fossil. By means of these zones he was able to unravel the intensely complicated structure of the southern uplands of Scotland and of other areas, thus throwing a flood of light on mountain-building and the folding of the earth's crust. By thus revealing the "Secret of the Highlands" he paved the way for the proper understanding of the geology of many other areas. Lapworth's great work has been and still is being ably carried on by his pupils, his followers and their disciples Another problem of first-class importance and somewhat cognate nature that arose during this same period was the question of the time order of succession of the rocks of the north-west Highlands of Scotland and the age of the crystalline rocks composing the central and the southern Highlands. The intensely complicated structures of the far north-west were worked out by Lapworth and the officers of the Geological Survey, and proved to be the relics of an ancient mountain chain of Alpine type In the central and southern Highlands work is still in progress

From this point it becomes impossible to refer in any detail to the progress of geology without mentioning the names of living workers Immense progress has been made in British stratigraphy, mostly in matters of detail, without any very fundamental new discoveries In structural geology one of the most important advances is the recognition of the principle of "posthumous movement," which means in simple language that when once the earth's crust has been crumpled into a fold running in a particular direction, further crumpling is likely to take place along the same line at later dates This principle has proved of immense importance in working out the structure and limits of coalfields buried under newer strata Further, the zonary method of stratigraphy has been extended to nearly all the fossiliferous formations

Physical Geology.—During the last fifty years physical geology has continued to develop, and as is only natural, the geological exploration of the great lands beyond the seas has tended to broaden the originally mainly European outlook In the other continents things are on a bigger scale, and probably geological processes are more rapid, owing to differences of climate, the greater prevalence of volcanoes and earthquakes and so on It has also come to be recognized that in past ages processes probably were, at certain times at any rate, more active and intense than they now are Hence the present conception of physical geology may fairly be described as evolutionary rather than uniformitarian in the strict sense, though there is no proof that processes ever differed notably in kind from those now in operation The differences were mainly in degree Very great attention has been paid of late to the formation of continents and oceans and of mountain ranges, as well as to crust movements in general, but this phase of the subject belongs rather to cosmogony and geodesy than to geology proper Special mention should be made of the great progress of the study of glaciation in the past half century

Petrology.—Turning now to the history of petrology, reference has already been made to the Wernerian controversy By the beginning of the nineteenth century it was generally accepted that both lavas and certain deep seated rocks such as granite were of direct igneous origin, their outpouring or intrusion being brought about by true volcanic action and depending on the internal heat of the earth But for many years scientific petrology made little progress, owing to certain difficulties inherent in the subject Many igneous rocks are mixtures of different minerals while others are of very fine texture A chemical analysis of an obvious mixture is not in itself very illuminating, without other data, and for long these were lacking It was not till in the fifties of last century Henry Clifton Sorby (1826–1908) of Sheffield discovered a method of making thin sections of rocks suitable for the microscope, that any real advance was made Such microscopic examination, largely by the aid of polarized light, is the foundation of scientific petrology It enables us to determine accurately the mineral composition of the rock, its structure and the order of crystallization of the different minerals, also revealing the nature of the finer-grained rocks From the time of this discovery petrology soon began to make great strides in the hands of Haughton, Allport, Bonney, Zirkel and Rosenbusch, to name only a few of the pioneers Similar methods are also applicable to the sedimentary and other rocks The latest developments of petrology, largely due to American and Norwegian workers, are rather in the direction of extremely accurate chemical and physical investigation, coupled with experimental work in the synthesis of rocks and minerals

Prehistoric Man.—It was stated at the beginning of this article that geology tends to merge into various sciences dealing with the living inhabitants of the earth Palaeontology must necessarily do so, and another not very well-defined branch of

geology concerns itself with the origin and earliest history of the human race, thus joining up with prehistoric archaeology The geological history of the human race has of late years been carried back much further than at one time seemed possible

II. PHYSICAL GEOLOGY

Physical Geology is that part of the science which deals with the form and constitution of the accessible portion of the earth, and studies the nature of the processes that have been at work in the past and are still moulding and modifying the earth's surface The term has to be interpreted very widely, in order to avoid unnecessary and confusing subdivisions of the subject, and physical geology has of necessity to take cognizance of all other parts of geology, as well as of mineralogy and of physics, chemistry, biology, etc —which have a direct bearing on it The relationship between physical geology and physical geography is very close

Physical geology also entails some acquaintance with the general principles of meteorology, since climate is a factor of great importance

THE GEOLOGICAL CYCLE

The fundamental principle of modern physical geology is that processes on the broad scale work in cycles The simplest observations show that the land surface as a whole is gradually being worn away by the action of rain, snow, wind, etc The material loosened by these agents eventually finds its way to the sea, where it is finally deposited to form new rock-masses Hence the land is being worn away and the sea filled up But geology shows that in many areas there has been an alternation of land and sea, often many times repeated, hence, part of the sea must have been uplifted to form land to be worn away in its turn It can also be shown that the periods of uplift are also periods of folding of the earth's crust to form mountain ranges, and are usually accompanied by great outbursts of volcanic activity In the history of the British Isles and of North America there is evidence of four or five such cycles, the phases of quiet or disturbance being nearly or quite contemporaneous in the two areas In the southern hemisphere there were also similar revolutions, tending to alternate with those of the north

In the study of such a continuous series of events it is obviously immaterial where we begin For most purposes it is convenient to start with a consideration of the stage that is most clearly displayed before our eyes, namely the degradation of the land, and then to follow the material in its course to the sea, with an investigation of the nature of the accumulations that it there forms These two stages are known to the geologist as *denudation* and *deposition* After these come in natural sequence earth-movements and vulcanicity, leading to the establishment of new earth structures and land-building, whence we arrive at the starting point of another cycle

The Zonary Structure of the Earth.—Regarding the earth as a whole it is easy to recognize four broad sub-divisions of its structure, namely the air, the water, the rocks of the surface and the unknown core below These are arranged as three concentric shells and a nucleus

The Atmosphere —The general character of the atmosphere is described in separate articles (*see especially* ATMOSPHERE and METEOROLOGY), and only a few of its properties have here to be considered Air consists, roughly, of four-fifths nitrogen, one-fifth oxygen, a small percentage of carbon dioxide and a varying amount of water vapour, with small traces of other gases, and a little fine dust in suspension, the last being more abundant in towns and in very dry regions The oxygen, the water vapour and the carbon dioxide are the geologically active agents, bringing about numerous chemical and physical changes in rocks The water vapour also is of primary importance as the source of rain, snow and dew

The Hydrosphere —This includes all the water on the surface of the globe not only the sea, but also the rivers and the lakes of the land areas, both salt and fresh It is the custom to speak of salt and fresh water as if they were essentially different, but in reality the difference is one of degree only All natural waters contain dissolved salts, but when there is not enough salt to taste the water is called fresh The water of the open sea is very salt, containing about 3·5 per cent of salts, mainly sodium chloride, but also including chlorides and sulphates of potassium and magnesium, a little calcium carbonate and traces of bromine and iodine Many salt lakes contain far more salt than this and some are saturated so that they actually deposit solid salts in crystals The calcium carbonate in sea-water, though small in amount, is of great importance, both in forming the basis of the shells of molluscs, crustacea, etc , and as providing the material with which certain rock-building animals—the corals, for instance—and plants do their work. Vast quantities of carbonate are poured into the sea by rivers running through limestone countries, but it is quickly annexed by these shell- and rock-making organisms

The Lithosphere —Under this name is comprised the solid earth, of which the outer part at any rate is composed of rocks (Gk λιθος, a stone). The outer part is obviously solid, but we do not know what is the condition of the interior (*see* EARTH). Strictly the geologist is only concerned with the part he can see or whose condition he can infer by analogy, as will be explained later. Here it need only be said that the core of the earth is certainly made of heavier material than the outside rocky part, which is usually spoken of rather vaguely as the *crust* This term may well be adopted for convenience, although it must not be understood as necessarily implying a sudden change of material or state at any particular depth There is reason to believe that concentric depth-zones do exist in the earth, but we do not yet know for certain what they are made of At any rate the earth as a whole is a very rigid body, as strong as solid steel at least, it is impossible to believe in a liquid interior of any considerable size, although the phenomena of vulcanicity do seem to indicate the existence of local fluid patches, and it is also certain from similar reasoning that the interior is intensely hot The actual composition of the accessible part of the lithosphere and the mode of origin of its component rocks come within the province of *petrology* (*q v*) Another point of first-rate significance in modern theories of earth-physics and earth-movements is the undoubted fact that the distribution of density in even the outer crust is not uniform it is clear that on the whole the continents and mountain ranges consist of light rocks, while those underlying the great oceans are heavier This discovery has far-reaching consequences, for a discussion of which *see* ISOSTASY

The internal heat of the earth, together with the circulation of water from the hydrosphere to the atmosphere and back again to the lithosphere, which is mainly due to the energy of the sun, constitute the main motive power of the geological engine

Denudation.—In an earlier section it was suggested that the best starting point for a discussion of the geological cycle is the wearing away of the earth's surface, or denudation

Weathering —This consists of three stages, weathering, transport and corrasion. The first consists of the loosening of the material of the rocks by various chemical and physical agents, mostly of a meteorological character, rain, snow, ice, the action of atmospheric gases and so on. The meaning of the second term is almost self-evident. to see examples it is only necessary to look at a muddy river during a flood, to examine the material piled up at the foot of a glacier, or to watch the clouds of dust on a windy day The term corrasion needs a little more explanation· it means the work done by the weathered material during transport; the wearing away of the bed of a stream by the sand held in suspension, the scooping out of its bed by a glacier or the fretting of a rock surface in the desert by wind-blown sand The solution of limestone by water, which often leads to the formation of caverns, and the wearing away of cliffs by the sea are also further examples Corrasion at some particular point is often followed by collapse of adjoining rock masses, as when a river undermines its banks The formation of the *screes* so well known in mountain regions is due to the breaking up of the rocks by frost

Purely chemical processes also have an important effect in weathering of rocks Compounds of iron are very abundant in nature and these readily undergo a process exactly like the rusting of steel under the influence of water and oxygen Nearly all rocks show a rusty crust very unlike the appearance of a freshly broken

surface. In the tropics this chemical action is so powerful that normally hard rocks like granite become so soft to a depth of scores or even hundreds of feet that they can be dug with a spade or washed away by hydraulic power in the mining of the valuable minerals that they contain, such as ores of tin The natural denudation of such rocks has also set free great quantities of tin ore, gold and platinum and valuable gems, which are carried down to lower levels and form rich alluvial deposits

Certain sulphides of iron and other metals, which are very abundant in nature, easily undergo oxidation, giving rise among other products to sulphuric acid, which is a most powerful corrosive, and brings about a pronounced decomposition of many minerals and rocks

By the action of these and similar processes the rocks are either removed altogether or reduced to a crumbly condition, so that they may easily be removed

Transport—The next stage of denudation consists of the removal of the material thus prepared by weathering Some constituents may simply be carried away dissolved in water, but more commonly it is transported in a solid form, the chief agents concerned being water, ice, wind and gravity

The transporting power of streams is a commonplace hardly needing elaboration. it is certainly a fact that most streams do nearly all their work in flood-time The amount of mud and silt brought down by great rivers like the Nile and the Mississippi is proverbial, while steeper streams and mountain torrents bring down vast quantities of gravel and great boulders of rock, often to the plains below. There are instances in some of the drier regions of the world, as in parts of Central Asia, where rivers flow into great depressions among mountain ranges and there dry up, owing to great evaporation In such cases there may evidently be terrestrial deposits of very long duration and of very great thickness, but this must be regarded as an exceptional type, although it is believed to have occurred fairly often in the past

The second great agent of transport is moving ice, but of course this is only effective in cold regions, either in the Arctic and Antarctic, or in high mountains in more temperate latitudes, where glaciers are formed They carry down vast quantities of rock-waste derived from the sides and floor of the valleys, and deposit it at lower levels The glaciers of high latitudes, which reach the sea, deposit their material there direct

It is only in desert regions that wind is the chief agent of transport, where it forms sand-dunes, but even in temperate climates a lot of fine dust is blown from place to place in dry weather In East Anglia a lot of material is shifted by wind, and the sandhills of the coasts of western England and Wales and the east of Scotland may also be instanced Such sandhills are common where an on-shore wind prevails and blows the beach sand inland. This is really a process of deposition rather than denudation, but is mentioned here as an instance of the geological power of the wind

In a similar way the transporting power of waves, tides and currents, belongs largely to deposition. The wearing away of coasts by the sea will be considered later, as it is so inextricably mixed up with the formation of marine deposits

Rivers and the Development of Drainage Systems.—It is apparent from what has already been said that rivers form one of the most important, if not the most important, of geological agents under normal conditions of climate, in temperate and also in tropical regions it is really only in the arctic areas that they are non-existent The drainage basin of a river-system is the whole area from which the drainage is carried off by one river and its tributaries; and it has been found by study of drainage systems in areas of simple and uniform geological structure, such as some of the Western States of America, that there is a considerable amount of regularity in the plan and development, and the history of some British river systems has been worked out, though most of these are more complicated

The Ideal River-system—The classical description of the development of an ideal river-system was worked out by G K Gilbert in his *Geology of the Henry Mountains* (1877) Gilbert begins with the conception of the rise of a new continent from the sea, in the form of a simple arch, known technically to geologists as an *anticline*, or *anticlinal uplift* Rain soaks into the ground to some extent, to issue eventually as springs a little below the summit line on either side, thus giving two rows, which are usually supposed to alternate, and not to lie opposite to one another in pairs From these springs streams run down the continental slopes in either direction, naturally choosing the steepest slope, which is also the shortest line to the sea Such rivers are called *consequent* streams, because they are the direct result of the uplift These rivers naturally increase in volume downwards by collecting the rainfall from the lower slopes, which gives rise to tributaries In Gilbert's original theoretical exposition it is argued that these tributaries should run into the main stream at right angles, for the reason that most stratified rocks consist of layers of varying hardness, of which the harder naturally resist denudation more than the softer, hence when the surface of the continent has been lowered somewhat by general denudation there will be strips of hard and soft rock, or of high and low ground, running parallel to the original main line of uplift, and therefore at right angles to the consequent streams In the slight hollows formed by the softer strata the principal tributaries settle down and are called *subsequent streams* In reality they always incline a bit downhill and enter the main stream at oblique angles These subsequent streams themselves develop tributaries which may in practice run at all sorts of angles into the subsequents

Some of the rivers of north-eastern England, such as the Tyne, Wear and Tees, conform more or less to this ideal arrangement though there are complications which cannot be described here in detail The rivers of the west and south of England are even more complicated, since in the course of their history some of them have interfered with others and spoiled their symmetry

Diversions of Drainage—The next thing to be considered is the manner in which some of the more simple of these departures from the ideal development have been brought about One of the easiest of them depends again on the principle just mentioned that soft rocks wear away more quickly than hard ones The general lowering of a valley, by steepening the slopes, makes denudation more rapid

Now let us suppose that for some reason, for example a higher rainfall, denudation is more rapid in the valleys of one subsequent than in another running in exactly the opposite direction along the same line of soft rocks It may then happen that the first named, by working backwards at its head more rapidly, may capture some of the minor streams that originally fed the other Or it might even cut back so far as to intercept the next consequent stream and divert all its water.

Any one who has looked intelligently at the scenery of a mountain region will have no difficulty in grasping what is meant by the idea of a stream working back at its head The steep slopes and piles of detritus at the top of any mountain valley are eloquent witnesses of the process The pass always found between two peaks shows the cutting-down in operation, and indeed the forms of most mountains are the direct result of the encroachment of valleys on their mass in this way The eastward-flowing rivers of Yorkshire and the northern Midlands which combine to form the Ouse and Trent, and eventually the Humber, afford a magnificent example of this process of capture and diversion

Sometimes the original uplift, instead of being an elongated ridge, was a rounded dome Then the drainage system will be radial like the spokes of a wheel, as is seen in the English Lake District Along the courses of most of these radial rivers lakes have been formed, for reasons to be discussed in a later section

Sometimes, again, instead of being a simple arch, it takes the form of two or more parallel ridges Then it is evident that the consequent streams just described must run as tributaries into a river flowing along the trough between the ridges, which is called a *syncline* This trough will probably be tilted one way or the other, so as to determine the direction of this stream, which is also a kind of consequent, since its course is directly determined by the earth-movement The lower part of the Thames below Reading is a river of this kind, flowing in the trough between the

North Downs and the Chiltern Hills

Meanders.—Rivers do not as a rule keep a straight course throughout the whole of their history, but eventually develop curves, called meanders, from the name of a singularly winding river in Asia Minor This depends largely on the fact that there is a limit to the deepening of a valley, which cannot be cut below sea-level, and eventually assumes a very gradual slope from its source to its mouth This limiting level of deepening is called the base-line of erosion When this is reached, the river has to use up its energy somehow, and does so by cutting sideways Any original slight variation from a straight course tends to get accentuated, and this is a cumulative process Cases are known where the curves have become so sharp that the river in a flood cuts across the narrow neck between two bends and shortens its course, leaving part of its bed as a sort of crescent-shaped lake, known as *ox-bows* in parts of the United States

Rejuvenation —If at some time during the existence of a river a further uplift of the land takes place, the river will again begin to deepen its valley backwards from the mouth, thus producing a step somewhere in its course, this is one way in which "hanging valleys" (see *Ice and Snow as Geological Agents* below) can be formed If the river was meandering on a wide plain when the second uplift occurred the result may be a deep meandering gorge, like the course of the Wear at and below Durham The second uplift causes the river to deepen its bed, but it cannot lower the whole plain

Inconsequent Drainage —The types of drainage system hitherto discussed are those in which the arrangement of the rivers is the direct consequence of the structure of the underlying rocks, but some examples are known in which it appears to be quite independent of such structures In certain instances it is observed that rivers, rising at one side of a great mountain chain, cut right through the range and continue their course on the opposite side Some of the best instances are the Indus and the Brahmaputra, both of which rise on the northern side of the Himalayas Again, the Danube twice cuts through the great mountain chain of southern Europe, once at Vienna and again at the Iron Gates (see *Earth Movements*, below) In such cases the only possible explanation seems to be that the river is actually older than the mountains, and kept its course open through them as they rose Such a relation is called *Inconsequent Drainage*

ICE AND SNOW AS GEOLOGICAL AGENTS

It has already been stated that ice is an important agent of transport It is now necessary to consider its efficacy from a more general point of view in moulding the surface of the earth into the existing forms For there is no doubt that in the colder regions of the earth land-ice has a great power of erosion

The existence of permanent snow in any given region is a matter of climate When the temperature is below freezing-point, precipitation falls as snow If the average temperature of any region is below this point it is obvious that the snow will remain, and will continue to accumulate In the arctic and antarctic zones this condition prevails down to sea-level even on the equator the snow-line is reached at about 16,000 feet. Consequently in many temperate regions we find permanently snow-clad mountains, as in the Alps, the Caucasus, the Himalayas, the Rockies and the Andes The snow-line is the level at which the snowfall of winter and the melting of summer exactly balance But in many valleys *glaciers* extend far below this level

Glaciers.—When snow accumulates to a great thickness the weight of the upper part squeezes the lower layers together to form ice, exactly as a handful of loose snow can be squeezed into a snowball Now when ice occurs in very large masses, it acquires, in a manner not yet quite explained, the power of flowing downhill, like a very viscous liquid The rate of flow of a large glacier is very slow, being measurable by inches, or at most a few feet per day, nevertheless they move sufficiently fast to extend below the snow-line, and to do much geological work in transport and corrasion

In addition to the mountain glaciers of the type just sketched, it is necessary to take into account the ice-caps and ice-sheets such as are now found only in the highest latitudes of both hemispheres, but formerly existed in many other parts of the globe (*see* GLACIAL PERIOD) These have often covered enormous areas, and have transported vast masses of material Thus the great Scandinavian ice-sheet of the latest northern glaciation brought innumerable boulders of Norwegian rocks to the east of England, and effected great modifications of the topography of Yorkshire and East Anglia by deposition and erosion

The material transported by mountain glaciers of the Alpine type is derived from two sources Part of it falls on to the surface of the ice from the steep slopes above, where it is mainly loosened by frost action, and part of it is torn from the bed of the glacier by the movement of the ice Much of the surface material eventually falls down cracks (crevasses), and reaches the floor where it becomes mixed up with the material torn from the bed, the two forming the *ground-moraine* The rock waste that remains on the surface also forms moraines, ridges of gravel and sand, whose form and distribution depend on the number of valleys that join to form the glacier Where two valleys join, the trains of moraine from the right bank of one and the left bank of the other combine to form a *medial moraine* down the middle of the compound glacier When a glacier ends in a wide open valley the moraine material is dumped as transverse ridges, often crescent-shaped, called *terminal moraine* Many of the large Alpine glaciers however end in deep gorges, like the Aletsch, the biggest glacier in Europe In such a case the moraine material is usually carried away by the stream that always issues from the end of a glacier, and forms torrential river deposits below

In a good many cases where glaciers have retreated owing to a change in climate, they have left moraine barriers across valleys, these barriers often hold up lakes, as described in a later section

Ice-Erosion and Hanging Valleys —For many years there has been discussion and difference of opinion as to the power of glaciers to scoop out the valleys in which they lie Some authorities maintain that they have little effect, being able only to bring about slight modifications in the form of pre-existing valleys due to rivers Glacier ice is a powerful agent of erosion and has been the main factor in the formation of many great mountain valleys At present probably the balance of opinion inclines to the latter view One of the strongest arguments in favour of extensive ice-erosion is the existence of "hanging valleys," a term denoting (*a*) a sudden steepening of slope in the floor of a main valley for a short distance—a kind of step, and (*b*) the sudden fall of a tributary valley of fairly flat grade in its upper parts down a steep slope into the main valley, sometimes forming a waterfall The last-named is probably the more significant for the present purpose The argument is that the valley system was once occupied by ice, which was thickest in the main valley and therefore more powerful in erosion Hence the main valley was deepened more rapidly than the tributaries, whose mouths were left hanging in the air, as it were Or it might have so happened that there was no ice at all in the tributaries Further it is noticed in many cases that the main valley shows a U-shaped section, with a flat floor, steep sides, and no projecting spurs, whereas the tributaries have the V-shaped section and alternating spurs characteristic of valleys in regions that have never been glaciated Borrowdale in the Lake District shows some good examples of hanging tributaries, *e g* , the Falls of Lodore, and Sour Milk Ghyll, above Seatoller

Glaciers also produce certain characteristic features in the rocks over which they travel, features often only properly observable when the ice has disappeared The surface of the rocks forming the sides and floor of the valley is often remarkably smoothed and polished, with sometimes scratches and grooves produced by stones embedded in the ice, showing clearly the direction of motion In the same way stones embedded in the sole of the ice are scratched by the rock below, and are often found in terminal moraines thus marked. The presence of such scratched stones is one of the best criteria for the glacial origin of a deposit

Roches Moutonnées.—Again, the rocks over which a glacier has passed often show a peculiarly hummocky outline, known as *roches moutonnées,* a term derived from a supposed resemblance to the curly fleece-like wigs of the 18th century These rocks often

show a smooth gentle slope up-stream, due to the grinding action of the ice, and a rough abrupt scarp down-stream, where blocks of stone have been torn off bodily along joints Below a large *roche moutonnée* or any other projecting boss, there is often a long line of debris, this formation being known as *crag and tail* Another notable feature of glaciated valleys is that the smooth and polished rock-surfaces often end abruptly upwards, at the original line of the top of the ice, the slopes above showing the sharp pinnacles of frost-riven rocks, which have not been ground down by the ice All these phenomena are clearly apparent, along with moraines, in regions where there are now no glaciers, giving clear evidence of their former presence

Erratic blocks—Further evidence of the same fact is afforded by what are called "erratic blocks," great boulders which have often been transported far from their original home and left stranded when the ice melted (*see* GLACIAL PERIOD) Such are abundant in all formerly glaciated areas, and are often of the utmost value in tracing the courses of former ice-streams

Wind Erosion.—A brief reference has already been made to transport by wind, the geological effect of which in many desert regions is important, since rocks are to a large degree worn away by the erosive power of the wind-borne sand Opinions have differed as to how much of the denudation of arid regions is actually due to the wind some authorities attribute most of the erosion to the chemical action of dew and salt solutions rising from the ground owing to evaporation, and hold that wind merely puts a superficial polish or etching on forms produced in other ways, other geologists consider that quite large rock-masses can be removed in time by the gradual effect of the sand-blast One very noticeable effect of wind action in many areas is the under-cutting at the base of cliffs, and in dry regions many strange rock-pillars, mushroom rocks and other forms are to be found Such indeed are not unknown in the drier parts of England

As a matter of fact wind is much more important in geology as an agent of transport and deposition than of erosion More will have to be said about this when we come to consider the characteristic deposits of arid regions (*see* also DUNES)

Limestone Regions.—There is another and very distinctive type of denudation which may well be considered here in somewhat more detail It is well known that calcium carbonate, the essential constituent of limestone, is much more soluble in water than most common minerals, and it is specially so in acid water (all freely-circulating water is slightly acid, only the stagnant water at great depths is neutral or feebly alkaline) Hence the denudation of limestone rocks is mostly due to solution, and is of a special character Another important factor is that limestone rocks are usually well jointed (*see* JOINTS), with a strong tendency to form more or less cubical blocks

Many limestones are very pure, such as the Chalk and a good deal of the Carboniferous limestone of England and North America Hence the whole rock can be dissolved away, leaving very little residue, which is mostly a fine sand or more commonly a reddish clay Soils on such rocks are therefore often very thin, or even non-existent A large bare expanse of limestone rock is by no means rare, rain falling on such a bare surface with open joints will of course flow down into the joints and will widen them by solution, thus giving rise to the peculiar forms known as "grikes" in the north-west of England (Ingleborough, etc) where there is in some places nearly as much open joint as rock, the joints usually run parallel for long distances and the surface consists of knife-edges of rock with fissures many feet deep between them If there are two equally well developed sets of joints more or less at right angles the surface will consist of isolated four-sided blocks

Caves—It is easy to understand that if solution is so active at the surface it will also go on underground Rain and small streams falling down joints and running underground often widen the joints very greatly far below the surface, to such a degree as to form great caverns, which are very numerous in many limestone regions, as in west Yorkshire, Derbyshire and the Mendips in England, south-eastern Belgium, the country east of the Adriatic; and Kentucky among many others (*see* CAVES) Besides actual caves in many places, indeed in most limestone areas, the main part of the river system is underground; surface streams are rare, and often disappear at some part of their course. Dry valleys sometimes occupied by streams in very wet weather are numerous in the Chalk Downs of southern England

Another remarkable phenomenon is afforded by the *swallow-holes* or pot-holes often seen in such regions, where a stream suddenly disappears down a vertical shaft, often running into a cave below One of the most remarkable is Gaping Ghyll on Ingleborough, Yorks , which is 365 ft in vertical depth; the stream runs for a long way underground and eventually comes out in Clapham Cave Most of its course has been explored

The above-ground topography of limestone regions is often very remarkable Rock-pillars, cliffs and gorges are common in many places, such as Dovedale and Matlock in Derbyshire The Cheddar Gorge in Somerset is supposed to be due to the collapse of a cave Some of the most remarkable limestone hills are found in Kedah and Perak, in the Malay peninsula, some show vertical or nearly vertical faces from 1,500 to 2,000 ft high and many of these cliffs overhang considerably for a height of hundreds of feet

Limestone pinnacles—Another remarkable feature seen in the same area, especially in the Kinta Valley, is the formation of pinnacles of limestone, below a covering of newer deposits These pinnacles, where uncovered in the alluvial tin-mines of the Kinta Valley, show very extraordinary forms From the disposition of the overlying deposits it is quite clear that the upper surface of the limestone was once smooth and that the solution went on underground and is even now in progress

All the features of limestone denudation, which may be equally well developed in dolomite rock, are specially well seen in the Karst plateau east of Trieste, hence, geologically, this kind of scenery and formation is known as the Karst type

In order to save space and avoid repetition a general account will here be given of the geology of coast-lines, this involves a consideration of the joint effects of causes belonging to several different categories, namely denudation, deposition and earth-movements

The geology of coast-lines is a complicated subject, because it is only rarely that one simple process or set of related processes is in operation Still it is possible to state that on broad lines some coasts are being destroyed while others are being built up Thus in England it has been shown by a Royal Commission on Coast Erosion that in a given period the gain of land in England, mainly on the west, was five times as great as the loss, mainly on the east Thus the country is not being washed away, but is actually getting larger, though the destruction of existing land is more striking and spectacular than the building up of new areas and so receives more notice

Loss of land may be due to two causes, marine denudation, or actual sinking of the land Gain of land may be due to deposition of new material along a fixed coast line, or to an uplift of the whole area In either case it is usually easy to decide which causes have been at work

Marine Denudation.—The destructive power of the sea hardly needs extended demonstration Its chief agents are waves, tides and currents The power of the waves is enormous, as is easily seen by the destruction of sea-walls, breakwaters, etc , during a storm and there is no doubt that the sea does most of its work of coast-erosion during storms just as rivers do most of their destructive work during floods The waves batter at the cliffs and tear off blocks of rock, usually along joints, they thus undermine the base, and the upper parts of the cliff slide or fall down The compression of air in cavities and open joints by the force of waves is important, and sometimes blows holes in the land some distance back from the end of the cliff, as is seen, *e g* , in S Wales and Cornwall There is a very fine specimen close to the Lizard lighthouse Naturally the sea wears away soft rocks faster than hard ones, long narrow inlets formed along a band of soft rock running at right angles to the general coast-line being not uncommon Another feature of coasts of hard rock undergoing destruction is the formation of stacks, pinnacles, skerries

and islands, abundant examples are found on the west of the British Isles, and some on the east Common also on such a coast is a belt of shallow sea studded with sharp rocks, with a wave-cut platform extending far out to sea below low-water-mark, constituting a danger to navigation In other cases there is a rock platform between tide-marks, and here there is little or no loose beach-material on the open coast, though it may accumulate in sheltered spots

On coasts composed of soft material undergoing destruction, conditions are rather different There is generally not much cliff but a gradual slope, the outline of the land is smoother and the wave-cut platform is not conspicuous, being replaced by a uniform slope seaward Beach material is also more uniformly distributed and consists of smaller fragments, also, under the influence of the tidal currents, it tends to travel more along the coast, owing to the absence of sharp promontories to check it

The two foregoing paragraphs describe simple, ideal cases, but in reality there are usually complications, and every shore-line has to be studied on its own merits In a general way, if the effects of uplift or depression are excluded, a deeply indented coast-line indicates a country composed of rocks of very varying hardness, exposed to the fury of a prevailing on-shore wind and powerful tides A smooth outline indicates a country of uniformly soft rock, sheltered from violent winds and with tides running parallel to the shore Such in its broadest outlines is the reason of the contrast between the coasts of the west and east of the British Isles

Drowned Valleys and Raised Beaches—But a smooth coast-line can be broken up, or a rugged coast-line made simple in plan, by relative changes in level of land and sea When the land sinks relatively to the sea the lower parts become submerged, the sea runs up the valleys and forms those long narrow winding estuaries which are so common in Cornwall and Brittany, and in north-west Spain, where they are called *Rias* Within them submerged forests are often found When, on the contrary, the land rises, its outline is frequently smoothed off and simplified in plan The shallow sea floor is raised to form a low plain, often bounded by a row of inland cliffs, and if the rise is spasmodic, *raised beaches* may be formed at various levels Thus, in many places round Scotland can be traced raised beaches at 25, 50 and 100 ft respectively, above present sea-level, they are not uncommon in S Wales, Devon and Cornwall; and in Norway they are well developed at great heights

Fiords—Striking effects are produced when an area of highly developed glacial topography is submerged The sea runs far up the long, straight and steep-sided (U-shaped) valleys already described as characteristic of ice-erosion, waterfalls drop straight from the mouths of the hanging valleys to the sea and there is little or no beach at the foot of the cliffs In some of the fiords of Norway, British Columbia and New Zealand great walls of rock ascend for 4,000 or 5,000 ft almost sheer from the water's edge, giving rise to some of the finest scenery of the world, similar to that of the western Highlands of Scotland, which also originated in this way

Marine Deposition.—It has already been pointed out that material removed from the land by denudation is ultimately carried down to the sea, there to be deposited and built up into the new rocks that take part in the next phase of uplift and land-formation It is therefore obvious that marine deposition is one of the most important processes in geology

The Materials of Marine Deposits—These are in part brought down by rivers, in part derived from the waste of the coast, and in part provided by the activity of animals and plants When the material forming any ordinary beach is examined it is usually found that there is a distinct gradation in the size of the fragments composing it Near the base of the cliff, or about high-water-mark if there is no cliff, are found large blocks of rock, more or less angular or rounded Below this comes shingle or gravel, usually well rounded, which gradually passes downwards into sand, extending commonly below low-water-mark The material usually gets finer and finer out to sea, and soundings show that sand eventually passes into mud Very often too, in the estuaries of large rivers and along certain low coast-lines, mud banks can be seen between tide-marks. Besides all this there are often shells and other organic matter, either living or dead, and in many of the warmer parts of the world, solid organic deposits, coral reefs, etc, are found We thus arrive at a natural classification of modern marine deposits—boulders, gravel, sand, mud and organic material The peculiar deposits found in the very deepest parts of the oceans will be disregarded for the present

Distribution of Deposits—One of the fundamental principles of geology is that the stratified rocks of past ages have been built up of exactly similar material, and that the modern deposits of the sea-beach will some day form rocks just like the older ones (*see* SEDIMENTARY ROCKS for mechanism of process) Of course the distribution of beach material is never uniform, for it is controlled by many agencies such as waves, tides and currents, and is sometimes transported for long distances, it is well known that along the south coast of England, for example, the shingle mostly travels from west to east, movement easily accounted for by the prevailing winds and tides At one point, near Portland, there is a local eddy due to the shape of the land, and the shingle turns back west, thus forming the well-known Chesil Beach on the Dorset coast In the east of England the set of the tides is mainly from north to south, and long gravel spits are formed, such as Spurn Head and the great beach at Aldeburgh, where the river is turned south and runs for 9 or 10 m parallel to the shore before it can get through the shingle banks

ARID REGIONS

An arid region may be defined as one in which the average annual rainfall is less than 10 inches The limit thus fixed is of course quite arbitrary, but it represents approximately a boundary between moist and dry regions possessing different geological and biological characters Within this category, however, there is room for a considerable amount of variation, and a great deal depends on the seasonal distribution of such rain as there is Some areas with a quite appreciable amount of rain may be absolute deserts, if the rain all falls at once, or within a very limited range of time, whereas on the other hand a surprisingly small total, well distributed, may give comparative fertility Obviously, also, temperature is an important factor It is well to remember that in reality the arctic regions are rather dry, if the snow that falls is calculated as rain, but the effect of the low temperature is to create here a special type of geology, which is dealt with elsewhere

Deserts—What we are here concerned with is the hot, dry regions of the world (*see* CLIMATE and CLIMATOLOGY), the idea conveyed to most people by the mention of a desert is *sand*, and this is for the most part a true conception, but there are also rock-deserts, as in parts of Egypt and the Sahara

The true arid regions of the world are defined also as those from which there is no drainage to the sea, and it is stated by Walther that no less than one-fifth of the whole land surface of the globe belongs to this type Such arid regions naturally include all types of topography, mountains as well as plains or basins, and some parts of them are below sea-level (*e g*, the Dead Sea region, the lowest part of the earth's surface and one of the hottest)

Salt Lakes—Now when a low plain or basin is surrounded by high mountains or plateaux there may be considerable rainfall or snow on the high ground, giving rise to rivers, these often dry up or become very small when they reach the low ground, owing to evaporation, or they may reach a lake, which is generally salt, because the dissolved matter carried down by the streams is concentrated as the water evaporates from the surface of the lake The nature and origin of these salt deposits is described under PETROLOGY (*q v*) and will not be pursued further here, but it should be emphasized that salt deposits and salt lakes form some of the most characteristic features of deserts If a dry region lies fairly near the sea a prevailing wind may carry a lot of salt inland for a long distance; the saltness of part of the desert region of N W India is attributed to this cause

Desquamation—In a dry region the chief weathering agent is sudden changes of temperature, aided by the chemical action of dew and strong salt solutions. The changes of temperature shatter

the rocks and often cause thin slabs to scale off and accumulate in piles at the foot of slopes (the *desquamation* of Richthofen). chemical action and wind carve the rocks into fantastic shapes, and the rocks are often covered by a peculiar dark enamel, due to evaporation of solutions containing iron or manganese

Wind Transport.—The chief and practically the only transporting agent is *wind*. This differs from other geological agents in that it can, and often does, carry material uphill, against gravity. It can also carry fine particles across rivers and lakes and across even quite broad stretches of sea. During gales sand derived from the Sahara is often noticed in southern Spain and Sicily. The deposits of salt formed in lakes are often discoloured by fine dust blown in by the wind.

But it is the behaviour of sand under wind action (*see* DUNES) that is the most notable characteristic of deserts. The grains of wind-borne sand-deposits show special features (*see* SAND) which enable a specimen to be distinguished readily from sands of other origins, for such sand grains are usually very well rounded ("millet seed sands"), and are thus readily distinguished when occurring among the older formations, cemented to solid rocks. Such deposits are sometimes of a red colour, since the iron present exists in the anhydrous ferric condition, but they are more commonly yellowish grey.

In deserts the direction of the wind is often very constant (trade wind or monsoon type) hence the sand drift often makes very well-marked grooves in definite directions on rock surfaces, and pebbles fixed in the ground show a peculiar triangular cross-section of the exposed part (*Dreikanter*), often with an exceedingly sharp ridge at the top. One of the most remarkable types of deposit found in a dry region is the *Loess* (*q. v.*) of central Asia and eastern Europe.

Oases.—As a rule the barrenness of an arid region is simply due to want of water, the soil contains plant-food in abundance if only water can be got into it. Hence arises the great fertility of the *oases*, places where natural springs occur, and the success of artificial irrigation schemes in the western United States, South Africa and Australia among other places. The soil is sometimes poisoned by soluble salts, but when irrigation is carried far enough to wash these out it may become very fertile, as in the case of the alkali soils of the western U.S.A.

Islands.—A short general account of the origin of islands seems to come in conveniently immediately after the section on coast-lines, though in reality it is a complicated subject belonging to several different branches of geology, as will appear shortly. An island is an area of land part of which is permanently above high-water-mark; a similar area submerged at every tide would be called a reef, shoal or sandbank. It is not possible definitely to limit the area to which the name may be applied; any rock part of which is permanently above water may be called an island, and so may the 2,950,000 sq. m. of the continent of Australia, and an island may have almost any kind of geological structure, and may be formed in an immense variety of ways. Some are clearly bits of a continent which have been cut off geologically by erosion or earth-movement, or both. Of this type the British Isles form a typical example, and most of the large islands of the world belong to it. Again a chain of islands or a long continuous island are often the highest parts of a mountain ridge that rose from the sea, but did not unite itself to a continent, *e.g.*, Japan. Many islands, especially those far out in the oceans, are obviously in the main submarine volcanoes, and another very important class, also often found far away from other land, is afforded by the coral islands. Naturally there are many transitional and doubtful forms. volcanic and coral islands are often much mixed up, and in the history of the larger islands of the world several processes have often played a part.

The British Isles.—Light is often thrown on the geological history of an island by a study of its living fauna and flora, as well as by its fossils. Thus Great Britain has fewer species of mammals and reptiles than the continent of Europe, and Ireland has fewer species than Great Britain. The natural inference is that Ireland was cut off from Europe first, before many species had arrived there in their westward migration, and that Great Britain was cut off at a later date, when more animals had arrived. Further, the study of island faunas and floras has been of enormous importance in the development of the doctrine of organic evolution, as set forth by Darwin, Wallace and many later biologists.

Continental Islands.—Taking first the group of continental islands, it is obvious that a tract of land may be isolated in two ways, or by a combination of them. The connection with the Continent may be severed either by denudation, terrestrial or marine, or by submergence, and in most cases, probably, the finishing touch is given by submergence. This is what seems to have happened in the opening up of the English Channel, which was once a great river valley with its watershed between Dover and Calais. A river cannot well completely erode its own watershed to sea-level, but either submergence or the waves of the North Sea might finish the work and break down the land bridge by which the animals migrated from the Continent.

Complex Formations.—In other cases it is clear that earth movements played the most important part. Thus, Madagascar is separated from Africa by a very deep strait undoubtedly due to the sinking of a long narrow strip of land. It is in fact a *rift-valley*, a term to be explained later. The formation of the islands of the Malayan region was evidently very complex, due partly to crumpling of the earth's crust into folds and partly to changes in the relative levels of land and sea due to some more general cause. The Malay peninsula only just escaped being another island very like Sumatra, as there is quite a low isthmus in Siamese territory to the north, where it was once proposed by Germany to cut a canal and intercept the trade of Singapore.

Coral Islands.—Apart from volcanic islands like St Helena and Ascension (*see* VOLCANO), one of the most interesting types comprises those islands partly or entirely composed of coral and other calcareous organisms. These are only formed in the warmer parts of the world, like the Pacific and Indian oceans, and the West Indies, because corals cannot live where the temperature of the water falls more than a degree or two below 70° F., there are none on the west coast of America, owing to the cold currents. Coral structures (*see* CORAL REEFS, JURASSIC, TRIASSIC), are not always islands; they may also be reefs along the coasts of large land-masses either close to, or at some distance from the shore. Both forms existed in many parts of the world, even in high northern latitudes, in earlier geological periods; their fossilized remains are found in several geological formations in Europe, indicating very different climatic conditions from those now prevailing.

Lakes.—A lake may be defined as "a hole full of water," and the study of lakes is a somewhat complicated matter, since holes on the earth's surface can be formed in many ways, involving many different geological processes. The simplest classification is based on the three elementary ideas of (1) a hollow formed by earth-movement, (2) a hollow formed by erosion, and (3) a basin formed by the accumulation of some sort of a dam or barrier. The last two categories evidently resemble artificial ponds and reservoirs, but the first class rather stands by itself. It is evident, however, that the level of a lake belonging to either of the first two classes may be raised by formation of a dam, natural or artificial, as has indeed happened in certain cases, to be mentioned later.

Lakes definitely formed by earth-movement are usually large, and some of them are salt. Thus it appears that the Caspian and the Sea of Aral were once connected with the open ocean, but were separated by uprise of the land. They have now no outlet, and are salt. The great lakes of North America were probably formed by the cutting off of an extension of Hudson Bay, at one time they drained to the Mississippi, but the drainage was much interfered with by land-ice, and the St Lawrence became the outlet. Recent movements in the area are indicated by the bending or warping of old beaches. All the great lakes of East Africa, except the Victoria Nyanza, are in "rift-valleys," which were formed by the letting down of long narrow strips of ground between two fractures. Hence their shape, and hence, too, they are very deep and have extremely steep sides, both above and below water. Tanganyika is the most typical example. Many of the

lakes of mountain regions like the Alps, etc, are determined by the uprise of chains (*see* EARTH MOVEMENTS, *below*), but they are often modified by glaciation or other causes.

Solution Lakes—Lakes due to erosion of various kinds are numerous One of the simplest types is where a hollow has been formed by solution of the rock below, such as limestone, or beds of gypsum and rock salt. The soluble rock need not lie at the surface. the solution may take place underground, below an impervious cover, which sinks down in the form of a basin and thus holds water Lakes of this kind are not uncommon in various salt-producing districts, *e g.*, some of the meres of Cheshire Artificial ones are often formed by subsidence after salt-mining or brine-pumping. Very similar are the large flooded areas often seen in coal-mining regions, also of artificial origin, but good illustrations of the natural process Some of the Swiss lakes in the St Gothard region are believed to be due to solution of beds of dolomite-rock, etc

Rock-basins—Of more importance are the lakes due to glacial erosion. There has been in the past much controversy as to whether a glacier can scoop out a rock-basin, but the question is now considered to be settled in the affirmative Such lakes are commonly associated with U-shaped valleys and all the other signs of glacial action previously described Many of these rock-basins extend far below sea-level and yet have a continuous rocky margin all round, even at the outlet. A precisely similar state of affairs exists in many of the fiords and sea-lochs of Norway, Scotland, British Columbia and New Zealand, except that the barrier is below sea-level Only a glacier could scoop out a basin of this kind, deep inside and shallow at the mouth. Some of the world's finest scenery is around such lakes and fiords—and it is of importance to notice that there is no real difference between a freshwater lake of this kind and a fiord, one happens to have its lip above sea-level, the other below

Barrier Lakes—This category includes a good many varieties Thus the barriers and therefore the lakes may be of a very temporary nature Examples of these are afforded by the lakes sometimes held up by landslips or avalanches, such as are not uncommon in Switzerland Behind such a dam water may accumulate to a great depth, and sometimes the dam bursts suddenly Several disastrous floods produced in this way are on record in the Rhone valley and also in the Himalayas It makes very little difference whether the barrier is ice and snow or rock Sometimes it happens that a glacier in its advance creeps slowly down and holds up a lake, as is seen in several places in the Alps A famous example is the Marjelen See in the Bernese Oberland, where the great Aletsch glacier holds up a lake in a tributary valley, which overflows over a low watershed into the next main valley, the lake shows a distinct beach line at the level of this outlet, and such appears to have been also the origin of the famous Parallel Roads of Glenroy, in Scotland On the other hand a glacier coming down from a side valley may build a dam across the main valley, as at the Mattmark See, above Stalden in the Saas valley, near Visp, Switzerland

Moraine Lakes—One of the most important groups of lakes comprises those held up behind the heaps of moraine left by retreating and melting glaciers As described in an earlier section the terminal moraines of glaciers take the form of ridges lying across the valleys, which obviously form admirable dams for lakes, which may be of any size, from the small tarns and lochans, so common in the higher parts of the Lake District mountains and of the Highlands of Scotland, to big sheets of water like Windermere and Loch Lomond As a matter of fact both the lakes just named appear to be rock-basins as well as moraine lakes, that is, the deepest parts lie in a rock basin, but the level of the water has been raised by a moraine dam This state of affairs appears to be exceedingly common, and naturally, because the glacier at its maximum scoops the rock-basin and on its retreat deposits moraines

EARTH MOVEMENTS

The study of earth movements in general forms one of the most important and interesting branches of geology, but for its proper comprehension it needs some acquaintance with certain features of geological structure—the results of disturbances of the rocks—so that here it is necessary to begin by arguing in a circle We can to some extent get over this difficulty by starting with large-scale earth-movements that do not involve small differential movements Certain necessary definitions can then be introduced as required

Relative Nature of Movements—Many of the facts of geology show that the relative levels of land and sea have changed Strata of marine origin are now found forming part of very high mountains (*e g*, at 16,000 ft in the Himalayas), and historical geology shows that alternations of submergence and emergence have been frequent in many areas In the British Isles at least three marine periods and four continental ones can be traced (*see* STRATIGRAPHY, *below*) It is a moot point whether the middles of continents and the abysmal depths of the oceans have ever changed places, but it is clear that the margins of continents and certain epicontinental areas have been drowned and have emerged many times In studies of this kind there is always the difficulty that we have no fixed datum line, we cannot measure the distance of any given point from the centre of the earth, and so we cannot tell in any case whether the land rose or the sea sank All such movements have to be treated as relative, hence we speak of emergence and submergence, not of rising and sinking These relative movements are exemplified on a smaller scale by raised beaches and drowned valleys (*see* above), and in such cases there need not necessarily have been any horizontal component in the movement, mere rising or sinking of the land would produce all the effects, and a possible cause is contained in the doctrine of *isostasy* (*q v*)

It has been suggested by American geologists that an actual lowering of the sea-level, simulating a rise of the land, might be brought about during a glacial period, by the locking up on a continent of a vast mass of water as snow and ice, since all precipitation is ultimately derived from the sea This seems very probable and has been applied to explain some actual examples of old sea-beaches and wave-cut platforms It is evident that during upward or downward movements of the land, the earth's crust might be fractured along the edges of the moving blocks, thus giving rise to faults (*q v*) but much more complicated and, therefore, more difficult to explain are those movements that are wholly or in part horizontal, for these may give rise either to compression or stretching of the crust, usually with local fracture and relative displacement of the fractured blocks Under the influence of such forces the earth's crust often behaves as if it were plastic, so that originally flat and horizontal strata are occasionally crumpled into the most fantastic forms, some instances worked out in detail in great mountain chains, such as the Alps, or even occurring in hand-specimens of rocks only a few inches square, almost passing the bounds of belief. It is probable that extreme crumpling of this kind (for detailed consideration of which *see* FOLD), mainly occurs in depth under a heavy load of rock, whereas near and at the surface fracture is the dominant feature

Movements Mainly Vertical.—It has already been briefly stated that movements due wholly or almost wholly to forces acting vertically are believed to have occurred in the past, and probably to be in progress at the present time Such may be conveniently designated continent-building movements, though it would be more strictly correct to call them movements of continental blocks For full details of the mechanism of such movements reference should be made to the articles EARTH and ISOSTASY

Floating Continents—According to the most recent ideas the continents form more or less permanent units, blocks consisting of rocks of low average density which behave as if they were floating in a substratum of some plastic and considerably heavier material This heavy material, which is supposed to have the composition of basalt, is found at or very near the floors of the great ocean basins, and extends under both oceans and continents to a very great depth Further, in order that the equilibrium of floating may be maintained any extra high elevation on the top of a continent, *e g*, a mountain range or plateau, must be balanced or *compensated* by a corresponding bulge downwards of the lighter

rock of the continental block According to this theory the continents are regarded as behaving like ice-floes and icebergs floating in the sea If we know the densities of water and ice and the amount that the floe projects above the water, we can calculate the thickness of the part submerged Similarly, in the case of a continental block, if we know its average density and that of the substratum, as well as the average height of the continent above the sea-floor the thickness of the continental block can be calculated, theoretically at any rate, for—since both are so uneven—the difficulty of determining the average height of the continent above the average sea-floor complicates matters

Rise and Fall of Land Masses—Now suppose such a floating continent is undergoing denudation, it is necessarily becoming lighter and will therefore rise, and the same effect will be produced if a great ice-sheet melts On the other hand a continent may be made heavier by the formation of an ice-cap, or by the outpouring of great floods of lava, as has indeed happened in earlier geological times, while another cause that has been invoked to account for continental sinking depends on the melting of part of the substratum by heat generated by radioactive disintegration, the substratum thus losing part of its density and the equilibrium being deranged This explanation is, however, at present regarded as highly speculative

Many of the facts of geological observation, such as raised beaches, drowned valleys and what are called transgressions of the sea over the land on a large scale, as well as the corresponding general emergences, certainly seem to indicate that extremely widespread and uniform movements do take place, of just the kind that would be expected in accordance with the theory or group of theories here outlined It is also clear that the greater movements of this kind may also be accompanied by subsidiary effects on a smaller scale, such as fractures of the crust and similar phenomena These must, however, of necessity be very similar to the types to be presently described as resulting from a special kind of tangential force and the two may conveniently be discussed together

Movements with a Horizontal Component.—The full discussion of these phenomena involves some of the most difficult problems of modern geology However, we can discriminate between the causes and the effects For the first-named, reference may be made to the article, EARTH The main geological importance of the *effects* is the part played by them in the structure of the visible crust, the effect on topography and scenery, and—what is of vastly greater importance—the economic bearing of such structures in mining and allied industries And it is well worth while to emphasize the fact that the highly complex structure of many mining areas, especially coalfields, has been elucidated, and their economic working made possible, as a result of what were in their inception purely theoretical studies of earth-structures in some of the more complicated regions

Tension and Compression—Movements possessing a horizontal component result sometimes in tension (stretching) of the earth's crust, sometimes in compression, and the effects in the two cases naturally show differences. It may be remarked in passing that tension in one place is usually accompanied by compression elsewhere, since the total volume of the crust, regarded as a skin, does not change In the early days of the earth's history, the crust probably did shrink in volume, owing to contraction on cooling, but for long ages its temperature has obviously been pretty constant, whatever may have happened to the interior Hence mere shrinking of the crust will not account for its movements, nor, above all, for the forces of tension that have affected it

In discussions of the general aspects of this subject, stress has been laid on the idea that after the crust cooled to a constant volume the interior may have gone on shrinking so that the crust became too large for it and tried to adjust itself to the new conditions by wrinkling like the skin of a dried apple A few years ago most geologists poured scorn on this simple conception, but it has lately been revived, especially in Germany, and it certainly deserves grave consideration

As a result of these processes, whatever their origin, two fairly clearly defined types of structure are produced—*faults* (*q v*) and *folds* (*q v*) It must be understood, however, that there are types of structure intermediate between them, or combining the two, in that folds, when pushed too far, often pass over into faults, just as excessive crumpling of a sheet of metal may cause it to crack Furthermore, an extreme degree of compression often results in *cleavage* (*see* SLATE and SCHIST)

It has already been mentioned that lateral movements of the earth's crust may occasion either tension or compression, and that the resulting structures in each case are characteristic It is not difficult to see that the chief result of tension will be cracks, *i e*, faults, while in compression folds will be dominant Now the formations produced in regions of tension will in many ways resemble, though on a smaller scale, the results of the purely vertical movements already described Naturally, one of the principal consequences of such movements will be the tilting and sinking of blocks between faults, it is difficult to see how they could ever result in elevation, for it seems inevitable that the only real movement possible under gravity is sinking, but in geology, movement always appears relative

Plateau-building Movements—Now if the crust, in a region of more or less horizontal strata, is cut up into blocks in this way, as a result of relative movement some may be left higher than others, forming *plateaux*. This result is so common and characteristic that the whole group of phenomena are often summed up as *plateau-building movements*

The subject has been studied systematically in the Great Basin region, the area lying between the Rocky Mountains on the east and the Coast Ranges on the west, where conditions are specially simple and favourable for generalization The Rockies are the result of a thrust towards the east, while in the Coast Ranges, the thrust was towards the west, hence the area between was stretched and cracked, and collapsed in blocks with tilting of the individual blocks As is so often the case, the collapse was accompanied by great floods of basaltic lava, which helped to weigh down the blocks In some cases the strata were not cut clean through by faults, but bent sharply at the edges of the blocks It appears that similar structures can also be produced by the forcing in below the surface of a mass of molten material, as explained in the section on igneous intrusion In this case the surface may have been uplifted in the absolute sense, but this phenomenon belongs to a rather different category.

Block Structure in Britain—Some of the types of structures just described as characteristic of plateau-building movements are also to be seen in the British Isles, though there the conditions are not quite so simple Some of the best-known examples are found on the western side of the Pennines, on the borders of Yorkshire, Durham and Westmorland Here the rocks are on the whole uplifted to form a very flat arch, steeper on the west than on the east Especially on the western side, cracks and flexures developed in this arch, and the general result is very like the block-structure of the Great Basin, on a smaller scale The blocks are separated by great faults, some of which show a very large displacement Similar structures are also developed among the younger and less-disturbed rocks of many parts of the world where the conditions, on the whole, have involved tension rather than compression

Effects of Compression—When we come to consider the types of structure produced as a result of compression, the matter is much more complicated The general effect is in most cases a combination of folding and faulting, sometimes one being dominant, sometimes the other, and it is with the general effects on topography and surface forms of certain types of these that we now have to deal

One of the fundamental general principles is that violent movements of compression tend to occur periodically throughout geological history and that their occurrence is usually confined to certain fairly well-defined regions of the earth, often taking the form of long narrow zones Furthermore, when a given region has once been compressed and folded there is always a tendency for similar effects to occur along the same or nearly the same lines Without entering into a discussion of causes, a brief out-

line may be given of the usual order of events in an area affected by movements of this kind

Mountain-building —The first phase is that a long narrow area of the earth's crust, usually part of the sea floor, begins to sag, forming what is known as a geosynclinal· at the same time deposition of sediment goes on *pari passu* with the depression, so that eventually an enormous thickness of shallow-water marine sediment of very uniform character is accumulated, sometimes amounting to 50,000 feet After a long time, probably owing to rise of temperature due to the blanketing effect of the sediment, the direction of movement is reversed and the geosynclinal begins to swell up and eventually as it were, boils over. At the same time the two stable margins of the trough approach each other, like the jaws of a vice, which accentuates the outward movement of the top layers The rising strata are naturally thrown into violent folds, which tend to topple over outwards, and are often cracked and torn in the process Broadly speaking, the effect is the production of mountain chains consisting of strata that have been strongly folded, fractured and over-thrust in one or more dominating directions.

It may happen that the thrust is mainly from one side, when the chain may consist of a series of nearly flat folds; on the other hand if the pressure from the two sides is nearly equal, the structure will be fan-shaped The outer, complex margins of the fan may be separated by a considerable width of less complicated structure; sometimes, apparently when the main pressures have slacked off, this central portion may collapse and fall back to some extent Such appears to be the origin of the Great Basin of western America, as before described, and it has been suggested that the Mediterranean region is actually a collapsed area between two mountain chains, the Alpine and Atlas systems—a complicated and much disputed question in which, however, it is generally admitted that the Mediterranean basin is a sunken area whatever may be the relations of the mountain chains around it. The plain of Hungary is another, on a smaller scale.

It must be clearly understood that a mountain chain in process of formation in the way just outlined may at the same time undergo denudation, so that the strata need not necessarily form such an enormous pile above the earth's surface as would be indicated by a theoretical restoration of all the missing bits of the folds And we have also to consider the fact, which may be regarded as established, that rocks are only plastic when under a heavy load; near the surface they tend to fracture rather than to fold, forming thrust-planes and faults Some thrust-planes, which are really only very flat faults, have a displacement to be reckoned by tens of miles—*e g*, the great Moine thrust in N W. Scotland (*see* SCOTLAND, *Geology*) and the still greater Scandinavian overthrust in Norway and Sweden

In this discussion we have hitherto dealt with phenomena on the very largest scales, measurable by miles in extent and thousands of feet in thickness. But in point of fact similar effects are found in every possible degree of magnitude Precisely similar structures can be seen in slabs of rock only a few inches across, and even thin sections of rocks prepared for the microscope sometimes show them in the space of a few millimetres Examples of complicated folding on a comparatively small scale, with its accompanying shattering and cleavage, are abundant in nearly all areas where the older rocks are exposed

Vulcanicity.—This term will be used in a somewhat broad sense, to include not only the phenomena belonging to volcanic eruptions proper, but also those of an analogous character which occur in the depths of the earth's crust, the underlying cause is the same, the difference in the effects depending only on conditions.

The basis of the subject is the fact that the interior of the earth is very hot. At a depth of only a few miles the temperature is high enough to melt metals and all rocks such as we know at the surface. Whether the material is *actually* liquid is a moot point: at any rate it is *potentially* so It is possible that it is really kept solid by the tremendous pressures that prevail in depth, but is liquefied if such pressure is in any way relieved, for example, by earth-movements It is obvious that it is sometimes liquid, as shown by the streams of lava (*q.v*) poured out by volcanoes. Geological observations also show that at times molten material has been injected underground into already existing rocks or into spaces between them. It is this aspect of the subject that will be chiefly described here. The superficial effects in general are dealt with under VOLCANO.

Magma —The molten rock-material is, before its consolidation, usually spoken of as *magma* whatever its chemical composition; the types of rock that result from its consolidation are dealt with under PETROLOGY, and in numerous other articles under the appropriate headings It is mainly the *forms* assumed by such masses that will here be considered, without much reference to their composition or nomenclature These forms depend on several factors In a superficial lava-flow one very obvious determinant is the form of the surface over which it has to run, and particularly the steepness of the slope, but another very important matter is its viscosity, which depends on two totally independent factors—its temperature and its chemical composition Naturally, very hot lava flows more freely and, therefore, as a rule further than a cooler mass; and lavas which are rich in silica and alumina are much more viscous at any given temperature than those in which iron and magnesia are the characteristic constituents (*see* PETROLOGY) Consequently, dark-coloured lavas of the kind called basalt (*q v*) are the most liquid and tend to spread out into the thinnest sheets under any given conditions, whereas rhyolite and trachyte (*qq v*) often form thick lumpy masses close to the orifice of the volcano, or even fail to escape into the open at all

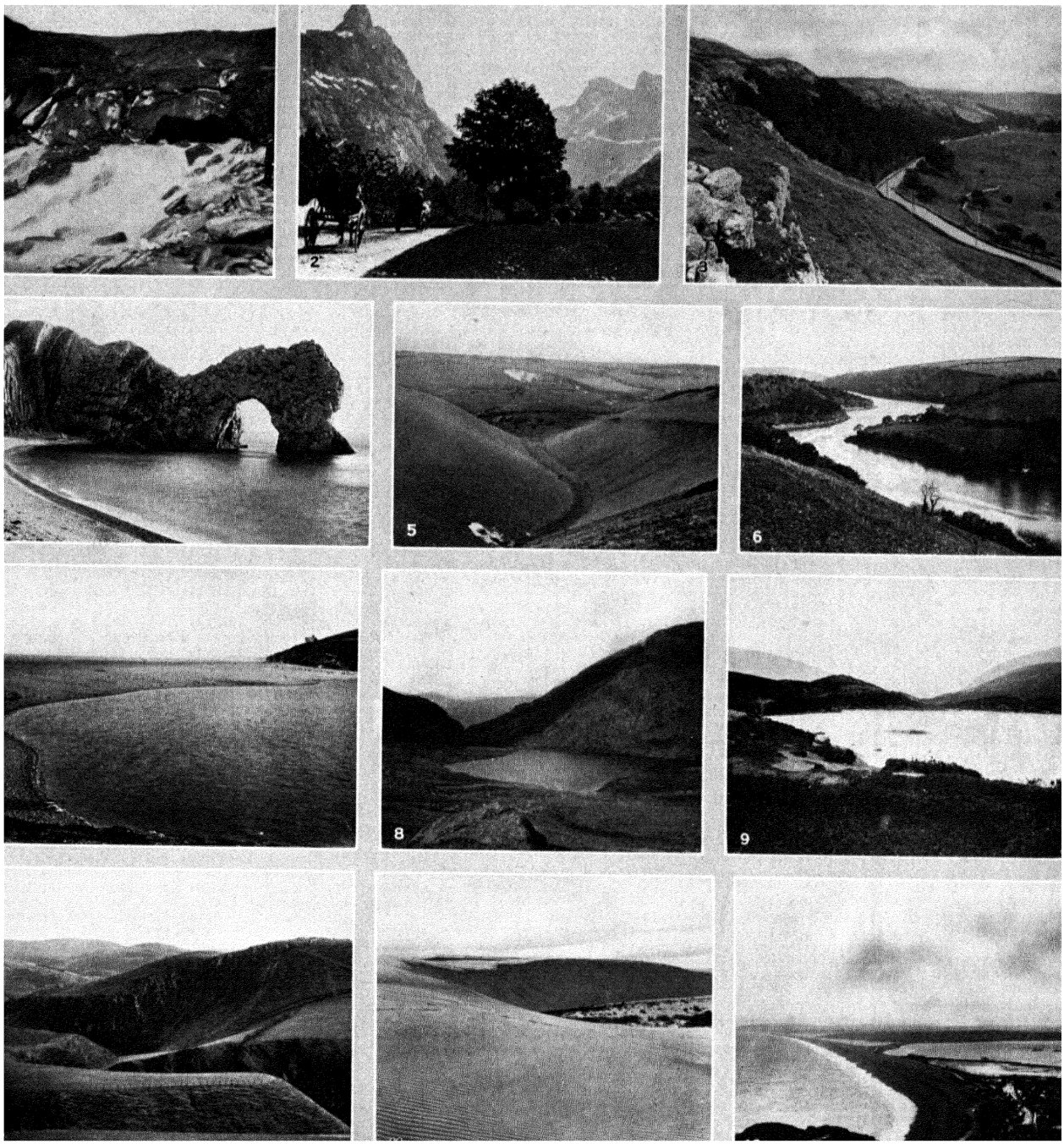
Extrusive and Intrusive Rocks —The mention of this fact leads to the other part of the subject, viz, the behaviour of intrusive magma, that is, magma that never reaches the surface, as even the most liquid lavas may fail to do There is often an actual physical connection between a mass of rock poured out on the surface (extrusive magma) and the underground reservoir from whence it came, this gives us the simple classification of solidified masses of magma—*extrusive* and *intrusive*

We must now consider the factors controlling the forms and positions of intrusive masses, as thus defined All the considerations already detailed as to temperature and viscosity are equally applicable here, but instead of the forms of a surface we have to take into account the position of lines and planes of weakness in the rocks invaded by the magma, as well as the thickness and weight of the overlying crust Another important thing is that when molten magma is confined underground, the steam and other vapours cannot readily escape from it, as they do at the surface, and their pressure helps to raise and fracture the rocks, and to drive a way for the passage of the magma, in fact the motive power behind it is very largely this vapour pressure, whether it escapes at the surface or is intruded below

Planes of Weakness —The planes of weakness in rocks may be classified as bedding-planes, joints, faults (*see* these headings), cleavage-planes and certain parts of folds The forms assumed by intrusive masses are largely controlled by the different possible arrangements and combinations of any or all of these· the varieties are therefore endless, but it is not very difficult to select a few common types having some distinctive character about them

First may be considered the kinds of intrusion possible in horizontal, or nearly horizontal, strata with well-defined bedding. It is evident that in order to reach such strata, if fairly near the surface, the magma must come up some more or less vertical fissure It appears that often, on reaching a certain level in such a fissure it is easier for the magma to spread out sideways along bedding-planes, lifting the roof, rather than to go on cutting a vertical fissure. The point at which this spreading begins is controlled by the rate of the weight of the overlying rock to the driving power of the magma

Sills, Laccoliths and Bysmaliths —Now, other things being equal, a very liquid magma will be able to spread further along a bedding plane than a viscous one. In the first case, the result will be a flat sheet of rock of any thickness, with its top and bottom nearly parallel for a long distance, of course eventually



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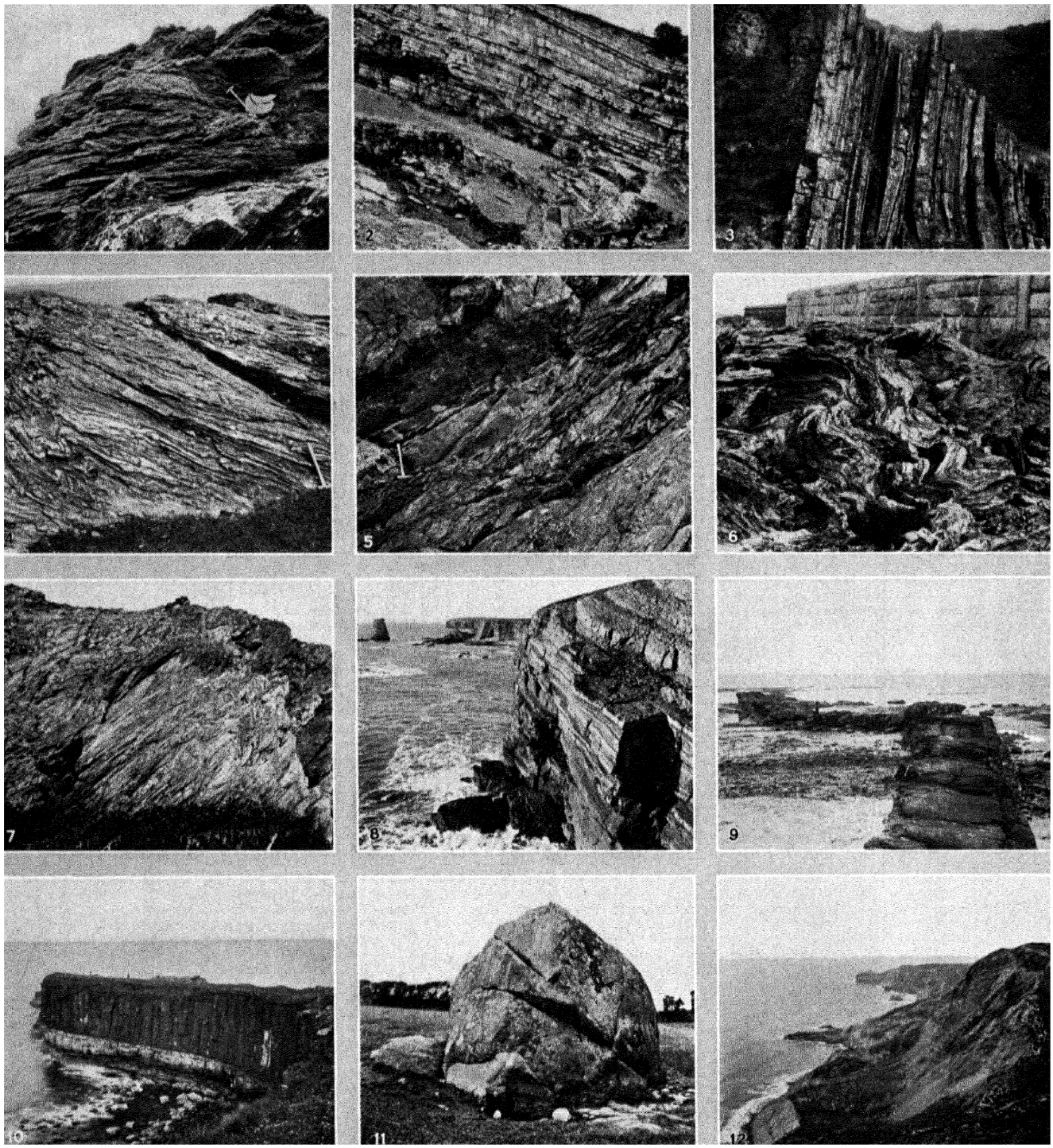
GEOLOGICAL FORMATIONS ON THE CONTINENT OF EUROPE AND IN GREAT BRITAIN

1. Ice-cave at end of Findelen Glacier, Zermatt, Switzerland.
2. Steep sides of a glaciated valley, Romsdalshorn, Norway
3. Giggleswick Scar, West Yorkshire. Cliffs at left are the scarp of the Craven Fault, which runs nearly along the line of the road
4. A natural arch in highly inclined limestone, Durdle Door, Dorset
5. A dry valley in the chalk, Devils Dyke, Poynings, Sussex
6. A drowned valley or *ria*, formed by submergence of land, Gillan Creek, Roscaddon, Monaccan, Cornwall
7. Freshwater lake held up by a barrier formed by a sea beach, Looe Pool, near Helston, Cornwall
8. Small lake formed by screes coming down from mountain (Great Gable) on the left, Sty Head Tarn, Cumberland
9. A typical example of a lake formed by a moraine barrier, Loch Collater, Braemar, Aberdeenshire, Scotland
10. An incised meander in a river valley, Rheidol Gorge, Pot Erwyd, Cardiganshire, Wales
11. Simulation of desert scenery in sand dunes of sea-coast, Culbin Sands, Elgin, Scotland
12. Beach formed by accumulation of shingle, with lagoon behind, Chesil Beach, Portland, Dorset

GEOLOGY



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GEOLOGICAL FORMATIONS IN GREAT BRITAIN

1. **False bedding** in blown sand, Towan Head, Newquay, Cornwall
2. Inclined stratification in Lias limestones, Mumble Gower, Glamorgan
3. Vertical stratification in Old Red Sandstone, Caldy Island, Pembroke
4. Crumpling and overfolding in phyllites, **west side of** Loch Gruinart, Islay, Argyllshire
5. Phacoidal structure in crush belts, in Veryan series, Nellys Cove, Porthallow, Cornwall
6. Violent folding in schists, Breakwater Rocks, Holyhead, Anglesey
7. Folding in schists, eastern side of Porth Eilian, Anglesey
8. Coast line eroded from steeply inclined Carboniferous limestone, with a stack on the left, near Linney Road, Castle Martin, Pembroke
9. Dolerite dyke of Tertiary age cutting Triassic sandstone, Kildonan Castle, Arran
10. Columnar dolerite sill overlying sandstone, Castle Point, Embleton
11. Boulder of hornblende-picrite, Myndd-mwyn-mawr, Anglesey
12. Undercliff formed by a landslip, near Boscastle, Cornwall

closing up at the ends. Such flat sheets, thin in comparison with their lateral extension, are called *sills* (*q v*) If on the other hand the magma is viscous, it will take a form something like a gigantic bun—thick in proportion to its extension—called a *laccolith* (*q v*) All such masses necessarily have a feeder in the form of a crack or pipe filled with magma, and must be more or less in the form of a mushroom, although the "stalk" is rarely seen and often ignored Geometrically the feeder may be either a point or a line, and the resulting form of the whole will naturally vary somewhat in accordance Certain related forms called *bysmaliths* or *plutonic plugs*, have been described by American authors

Dykes—Cracks similar to these magma-filled feeders often fail to spread out into mushrooms, or to allow their contents to overflow as lava-sheets at the surface, and, in other cases, the mushrooms or sheets have been removed by denudation leaving only the feeders These more or less vertical sheets of rock formed by consolidation of magma and traversing all other rocks, form a well-defined geological unit, to which the term *dyke* (*q v*) is applied The name is the Scotch word for a stone wall which, on denudation, they resemble as they sometimes project above the general surface owing to superior hardness In many parts dykes are enormously abundant, and they vary from a fraction of an inch to hundreds of yards in width It may perhaps be mentioned here that many mineral veins, as described under ORE-DEPOSITS, are of essentially similar form and nature, and the study of dykes and other masses of unmineralized igneous rock has thrown much light on problems connected with the mining of metalliferous deposits of similar form and sometimes of analogous origin

It appears then that when the strata, or what a miner would call the "country rock," are horizontal or nearly so, the forms assumed by intrusions are very simple, and their classification is easy, but in areas where there has been much disturbance, a great variety is possible

It may be noted that when the rocks are faulted intrusions of magma naturally tend to follow the fault-planes, which of necessity are, as a rule, more or less open fissures Since faults may be inclined at any angle to the vertical it is sometimes difficult to decide whether a particular intrusion should be called a dyke or a sill, though there is usually more analogy to the dyke form, since faults very often cut across bedding-planes

Phacoliths—An important and common occurrence is an intrusion in folded rocks, and here the position of planes of weakness is the deciding factor Taking the common case where the rocks are thrown into a series of fairly gentle anticlines and synclines(*see* FOLDS), it is clear that there will be a tendency to gape at the tops of the anticlines, as there the rocks are stretched, while at the bottoms of the synclines they are compressed Hence magma will tend to spread along the tops of the anticline in a long narrow strip, convex upwards and concave downwards, with an indefinite extension along the top of the fold Such structures are called by geologists *phacoliths* and by miners *saddle-reefs* The gold-bearing saddle-reefs of Bendigo, Victoria, though perhaps not of direct igneous origin, are a well-known example of the form Occasionally similar shaped bodies, but of course, inverted, are found in the bottoms of synclines

When dealing with regions of really complex folding, it becomes quite impossible to lay down any rules as to the shapes assumed by intrusions Owing to accidental variations in the position of planes of weakness, due to special causes, the intrusion may assume most complicated forms, each of which has to be dealt with on its own merits Again in certain cases the magma, instead of occupying a definite, clearly bounded space, may permeate a whole region in thin sheets and veins, sometimes of microscopic dimensions, following planes of bedding or cleavage or cracks produced by fracturing of the crust When the magma mainly follows planes of bedding or foliation in thin sheets the whole effect is described as *lit-par-lit* injection

Inspection of a geological map of almost any highly disturbed region will show masses in a great variety of forms coloured as igneous rock Some are clearly sill-like, while others may be interpreted as dykes Often however large masses will be observed with a more or less circular outline, many being *necks* (*q v*), viz, the pipes or conduits of volcanoes that have long been worn away.

Bosses and Stocks—It is also evident that many masses of igneous rock, similar in plan on the present surface, never did reach the open air The mechanics of their formation are difficult to explain, more especially since it is usually impossible to determine the true form of their underground extension Many of them however seem to have very steep margins and to be more or less plug-like in general shape, such are usually described as *stocks* or *bosses* The meaning of neither of these terms is very clear, and the whole subject of the origin of the masses is in an unsatisfactory state The nature of the downward extension is a matter of practical importance, since ore-bodies are often found at the margins of intrusions of this type, which have usually been formed under rather deep-seated conditions Some remarkable circular occurrences of igneous rock, such as the granites of western Cornwall, are now regarded as *domes* or *cupolas* formed as subsidiary features on the top of a great batholith underlying the whole region The ores of tin and other valuable metals show a tendency to accumulate in and around such cupolas, as has also been observed in many parts of western America For further particulars *see* LACCOLITH and BATHOLITH

III. STRATIGRAPHICAL GEOLOGY

The end and aim of stratigraphical geology is the elucidation of the history of the earth by a study of the rocks composing it It is therefore sometimes called *historical geology* For its proper comprehension it requires a knowledge of all the other branches, physical geology, petrology (including mineralogy) and palaeontology Stratigraphy may therefore be well regarded as the highest category of geology, to which all the other divisions are subsidiary, though extremely interesting in themselves Now stratigraphy is not a mere academic science, concerned only with abstract history and dry bones It is of enormous practical value, for on it depend many problems in mining and quarrying, engineering, water supply, oil-finding, and a number of other subjects essential to the well-being of the world The technicalities of stratigraphy, though apparently of the nature of jargon and often extremely arbitrary in their application, are in reality a convenient *lingua franca* universally understood in the geological world and thereby a means of saving time and space in verbose explanations

Let us now consider briefly some of the principles and methods of stratigraphical geology, in a systematic way Two of the fundamental laws may be defined and explained as follows

The Law of Similar Conditions.—First of all, there is the principle that certain types of deposit are correlated with certain physical and geographical conditions, and that this held in the past as in the present This is a re-statement of part of the Law of Uniformity, as described in the opening of this article In modern times this has been qualified to some extent by the reservation that processes may have been more active in the past, differing in degree and not in kind from those now in operation From this it follows that when we find among the older rocks certain well-defined types of deposit like those now being formed under known conditions, we are justified in drawing deductions as to the climatic and geographical conditions of the time when the rocks in question were formed

Almost to be regarded as a corollary of the foregoing is the principle that certain types of organisms, both animals and plants, are characteristic of particular climatic and geographical conditions From this it follows that deposits formed at the same time under different conditions may contain the remains of different assemblages of plants and animals, which can be used as indicators of the nature of such conditions This is the principle of *facies*, which will be discussed in detail later

The Law of Organic Evolution.—The second great law is that organisms, regarded from the broadest biological standpoint, have developed throughout the history of the world in a certain definite order of progression from the less organized to the more organized types, from lower to higher forms of life. This of

course is a mere bald statement of the general principle of evolution. From it follows the great generalization first stated by William Smith, that the ages of strata can be determined by means of their included fossils

It cannot be denied that from a strictly philosophical standpoint geologists are here arguing in a circle. The succession of organisms has been determined by a study of their remains embedded in the rocks, and the relative ages of the rocks are determined by the remains of organisms that they contain Nevertheless the arguments are perfectly conclusive This apparent paradox will disappear in the light of a little further consideration, when the necessary limitations have been introduced The true solution of the problem lies in the combination of the two laws above stated, taking into account the actual spatial distribution of the fossil remains, which is not haphazard, but controlled by definite laws It is possible to a very large extent to determine the order of superposition and succession of the strata without any reference at all to their fossils When the fossils in their turn are correlated with this succession they are found to occur in a certain definite order, and no other Consequently, when the purely physical evidence of superposition cannot be applied, as for example to the strata of two widely separated regions, it is safe to take the fossils as a guide, this follows from the fact that when both kinds of evidence are available there is never any contradiction between them, consequently, in the limited number of cases where only one line of evidence is available, it alone may be taken as proof

Taking all these facts into consideration, then, it has been found possible to construct a history of the earth, at any rate from the times when conditions became comparable with what they are now Naturally, the further back we go in time the more difficult does the construction of such a history become, for the simple reason that the events of a later date have often masked or destroyed the evidence of earlier ones Unfortunately also it happens that certain widespread and common types of deposit are often unfossiliferous, for reasons to be discussed later

In many writings on evolution, especially in the earlier half of the nineteenth century, much stress was laid on the "imperfection of the geological record." The chapters with this heading in Lyell's *Principles* and in Darwin's *Origin of Species* are classics in scientific literature This argument was brought forward, and quite justifiably in the then state of knowledge, to account for gaps in the apparent order of biological evolution At that time the geological succession of only very limited areas of the world was known, and that imperfectly It is true that the geological succession in north-west Europe is unusually complete, as compared with many other parts of the world, but even there gaps are found, and certain formations are rather poorly represented by special and peculiar types of deposit But as stratigraphical geology was extended to other parts of the world many of the gaps were filled up, and the geological record as at present known is not so incomplete as is still rather commonly believed, largely on the strength of certain of the older classical writings on evolution

Importance of Marine Organisms.—There is also another point of great importance: in the earlier portions of geological time life seems to have been confined to the sea, or to put it perhaps more accurately and certainly in a safer form, in the earlier geological periods organisms whose remains are capable of preservation as fossils were apparently found only in the sea Throughout the whole of geological history, in point of fact, the succession of marine animals is better known than that of terrestrial animals, because in the sea conditions for their preservation as fossils are more favourable than on land Hence stratigraphy depends to a very large extent on marine biology, and in particular the evolutionary and palaeontological side of it has mostly been worked out on this line Hence it follows that when any large area has been land for a considerable time we know less about the history of the area during that time than about the history of other parts of the earth during the same period Consequently also, gaps in the evolutionary history of land animals during the earlier ages are specially prominent It is only after the vertebrates appeared that we get anything like a complete succession, and even this shows many lacunae thus the origin of the mammals is still very obscure, as is likewise the early history of the human race

The Geological Datum-line.—From the evolutionary character of the development of organisms and the poor preservation of the earlier forms, another very important consequence follows, namely, the absence of any definite base-line as a starting point in the study of the stratified formations This difficulty is accentuated by the high degree of alteration that most of the earlier rocks have undergone, so that the fossils, if there ever were any, have been wiped out It is a very significant fact that the oldest known fossils are organisms of a comparatively high grade of development, highly specialized, and even in some cases showing signs of biological degeneration It is a fair inference therefore that they must have had forerunners capable of preservation, only by an unfortunate series of accidents all trace of these forerunners so far as yet known, has been destroyed There is still a chance that some day they may yet be discovered in some of the less-known parts of the world, but this hope is becoming rather slender It is quite impossible to believe that the highly organized and abundant fauna of the oldest known fossiliferous marine strata represents the absolute beginning Such an assumption postulates a sudden special creation, and is entirely anti-evolutionary and inconsistent with all known evidence

Another very important consideration is that the absence of fossils in the oldest known rocks makes it very difficult to work out their relations, and especially to establish the relative ages of formations not actually seen in contact It is always dangerous to correlate rocks in two distant areas by lithological resemblances alone, since precisely similar physical conditions may and do recur over and over again, whereas precisely similar fossil assemblages do not Hence the stratigraphy of the oldest non-fossiliferous rocks is in a much less satisfactory state than that of the later formations In any one continuous area it is always possible to work out the succession of such rocks by means of the law of superposition, but it is not possible to be sure that the enormous development of these oldest rocks in Canada, for example, is the time-equivalent of the very similar series in South Africa It is only by means of fossils that it is safe to extend geological time-divisions across the sea

Taking all these points into account, the only allowable procedure for the stratigrapher is to take the oldest known fossiliferous formation as a datum-line from which to work both upwards and downwards, just as the heights of the land and the depths of the sea are both measured from mean tide level Above this artificial datum-line the sequence of events is clear and well-known, below it is partly guess-work

It may be well at this point to refer to a question of nomenclature It is universally agreed that the oldest known fossiliferous rocks shall be called the *Cambrian System* The exact meaning of the term "system" as here used is of no importance at the moment and will be duly explained later, as likewise will the reason for the name "Cambrian" It is only with the base-line of the system, the datum-line spoken of in the last paragraph, that we are here concerned, for a practical reason all the rocks below this base-line are obviously older than any Cambrian rocks, hence it is convenient to speak of all of them, collectively, as the *Pre-Cambrian* rocks Many other names have been applied to them, some suitable, some otherwise, but this one possesses the advantage that it is impossible to mistake its meaning

The geological datum-line, then, is the base of the Cambrian System, but too much importance should not be attached to it The average school-boy usually gets the idea that before the arrival of William the Conqueror in A D 1066 English history was a sort of chaos just in the same way the geologist is in danger of regarding Pre-Cambrian times as a chaotic era, whereas in both cases conditions before and after the arbitrary dates chosen were very much the same, for though after 1066 there were Norman rulers in England and after the date represented by the base of the Cambrian there were animals in the sea, the presence of neither made very much real difference The stratified rocks of the latest Pre-Cambrian times were very like those of earliest Cam-

brian times, and in some places there was little physical break between In point of fact obscure traces of organisms have been detected in Pre-Cambrian rocks, but no well-defined fauna

Structural Relations.—In working out the geological history of any given region or of the earth as a whole we have three main lines of evidence. (a) the structural and tectonic relations of the different rock series, (b) their petrological character, (c) their fossil contents It is by the combination of all of these that the final results are reached Each of these categories however requires a little further elucidation, especially with regard to the relations of one line of evidence to another and the principles to be employed in combining them to form a coherent whole

The first principle here is that a continuous and uninterrupted series of stratified rocks represents either stable conditions or a gradual sinking of the sea floor Any discordance, that is, failure of parallelism in the strata, must indicate an interruption of some kind, usually the occurrence of earth-movement Such a discordance is known as an *unconformity* The presence of an unconformity as a rule implies also a certain amount of denudation in an interval between the deposition of the two sets of discordant of parallelism in the strata, must indicate an interruption of some sea is buckled up into ridges and furrows, the tops of the ridges may be planed off by tides and currents till the floor is again flat If now deposit is resumed there must obviously be some discordance on the site of the former ridges, while the material planed off their tops may have been deposited in the hollows between them, so that there the discordance will be less apparent There will thus be a gap in the strata at certain points

An even simpler case is where a large region has been merely tilted and then planed off by denudation, newer strata being afterwards laid down in flat horizontal beds on the top this gives rise to what is called an angular unconformity It is obvious that in all such cases the lower series of strata must have a steeper inclination than the upper ones, unless of course a further movement at a later date has tilted the whole back again, which often happens

These are the conditions which must prevail if disturbance takes place in the open sea, far from a shore line But if marine strata are raised above sea-level to form a land-surface, the effects are rather different Let us suppose that new deposits are being formed along a coast-line with a moderate slope below sea-level Then it is quite evident that each successive stratum of sediment laid down on the floor of the basin must extend rather towards the shore than the one below it This relation is called *overlap* The effect will obviously be more marked if the land is sinking, when marine strata may extend over what was once a land-surface when this occurs on a large scale and for a considerable distance it is called *transgression*

It is impossible here to enter into detail concerning all the varieties of structure that may result from these processes under varying conditions the point here to be made is that these phenomena, which represent breaks or interruptions in the peaceful deposition of sediment, form convenient dividing lines in the stratigraphical succession, just as in history the end of the reign of a ruler forms a convenient end for one chapter and beginning of the next The geological time-scale is divided arbitrarily into periods by means of these interruptions in the succession of strata, or, in other words, the major subdivisions of the stratified rocks are separated by well-marked unconformities

Here two very important considerations arise they may be put into simple language as follows

(*a*) After a disturbance caused by earth-movements, deposition need not necessarily begin again immediately in that particular area, although it may be going on elsewhere Thus there may be a long gap in the succession in any one place

(*b*) Any given formation may be disturbed in any one place but not necessarily in other places Thus a hiatus found in one locality may be bridged over by a complete series elsewhere

These two statements really amount to the same thing, but the matter becomes clearer if they are stated separately They have an important bearing on the subject of the imperfection of the geological record, already alluded to, and are, in fact, a re-statement of the arguments used in dealing with that matter The repetition is excusable, since the question is of first-rate importance in stratigraphical geology

Petrological Character.—The title of this section must be taken to indicate not only the study of the actual characters and composition, both chemical and mineralogical, of the rocks, but also the evidence given by these studies as to the conditions of their formation it is genetic rather than descriptive

It has already been emphasized in earlier portions of this article that particular types of deposit are characteristic of particular sets of physical and geographical conditions This was then specially applied to modern instances, but it is equally applicable to the older rocks, since when in course of time the incoherent superficial deposits become consolidated to form rocks, their characteristics still persist and are just as easily recognizable (For detailed treatment of this subject *see* PETROLOGY, SEDIMENTARY ROCKS)

Facies of Deposition—Thus by a petrological study of the older rocks we are able to determine how they were formed, whether their origin was marine or terrestrial, freshwater or aeolian, and so on Volcanic and other igneous rocks and their relations to the sediments have also to be taken into account thus we arrive at the general conception of *facies of deposition*

On broad lines it may be said that there are three chief facies of deposition, having regard to purely geographical considerations, namely, marine, freshwater and terrestrial, the term terrestrial being used of deposit under arid conditions The glacial type of deposition is well-marked and is usually to be associated with freshwater conditions, although glaciers and icebergs do also deposit material in the sea Each of these primary categories, however, requires further subdivision; the types of sediment formed along the sea-shore, for instance, are distinctly different from those laid down in deep water, the deposits of lakes and rivers also show variations, and so on Here also, it must be mentioned, the purely physical types of sedimentation come into relationship with the variations of organic remains proper to the particular conditions, so that it is hardly possible to treat the subject without bringing in also its palaeontological aspect Just as at the present time the different regions of the world each have their own fauna and flora, so in the past, owing doubtless to climatic conditions, contemporaneous life-provinces can be recognized in the strata of one and the same age Nevertheless certain groups of organisms, such as shore-dwellers and inhabitants of deep water, are characteristic of certain particular physical conditions, and though the particular species found in, say, the shallow-water shore deposits of a particular period will not be the same all over the world, there will be a general and characteristic similarity in the groups of animals represented Hence it appears that the question of facies of deposit cannot be properly studied without including also the fossil remains found in the rocks

Still, as a first approximation we may consider what subdivisions are to be made, on a physical basis, in each of the three major divisions above defined It has already been stated that the chief types of modern marine sediment are gravel, sand, mud and calcareous material When these are consolidated they form conglomerate, sandstone, clay, mudstone, shale and limestone Of these, conglomerates clearly indicate the close proximity of a shore line, sandstones mean shallow water deposition, clay, mudstone and shale, being formed from mud, must have been formed in deeper water, while limestones can apparently be formed in water ranging from very shallow to moderately deep, causes other than depth, such as a clear sea and warm water being favourable to their formation

Thus we obtain the following as a useful classification —

LITTORAL FACIES	Conglomerates, grits and coarse sandstones	Between tide-marks
SHALLOW WATER FACIES	Fine sandstones, shelly and coral limestones	Shallow water (less than 100 fathoms)
DEEP WATER FACIES	Clay, shale and mud stone	Deep water (more than 100 fathoms)

Calcareous deposits may be found associated with any of the three Thus some coral reefs belong to the littoral facies, shell banks are formed between tide-marks, and shells may also drift out to very considerable depths, while some molluscs live in quite deep water The modern abyssal deposits (*see* OCEANOGRAPHY) are not known with certainty to be represented among the older rocks and therefore need not be considered here

Estuarine and Delta Deposits—A category intermediate between marine and freshwater deposits includes those formed in the estuaries and deltas of large rivers The former class show most affinity to the littoral and shallow-water marine formations, since they usually contain marine fossils, but mixed up with organisms derived from the land, notably plant-remains The types of sediment are much the same as described above, except that calcareous deposits are generally not well developed, probably owing to the muddiness of most large rivers In deltaic deposits terrestrial fossils usually preponderate, but marine animals sometimes penetrate up the rivers and become entombed Vegetable remains are generally very abundant, owing to the growth of swamps in deltas, and sometimes form coal Any temporary sinking of the land, or rise of the sea may cause the intercalation of a definite marine band, as has happened in the Coal-measures at various horizons

River Deposits—Freshwater deposits (*see* ALLUVIUM) can be divided pretty clearly into those formed by rivers and in lakes Evidently there must be a gradual transition from estuaries and delta deposits to those laid down in and along the upper parts of the course of the river, the sediment may be of any kind, except calcareous, and the fossils may obviously be a mixture of freshwater and land animals and plants There will naturally be much variation in the kind of material deposited according to whether the river (or the particular part of it) in question flows placidly through lowlands or is a steep and rapid upland torrent The former type lays down chiefly fine sand and silt, while the latter rolls along great boulders, stones and gravel River deposits are therefore most like the littoral and estuarine facies from the petrographical point of view, but the fossils are different

Lake Deposits—Owing to the general stillness of the water, the material laid down in lakes is finer in grain than that in river beds There may of course be gravels and stream deltas along the shores, but in the deeper waters we usually find fine silt and mud, often calcareous, from the abundance of freshwater shells These sometimes eventually form regular bands of rather muddy limestone Very large lakes differ from the sea mainly in the absence of tides, and the types of sediment are much the same The smaller lakes, and all lakes so far as we know (except salt lakes, *see* below), eventually become filled up, there is usually a delta at the head, which grows steadily, and at last fills the whole basin, leading first to an alluvial flat On top of all the other deposits there is often a bed of peat, which later forms lignite or even coal

Desert Deposits—The deposits belonging to the arid facies, which in point of fact is of great importance in geology, possess several distinctive features They are generally rather coarse in texture, forming eventually breccias, conglomerates and special types of sandstone with very well-rounded grains ("millet-seed sands") Cross-bedding and dune-structure are common, and there are no fossils; further such deposits are nearly always associated with beds of rock-salt and gypsum laid down in salt-lakes, as described above, § Physical Geology Furthermore, the strata are nearly always red, orange or yellow in colour, sometimes white, but never grey or bluish, like so many aqueous deposits Red sandstones are by far the most characteristic feature

Glacial Deposits—In recent years it has been discovered that undoubted glacial deposits exist among the older rock-systems of many parts of the world They consist of material similar to the deposits of modern glaciers, boulder clays like that of the Pleistocene ice-sheet, scratched stones, etc Likewise they often overlie glaciated pavements with grooves and striae showing the direction of ice-movement in those ancient times Magnificent examples have been found in South Africa and in other southern lands at several horizons as well as in Canada, among the most ancient rocks of the mining regions of Ontario and Quebec The glacial facies of deposit is therefore of increasing importance in stratigraphy

In working out the geological history of any region it is of course necessary to take into account the volcanic intrusive igneous rocks that are found there The age of these can usually be determined by considering their relations to the stratified rocks and to the disturbances that have taken place in them It may perhaps be mentioned that igneous rocks are very often closely associated with such disturbances and frequently contemporaneous with them Earth movements and igneous activity are closely related phenomena Thus it is logical to recognize a volcanic facies of deposit, when lavas and ashes are found interstratified with sedimentary rocks

PALAEONTOLOGY

The general principles of palaeontology are discussed in a separate article (*q v*), but for the sake of continuity and at the risk of slight repetition it will be well here to consider certain points having an important bearing on stratigraphical investigation

Fossils as Time-indices.—In the first place, fossils are regarded as time-indices, on the general ground that any particular species comes into existence, lasts for a certain length of time and then dies out completely, never to recur Therefore it would appear that if the same fossil is found in rocks in different places, these rocks must be of the same age This of course is true in the broad sense, though some slight qualification is necessary It may be safely assumed that any given species arises at a point, or within a very small area, and spreads outwards by migration Hence it must take a considerable time, measured in years, to reach a distant region, and the concurrence of date in the deposits of the two areas can only be approximate, the discrepancy depending on the rate of migration, consequently, to a large extent on the character and mode of life of the organism The two deposits are to be regarded as equivalent, not strictly contemporaneous This is called the *principle of homotaxy*, and was first clearly enunciated by Huxley

Life-provinces—It is notorious that at the present time the animals and plants of different parts of the world differ widely, the variations being largely a matter of climate and environment Many distinct life-provinces have been demarcated, both zoological and botanical Now there is every reason to believe that the same state of things held in the past, and likewise many palaeozoological provinces have been recognized, though naturally in less detail than the modern ones Consequently, it follows that contemporaneous deposits in different parts of the world need not contain the same fossils, but, just as at present a few species are almost world-wide, so they were in the past Two contemporaneous faunas can usually be linked up by some forms common to both, especially among marine animals

Biological Facies—We now come to the important consideration of the value of fossils as indicators of geographical conditions It is hardly necessary to point out that marine animals are found in marine deposits, land animals and plants in freshwater and terrestrial deposits, and so on, the real matter at issue is to what extent slightly different assemblages of contemporaneous fossils can be taken as indicators of geographical conditions This problem is exactly the same as that discussed in connection with lithological variations in rocks, and denotes the existence of *biological facies*

For the sake of simplicity attention may be confined to marine conditions Everybody knows that marine animals vary much in their habits, some remain fixed to rocks or buried in the mud and sand of the sea-floor, some swim freely, while others float passively as carried by tides and currents, some live between tide-marks and are above water for a considerable part of each day, others must be always submerged, some in shallow, some in deep water and so on. It is clear that among primeval creatures a similar state of things prevailed, as shown by analogy, and among extinct forms conclusions as to mode of life can be drawn from structure Hence by a study of fossils it is possible to draw up a scheme of facies, just as in the case of rocks In actual practice the two

are always combined, yielding precise information as to geographical and often as to climatic conditions

Palaeontological Classification.—A few words must now be said as to the methods adopted in a purely palaeontological classification of rocks In modern geological work biological evolution is assumed, either explicitly or implicitly, though no postulates are necessarily made as to how it is brought about It is clear that groups of animals have appeared and have undergone variation, usually at first in the direction of multiplication of forms and progressive adaptation to their environment; equally obviously, some have retrogressed and finally died out; but the important matter here is that certain forms are characteristic of certain groups of strata, and of no others, and that by taking sufficiently large or sufficiently small groups the major and minor subdivisions of the stratified rocks can be demarcated This principle can be extended even to the very smallest subdivision now recognized, which is called a *zone*, and is characterized by the presence of one particular species, arbitrarily selected from the general assemblage of fossils as being specially suitable for the end in view Numerous examples of the methods of palaeontological classification of strata will be found in the articles dealing with the various stages and groups into which the succession of stratified rocks is now divided, and the subject need not here be pursued further

In the foregoing sections a brief sketch has been given of the materials with which stratigraphical geology has to work, the "tools of the trade" Another point which scarcely needs elaboration is the importance of maps Maps and sections are the only possible means of representing the results in a convenient form, capable of easy multiplication and distribution A solid model is of course the best, but such are necessarily cumbrous, and suited only to a limited number of cases

It may be said then that in the simplest terms the task of the stratigraphical geologist is first to work out the present structure of the earth, and from the facts thus ascertained to draw deductions as to events in the past According to personal idiosyncrasies these deductions may take somewhat different forms, palaeontological, petrological, palaeogeographical and so on, but on the whole the aim is historical, the elucidation of the history of the earth Over large areas this history has been worked out in very considerable detail, and the remainder of this article will be chiefly occupied by a very brief and generalized summary of the results so far attained Much still remains to be done in the remoter and less developed regions, but it may probably be said with safety that the broad lines are now firmly established

In treating a historical subject it is usually advisable to begin at the beginning, but, as before explained, this is just what geology cannot do We are constrained therefore to adopt the large and unsatisfactory category of Pre-Cambrian rocks for our lowest division, fully aware that this group extends indefinitely downward and probably covers a vastly greater period than all the later formations put together, for while it is generally agreed by astronomers and cosmogonists that whatever may have been the origin of the earth it must have passed through a molten stage, and therefore must have had a "first crust," geologists hold that it is very improbable that any of this first crust has survived and that it was probably broken up and re-melted over and over again before a permanent solid covering for the molten interior was developed It is true that the oldest known rocks are highly crystalline, but they always show signs of having been derived from older rocks rather than formed by direct crystallization from a fused state In the later part of Pre-Cambrian time at any rate, conditions seem to have been very similar to what they are now, except for the absence or apparent absence of living beings, there is reason to believe that the earlier developments of life on any considerable scale were confined to the sea, for there is little or no evidence for the existence of land-dwellers till a later date than some highly organized marine faunas, but, though their remains have not been found, there is no proof that there were not lowly animals and plants on land as early as in the sea

Methods of Subdivision—The next point to be considered is the general principle to be adopted in the choice of subdivisions and nomenclature for the stratified rock-series It will no doubt already be apparent that geological history is not a smooth and continuous sequence of uniform conditions, there are breaks in the continuity and these are naturally adopted to mark the periods Now the most obvious kind of break is an unconformity, and most of the major time-divisions are determined by these In the unfossiliferous rocks this is the only kind of subdivision that is possible, but when fossils are present the rocks may also be subdivided according to the palaeontological succession, and this method is now very extensively adopted, as being more scientific than the purely physical method The ideal classification would be a combination of both, but unfortunately the well marked lines do not always coincide in the two scales A change of fauna does often coincide with a physical break, but these physical breaks are not always contemporaneous in different places Upheavals due to earth-movements crawl slowly over the world, as it were, and there is often time for a considerable change of fauna during their progress, so that the break may come at one life-zone in one place and at another life-zone in another place This is a crude illustration of the kind of difficulty that stratigraphy has to contend with, but, when treated on the right lines, is very illuminating as to the history and geography of the past

Space does not permit us to give here an account of the stratigraphy of the whole world, general summaries of the particular formations will be found in special articles and a sketch of the general geology is given in the articles dealing with each country, so all that will be attempted here is a brief outline, by way of example, of the principles adopted in subdividing the strata of the British Isles, the general geological history of North America is very similar, while that of Africa, India and Australia for example, are very different, and in some sense antithetical, especially in the later periods There is evidence that in the earliest times climatic and other conditions were more uniform over the whole earth than they are now, and some of the earliest marine faunas were very widely spread

Taking the British Isles as a whole, the oldest rocks are found in the north and west, the newest in the south and east this means that in general the country is tilted towards the south-east, like a pile of books that has fallen over In the extreme north-west of Scotland and in the Outer Hebrides are the oldest rocks of all, the Lewisian gneiss, a highly crystalline series mainly composed of igneous rocks, this is succeeded, with a very strongly marked unconformity, by the Torridon Sandstone, a quite normal series of sedimentary rocks, evidently formed under arid conditions This again is followed unconformably by the lowest Cambrian fossiliferous rocks Here then we have a very simple but typical succession Pre-Cambrian rocks in two well-marked and strongly contrasted types, the later being clearly of continental origin, succeeded by a marine transgression Here in this particular region the succession is cut off short, owing to later disturbances which need not now be discussed, but Cambrian rocks are found again in Wales and the Western Midlands, so that the succession can be picked up and continued The marine transgression soon became very extensive and an immensely thick series of marine strata were laid down, with minor breaks locally this state of affairs lasted a long time and the rocks are now divided into three systems, Cambrian, Ordovician and Silurian These constitute the First Marine period Towards the end of Silurian times uplift and disturbance occurred, culminating in the Caledonian mountain-building movements, which formed a great northern land-area, leaving sea where Devonshire now is On this great continent, named by Walther the "Old Red Northland," the desert deposits and lakes of the Old Red Sandstone were formed, while in the south were laid down the marine strata appropriately named Devonian, which extend underground to Belgium and Germany In the north this constituted the Second Continental Period, and was accompanied by an immense development of igneous rocks (the Highland and Lake District granites, and the lavas of the Ochils, Sidlaws and Cheviots) After this the sea again crept north, spreading limestones far over England, with shales and sandstones and even coal in the north, indicating a shore line in Scotland This constitutes the Second Marine Period of the Lower Carboniferous This did not last very long north-western Europe

was soon converted into a low-lying, swampy land area on which the Coal-measures were formed in the Upper Carboniferous Then the continent rose and extended, so that desert conditions again set in and continued during the Permian and Trias About the end of the Carboniferous there was another phase of mountain-building and igneous activity, when the Pennine Hills and the Mendips were formed and granites rich in metals were intruded in Devon and Cornwall Salt lakes were also numerous This was the Third Continental Period After a long while the sea again broke into the desert basins of the Trias and rapidly extended, ushering in the Third Marine Period, which comprises the rocks of the Jurassic and Cretaceous, culminating in the great Chalk sea, which spread far into France and Germany, but was cut off from the Mediterranean region by a barrier Soon after mountain-building became acute in central and southern Europe, leading to the uprise of the Alps, and slight earth-waves were propagated far to the north-west, again bringing in land conditions over most of the area, and this state of affairs continued for the rest of geological time, constituting the Tertiary and Recent, the Fourth Continental Period. accompanying these movements were violent volcanic eruptions in N E Ireland and Western Scotland

Such in the baldest outline is the geological history of the British Isles, which may now be re-stated in the form of a table, from which certain generalizations will be drawn

	Name of system	Character of period	Earth movements
Kainozoic	Neogene	Fourth Continental Period	Alpine
	Palaeogene		
Mesozoic	Cretaceous	Third Marine Period	
	Jurassic		
	Trias		
Palaeozoic	Permian	Third Continental Period	Armorican
	Upper Carboniferous		
	Lower Carboniferous	Second Marine Period	
	Upper Old Red Sandstone	Second Continental Period	Caledonian
	Lower Old Red Sandstone		
	Silurian	First Marine Period	
	Ordovician		
	Cambrian		
Pre-Cambrian	Torridonian	First Continental Period	Huronian
	Lewisian	Mainly igneous	

In connection with this table several points arise for comment In the first place it brings out with great clearness the close relationship between unconformities, earth-movements and igneous activity The major unconformities are due to the mountain-building movements, and minor unconformities, not here mentioned, are of course due to similar causes on a smaller scale. for example there are minor unconformities between Cambrian and Ordovician and Ordovician and Silurian also in many places between Jurassic and Cretaceous Locally again there are smaller unconformities and breaks within the systems, leading to minor subdivisions In other cases the systems are subdivided by lithological variations, or by changes of fauna (zones) Both methods are now usually followed and often lead to inconsistent results, as explained in the section of this article on the biological side of stratigraphy

Another important principle arising from a study of this table is that the beginning and end of a continental period differ in character The beginning of a period of disturbance is indicated by an interruption in the regular deposition of marine strata, usually local at first, then becoming general, culminating in folding, denudation and a marked unconformity, so that the strata of the continental type rest on the eroded edges of the older rocks, but at the end of the period either the land gradually sinks or the sea-level rises, resulting in a quiet marine transgression, with well-marked overlap, and a continental period gradually slides into a marine period without any marked convulsion of nature A good instance is afforded by the gradual transition from the Old Red Sandstone to the marine Carboniferous limestone In many places the passage from one to the other is perfectly conformable, and the boundary can only be drawn on lithological or palaeontological grounds This is a general principle of wide application. The lowest division, the Pre-Cambrian formations, happen to be rather poorly represented in the British Isles; in a similar table for Canada or India they would show up much more conspicuously, and in a South African table it would be necessary to show five or six systems of almost certainly Pre-Cambrian age, though unfortunately there the systems from Cambrian to Silurian, if present at all, contain no fossils In Canada likewise a large number of undoubted Pre-Cambrian systems would have to be shown, though opinion is as yet by no means settled as to how they should be classified But the British Isles happen to contain an unusually complete series of fossiliferous formations and therefore afford an excellent general example

Nomenclature.—An inspection of any list of geological formations will at once show that the names adopted are purely arbitrary Many of them are geographical, derived from localities where the rocks are well represented (Torridonian, from Loch Torridon, in N W Scotland, Devonian, Jurassic, from the Jura Mts, etc), sometimes they are derived from ancient names for the country or for its inhabitants (Cambrian, the Roman name for Wales, Ordovician and Silurian from ancient tribes inhabiting the Welsh borderland), while another group comes from lithological characters (Old Red Sandstone; Carboniferous=coal-bearing, Cretaceous from *creta,* Lat for chalk) "Trias" is derived from a three-fold division of the system on the continent of Europe, which is not seen in England The Tertiary again is subdivided into Eocene, Oligocene, Miocene, Pliocene (*see* these headings), names of Greek origin founded on the numerical proportions of living species in each

Most of these names are in world-wide use though they are not always very applicable in distant countries; it is when we come to those of the smaller subdivisions that chaos sets in, many of them being of purely chance origin, especially among the older ones The British rocks were first roughly classified, as before mentioned, by William Smith, about the beginning of the last century, and many of his rough-and-ready names have stuck and have obtained world-wide currency, sometimes in their original form, sometimes slightly altered They are usually descriptive of the character of the rocks and many have a geographical name tacked on, such as Oxford Clay, Stonesfield Slate, Lincolnshire Limestone A few are derived from English dialect words, as are probably, Lias and Gault Such names as Coal-measures, Lower Greensand and Magnesian Limestone explain themselves; in certain cases old names have been more or less classicized or modernized, taking such forms as Corallian, Callovian (from Kellaways Rock) and so on, and a large number of new names have been constructed on similar lines.

Attempts have been made, especially by palaeontologists, to sweep away these old historic names and to substitute an entirely new and "scientific" classification On logical and utilitarian grounds such a procedure would perhaps be justified, but very many geologists, especially field geologists, would deeply regret their disappearance, since they do at any rate indicate where and how stratigraphical geology took its rise and they serve as a

lasting memorial to William Smith, Adam Sedgwick, Sir Roderick Murchison and the other founders of stratigraphical geology

In connection with nomenclature one more point remains in need of explanation, namely, the meaning of the names Palaeozoic, Mesozoic and Cainozoic, used in this table to indicate three out of the four major subdivisions adopted Etymologically the words mean *ancient, middle* and *recent life,* and thus of course refer to the character of the fossils found in the rocks. each is the subject of a special article (*q v*) and the subject need not be elaborated here Sometimes these names are replaced by Primary, Secondary and Tertiary respectively, the first is little used, Secondary and Mesozoic are employed almost indiscriminately, while Tertiary is perhaps even commoner than Cainozoic It is all a matter of taste, as the connotations of the two sets of names are identical

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Many of the books named above give abundant references to the literature Special bibliographies will be found at the end of the articles dealing with petrology and with the subdivisions of geology and mineralogy For local details *see* the publications of the Geological Surveys of the countries concerned (R H RA)

GEOMETRIC CONTINUITY: *see* CONTINUITY

GEOMETRIC PERIOD, in architecture, the earlier of the two sections into which the decorated period (*q v*) of English Gothic (*see* GOTHIC ARCHITECTURE) is usually divided, comprising roughly, the last half of the 13th century

GEOMETRIC SOLIDS: *see* SOLIDS, GEOMETRIC

GEOMETRIES, FINITE, a class of geometries in each of which there is a finite number of (undefined) elements called points, falling into (undefined) subsets called lines, such that the mutual relations of lines and points (as well as various derived figures, such as planes, 3-spaces, etc) are closely analogous to those of like objects in ordinary projective geometry Following Professors Veblen and Bussey, we define them in the following manner

A finite geometry consists of a set S of elements, called points for suggestiveness, which are subject to the following five conditions or postulates

I The set S consists of a finite number of points It contains one or more subsets called lines, each of which contains at least three points

II If A and B are distinct points, there is one and only one line that contains both A and B (We denote this line by AB)

III If A, B, C are non-collinear points and if a line l contains a point D of the line AB and a point E of the line BC but does not contain A or B or C, then the line l contains a point F of the line CA

IV_k If m is an integer less than k, not all the points considered are in the same m-space

V_k When IV_k is satisfied, there exists in the set of points considered no (k+1)-space

The geometry so defined is one of k dimensions

In this system of postulates the terms point and line are left undefined They are to be any objects of thought for which the postulates are true An m-space, or a space of m dimensions, is then defined inductively as follows A point is a 0-space and a line is a 1-space If $P_1, P_2, \ldots, P_m, P_{m+1}$ are points not all in the same (m−1)-space, then the set of all points each of which is collinear with P_{m+1} and some point of the (m−1)-space $(P_1, P_2, \ldots, P_m)$ is the m-space $(P_1, P_2, \ldots, P_{m+1})$. A 2-space is called a plane.

It may be observed that the foregoing definitions and postulates are all identical with corresponding definitions and propositions of the usual projective geometry, except for the one requirement here made that the number of points considered shall be finite This is the justification for using the name geometry for the configurations here defined Many of the propositions of projective geometry can be developed from postulates similar to the foregoing without saying whether the number of points is finite or infinite, and this is done in Veblen and Young's *Projective Geometry* In fact this procedure is illuminating, so that the finite geometries justify themselves in the light which they throw on ordinary projective geometry But they also have other uses, particularly in the development of the theory of permutation groups Moreover, the theory in itself possesses such artistic elegance as to commend it strongly to one who takes pleasure in such aspects of thought

As an example of a finite geometry of two dimensions we have one in which the set S consists of the 13 letters A, B, C, ..., M, while the lines consist of the 13 subsets of four elements each indicated by the columns of the following array

A	B	C	D	E	F	G	H	I	J	K	L	M
B	C	D	E	F	G	H	I	J	K	L	M	A
D	E	F	G	H	I	J	K	L	M	A	B	C
J	K	L	M	A	B	C	D	E	F	G	H	I

That this set of points, with the indicated subsets forming lines, satisfy the given postulates the reader may readily verify

There are special finite geometries of two dimensions which cannot be extended to, or imbedded in, geometries of higher dimensions These exceptional geometries we shall not consider All our further statements will refer only to those geometries remaining after these exceptional cases are excluded

Some Principal Theorems.—In any given finite geometry the number of points on one line is the same as the number on any other, and this number is always of the form $1+p^n$ where p is a prime and n is a positive integer For every such p and n a unique k-dimensional finite (projective) geometry exists having $1+p^n$ points on a line, it is denoted by the symbol $PG(k,p^n)$ Many of its properties are common to it and the ordinary projective geometry of k-dimensional space The number of points in a $PG(k, p^n)$ is

$$1+p^n+p^{2n}+\cdots+p^{kn}$$

If one omits from a PG (k, p^n) any subspace of k−1 dimensions, then there remains a set of p^{kn} points forming a Euclidean geometry $EG(k, p^n)$ of k dimensions It has many properties in common with the usual geometry of k dimensions and of Euclidean type The finite geometries $PG(k, p^n)$ exhibit a property of duality in all respects analogous to the property of duality in ordinary projective geometry Thus, in a space of three dimensions the planes may be interpreted as points if one at the same time reinterprets the points as planes, while lines continue to be lines

It is possible to introduce homogeneous co-ordinates into the geometry $PG(k, p^n)$ and thus to represent its points by means of k+1 homogeneous co-ordinates This is simplest in the case when n=1 For the PG(k, p) we employ for the number system the integers taken modulo p Thus we have in this case the distinct numbers 0, 1, 2, ..., p−1 In the general case of $PG(k,p^n)$ we use for the number system the marks of the Galois field $GF(p^n)$ In each case a point is denoted by the symbol $(\mu_0, \mu_1, \ldots, \mu_k)$ interpreted as a set of homogeneous co-ordinates, that is, interpreted so that $(\mu_0, \mu_1, \ldots, \mu_l)$ and $(\nu\mu_0, \nu\mu_1, \ldots, \nu\mu_k)$ represent the same point if ν is any mark different from zero, it is understood that one at least of the marks $\mu_0, \mu_1, \ldots, \mu_k$ is different from zero Then the points $(x_0\ x_1, \ldots, x_k)$ whose co-ordinates satisfy one linear homogeneous equation

$$c_0x_0+c_1x_1+\cdots+c_kx_k=0$$

constitute a space of k−1 dimensions, those satisfying two such equations (when these are independent) constitute a space of k−2 dimensions, and so on

The geometry already exhibited as an example is the PG(2, 3); and its number system consists of integers taken modulo 3 It affords a convenient illustration of the results stated in the two foregoing paragraphs.

The totality of transformations of points by each of which a PG(k, p^n) is left invariant, that is, transformations of points by which lines go into lines, are of particular importance They are called collineations. This totality contains all the linear homogeneous transformations on k+1 variables ($x_0, x_1, \ldots, x_k$) into k+1 variables ($y_0, y_1, \ldots, y_k$), the set of variables in each case representing a point of the geometry When n = 1 this totality contains all the collineations When n > 1 it is necessary to adjoin the transformation

$$y_i = x_i^p, \quad i = 0, 1, \ldots, k,$$

in order to generate all the collineations in PG(k, p^n) Those transformations in this set, each of which leaves fixed a given (k−1)-space in PG(k, p^n) transform among themselves the points of the corresponding EB(k, p^n) according to the group of collineations of this Euclidean geometry

Relations with Permutation Groups.—The collineation groups give rise to some of the most interesting permutation groups, particularly those known as primitive groups But the finite geometries have a more intimate relation than this to the general theory of abstract finite groups Thus an Abelian group H of order p^{k+1} and type (1, 1, . . , 1) affords a representation of the PG(k, p) by interpreting as points the subgroups of order p in H and as lines the subgroups of order p^2 This theorem, which is easily demonstrated, may be extended to the case of the geometries PG(k, p^n) Here we consider an Abelian group G of order $p^{(k+1)n}$ and type (1, 1, , 1) and select from G a certain special set of subgroups of order p^n, interpreting each subgroup as a point, while a group of order p^{2n} generated by two of them is called a line Then the collineation groups are interpretable by means of the holomorph and the group of isomorphisms of G Thus the finite geometries may be treated as a chapter in group theory, and conversely all propositions in the finite geometries may be translated into propositions about Abelian groups

See O Veblen and W H Bussey, Trans Amer Math Soc , 7, 241–259 (1906), O Veblen and J W. Young, *Projective Geometry*, vol 1 (1910) and vol II. (1918) (Boston, U S A) (R D Ca)

GEOMETRY, one of the three principal branches of mathematics (the other two being algebra and analysis), may be described as the branch which deals with the properties of space Its most elementary part is known to every schoolboy under the name of plane and solid geometry, the former dealing with the properties of figures in a plane, the latter with the properties of figures in space (of three dimensions) These two subjects form, however, only a small part of geometry as the term is now understood The present article attempts, first, to describe briefly these two elementary topics in geometry, and secondly, to give the reader some conception of the content of geometry as a whole with references to other articles where more detailed information on the various topics may be found The article is then intended, in part, to orient the reader in a very large subject, sending him to other articles for more elaborate discussion of the special fields

GENERAL SURVEY

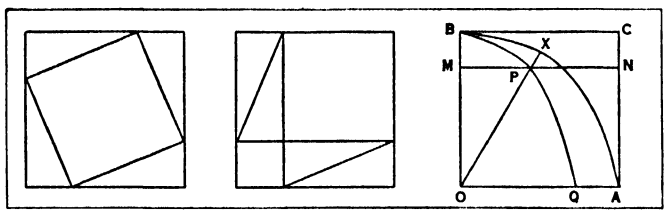
Like most other branches of knowledge, geometry arose originally in response to man's practical needs The word "geometry" (Gr. γη, earth and μετρον, measure) means "earth measurement " Indeed, the subject seems to have had its birth in ancient Egypt, where the periodic inundations of the Nile made the surveying of the land for the re-establishment of boundary lines a necessity This early *empirical* geometry consisted merely of a number of crude rules for the mensuration of various simple geometric figures; for the laying out of angles, especially right angles, etc (*See* below for details as to history)

The ancient Greeks developed this crude beginning into the science which is now studied in the schools under the name of *demonstrative* geometry, the plane and solid geometry already mentioned This form of geometry depends on the observation that the propositions of geometry are logically inter-related, *i e*, that, if certain propositions are granted, certain others can be proved as logical consequences of those assumed. This suggests the possibility of arranging all the propositions in a sequence such that every proposition in the list, *after a certain one,* is a logical consequence of some or all the propositions that precede it. The first comprehensive and systematic attempt to exhibit the propositions of geometry in such a sequence, which has come down to us, is one of the most famous works in all literature, the *Elements* of Euclid (*q.v*) of Alexandria (*c* 300 B C) This work consists of 13 books, the first six and the last three of which are devoted to plane and solid geometry respectively More or less literal translations of this ancient work were used to within a generation ago as textbooks in the public schools of England The textbooks of the present time in all countries are adaptations of Euclid's *Elements* designed to meet the pedagogical needs of young pupils, they may claim pedagogical advantages, but at the sacrifice of some logical rigour and comprehensiveness.

The Foundations of Geometry—If the propositions of geometry have been arranged in a strictly logical sequence, as above indicated, it is evident that a certain number at the beginning of the list are not logical consequences of the preceding ones The first proposition is, of course, not a logical consequence of a preceding one, nor is it likely that the second is a logical consequence of the first The question then, naturally, arises as to the logical status of these unproved propositions on which all the others depend Moreover, these propositions involve certain terms, such as point, straight line, circle, etc What meaning attaches to such terms? A definition defines a term in terms of certain others, the meaning of which is supposed known In order to avoid defining in a circle some terms must remain undefined The foundations of geometry must then consist, from the purely logical point of view, of a set of undefined terms and a set of unproved propositions concerning them, such that every new term can be defined in terms of the undefined, and such that every new proposition can be proved a consequence of the unproved The unproved propositions are usually called axioms (*q v*) or postulates Are these to be regarded as self-evident truths? Are they imposed on our minds *a priori,* as Kant (*q v*) taught, and is it impossible to think logically without granting them? Or are they, in accordance with the teaching of John Stuart Mill (*q v*) of experimental origin? Do the undefined terms denote primitive notions, the meaning of which is clear without definition to everybody? Prevailing opinion regards a geometric theorem as true beyond possibility of doubt by a reasonable being Will a critical inspection bear out this opinion? The answer is in the negative Indeed, Bertrand Russell has said "Mathematics may be defined as the science in which we never know what we are talking about nor whether what we say is true " ("Recent work on the Principles of Mathematics," *The International Monthly,* 1901) Many a reader, in looking back on his school days, may heartily agree with this definition Modern work on the foundations has shown that Kant was wrong and that Mill was only partly right Logically considered, the axioms and postulates are mere assumptions A certain writer has considered the dethroning of the "self-evident" as analogous to the change from an absolute monarchy to a democracy The "self-evident truth," which ruled by the Divine right of the alleged inconceivability of the opposite, has been replaced by the "assumption," which is elected for its qualifications to serve (the reference is obviously to an ideal democracy)

Greek Geometry.—The more elementary part of Greek geometry is too well known to warrant a detailed exposition here The reader will recall with pleasure or pain, but without difficulty, the theorems on the equality or congruence (to use the more modern term) of triangles, on parallel lines, on the circle, on the measurement of angles by various circular arcs, on the similarity of triangles and other figures, on regular polygons, on proportion, on perimeters and areas, etc , in plane geometry; and the various properties of planes and lines, dihedral, trihedral, and polyhedral angles, the mensuration of pyramids, prisms, cones, cylinders, and the sphere, etc , in solid geometry

Among the high spots of this material we may mention the famous so called Pythagorean proposition (the square on the hypotenuse of a right triangle is equal to the sum of the squares on the other two sides) of which many proofs have been published Among them the visual proofs are of special interest, one of which is reproduced herewith A mere comparison of the adjoined figures establishes the theorem The theorem is of interest



also for the problems to which it gave rise Even in ancient times the problem of finding right triangles with integral sides, *i e*, to find three whole numbers x, y, and z, such that $x^2+y^2=z^2$, engaged the attention of mathematicians and was completely solved by them The generalization to the solution in whole numbers of the equation $x^n+y^n=z^n$ is still one of the unsolved problems in the theory of numbers (*see* THEORY OF NUMBERS), no solutions existing for any value of n greater than two and less than 100 Certain other famous problems deserve mention on account of their influence on the development of geometry and of mathematics in general

The Duplication of the Cube—The Athenians, so the story goes, appealed to the oracle at Delos to know how to stay the plague which visited their city in 430 B C The oracle replied that they must double in size the altar of Apollo without changing its shape The altar being in the form of a cube, the problem was to find the size of a cube whose volume was twice that of a given cube In modern notation, if a is the side of the given cube, the problem is to construct x such that $x^3=2a^3$. It must be remembered that, to the Greeks, "construct" meant construct *with ruler and compasses only* With this limitation on the means to be employed the problem is now known to be impossible But the attempts to solve it led to the invention of numerous new curves (*see* CURVE, CURVES, SPECIAL) and was a powerful stimulus to mathematicians through many centuries

The Trisection of an Angle—To construct the bisector of any angle is one of the easiest problems in plane geometry It was inevitable that a construction for dividing any angle into three (or more) equal parts should be sought Again, if the construction is to apply to any angle (certain special angles such as a right angle are, of course, readily trisected) and if ruler and compasses only may be used, the problem is impossible, *i e*, there is no such construction Many new curves, however, have been invented for the purpose of solution Among these we may mention the curve that was later known as the *quadratrix*, because it furnished a solution also for the problem of squaring the circle (*see* below) In the figure shown above OX rotates at a uniform rate through one right angle from the position OB to the position OA, in the same time that the line MN, always parallel to OA, moves at a uniform rate from the position BC to the position OA The intersection P of the line OX and MN then traces the curve in question The use of this curve in trisecting an angle is almost trivially simple Let XOB be the angle to be trisected Divide BM into three equal parts and draw lines through the points of division parallel to OA These lines meet the quadratrix in points which if joined to O yield the required trisectors

The Squaring of the Circle—This problem, perhaps the most famous one of all, consists in constructing a square equal in area to the area of a given circle It, too, is impossible if ruler and compasses are the only instruments permitted The use of the quadratrix in the solution of this problem depends on the following relation. In the preceding figure it may be proved that the length of the quadrant BXA satisfies the following proportion.

$$\frac{BXA}{OA} = \frac{OA}{OQ}.$$

This makes it possible to construct a line equal in length to the circumference of the circle, from which a square equal in area to that of the circle is easily constructed In spite of the fact that the solution of these problems by means of ruler and compasses alone has been known to be impossible for over 100 years, angle-trisecters and circle-squarers continue to appear The best that can be said of these deluded individuals is that their enthusiasm has outstripped their scholarship A later section of this article is devoted to the modern aspect of construction problems, and another section to developments arising from Euclid's parallel postulate

The Conic Sections—Partly under the stimulation of the problems just mentioned, the ancient Greeks investigated a class of curves known as the conic sections (*q v*), or more briefly the conics, and developed a large number of their properties These curves arise as the plane sections of a right circular cone and have three distinct forms, the ellipse, the parabola, and the hyperbola They have played a fundamentally important rôle in the development, not only of pure mathematics, but also in the applications The reader may find further information in the article referred to (*see* also PROJECTIVE GEOMETRY) Suffice it to say that, had the conic sections not been previously studied, Kepler could not have discovered his famous laws concerning the motion of the planets, nor would we to-day have the benefit of searchlights with their parabolic reflectors With the work of Apollonius on conics and the work of Archimedes on certain spirals and his remarkable determination of certain areas—he succeeded in finding the areas of an ellipse and of a parabolic segment—we reach the limits of ancient Greek geometry No essential progress was made in this subject for over 1,000 years We may, however, at this point say a few words about a more modern development, which is largely in the spirit of ancient geometry

The Geometry of the Triangle and Circle—This development relates to a detailed study of the triangle (*q v*) and circle (*q v*) It consists largely of the discovery of numerous points and lines connected with a triangle or circle and the discussion of their properties Some of the latter are very remarkable As an example, we may mention the nine-point circle related to a triangle, so-called because it passes through (*a*) the three mid-points of the sides, (*b*) the feet of the perpendiculars drawn from the vertices to the opposite sides, and (*c*) the mid-points of the lines joining the intersection of the three altitudes to the three vertices This circle is tangent to the inscribed circle of the triangle, and also to the three circles which are each tangent to one side and the other two sides produced

Descartes and the Invention of Analytic Geometry.—A new stimulus came to the development of geometry by the introduction through Descartes (1637, *q v*) of the so-called analytic methods By representing a point in a plane by means of two numbers (co-ordinates, *q v*), giving the distance and direction of the point from two intersecting lines (axes) of the plane, it was found possible to translate any geometric situation into an algebraic situation, whereby the powerful methods of algebra became available as a means of geometric investigation The resulting analytic geometry (*q v*) is distinguished from the older or synthetic geometry by its method rather than by its content Analytic and synthetic geometry do not then constitute two different branches of geometry, they denote, rather, two distinct methods of studying geometry There seems to be no need, therefore, to give further details as to this method at this point, the reader should consult the article just mentioned We may, however, try to characterize briefly the effect on the development of geometry of the introduction of these new methods

In the first place, it provided a systematic plan for further progress A curve in the plane is represented by an equation in the variable co-ordinates (x, y) of a point on the curve The straight lines are represented by equations of the first degree Equations of the second degree turn out to represent the conic sections (*see* above) It was therefore natural to study next the curves represented by equations of the third degree (cubic curves), then those of the fourth degree (quartic curves), and so on It was possible even to develop a general theory of curves of

degree n Some curves, such as the quadratrix previously mentioned, lead to equations that are not algebraic but transcendental (*see* EQUATION) Similar remarks apply to the geometry of space (of three dimensions) A point in space is represented by three co-ordinates (x, y, z); an equation in these three variables represents a surface, and surfaces may then be classified according to their degree (those of the first degree being the planes), and then systematically studied

Construction Problems.—In the second place, and closely related to the preceding, the new method gave a means of classifying the construction problems inherited from the ancients, as well as new ones A construction problem, when formulated analytically, is found to be equivalent to the solution of an equation or to that of a system of simultaneous equations A construction with ruler and compasses is possible only when the corresponding equations can be solved by means of the rational operations (addition, subtraction, multiplication, division) and the extraction of square roots The equations underlying the problem of duplicating the cube and that of trisecting an angle cannot be solved without introducing irrational operations of higher order than square roots (in both these cases cube roots suffice) These problems are, therefore, impossible with ruler and compasses, as previously stated Another problem that had a great influence on the development of algebra was that of constructing a regular polygon of a given number of sides The ancient Greeks were able, with ruler and compasses, to construct regular polygons of three, four, five, six, eight, ten, . . . sides, but failed in their attempts to construct one of seven sides The determination of those values of n for which a regular polygon of n sides can be constructed with ruler and compasses led to a detailed study of the so-called cyclotomic equations, $x^n-1=0$ As a result it was shown that the problem is possible only when n has the form $n=2^k p_1 p_2 p_3 \ldots$, where each p represents a prime number of the form $2^{2^t}+1$ Since seven is not of this form, the problem is impossible when $n=7$ It will be noted that the first prime of the required form greater than 5 is 17, the next 257 The general result given is due to K F Gauss (1796) (*q v*).

Spaces of More Than Three Dimensions.—In the third place the analytic formulation of geometry led naturally, almost inevitably, to a vast extension of the domain of geometry Since the points of a plane could be represented by pairs of co-ordinates (x, y), the points of a space of three dimensions by triples (x, y, z) of co-ordinates, the question arises as to the geometric interpretation of a set of four independent co-ordinates (x, y, z, u) of a set of five, ; in general, of a set of n such co-ordinates This led to the conception of a space of four, five, . . , or in general of n dimensions The precise formulation of the idea of dimension (*q v*), as here used, need not concern us at this place We may note, however, that the notion of a space of four or more dimensions is not, as is generally supposed, necessarily beyond our powers of concrete representation True, a space of points of more than three dimensions is an abstract generalization to visualize which is beyond the present powers of our imagination But, if we use other elements than points with which to build our space, no such difficulty arises Thus the totality of straight lines in ordinary space (of three dimensions) is four-dimensional, *i e*, constitutes a four-dimensional space (of lines) The totality of all spheres in ordinary space is a four-dimensional space of spheres The corresponding geometries (line geometry and sphere geometry, *see* below) are just as concrete as the ordinary point geometries in the plane or in ordinary space Nevertheless, point spaces of more than three dimensions are the ones usually thought of when n-dimensional spaces are being considered Strangely enough, they find a large part of their interest in the field of applied mathematics The four dimensional space-time manifold of Einstein-Minkowski is one that has recently aroused considerable popular interest in connection with the theory of relativity (*q v*) In the field of applied mathematics the conception of a space of more than three dimensions is generally of value in that it makes possible the application of geometric language to a problem that is essentially analytic This language is of great convenience and is often suggestive of the relations sought As an example we may cite the dynamical theory of gases. Suppose a gas consists of a (very large) number, N, of molecules The dynamical condition of each of these molecules is represented by six co-ordinates, three to specify its position in space and three more to give the three components of its velocity. To describe completely the state of the gas at any instant $6N$ co-ordinates would be necessary. Jeans, in his *Dynamical Theory of Gases,* says "We can suppose this dynamical system represented in a generalized space of $6N$ dimensions" A space of $6N$ dimensions, where N is the number of molecules in a certain volume of a gas! After this, it will cause no surprise to learn that spaces of an infinite number of dimensions have also been defined and their properties investigated Indeed, there are several different kinds of such spaces Before leaving this topic, it should perhaps be noted that, while we have chosen to introduce the concept of an n-dimensional space on an analytic basis, the same can be done equally well on a purely synthetic basis

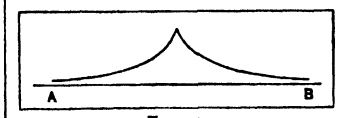


FIG 3

Imaginary Elements.—In the fourth place, the introduction of analytic methods led to the conception of imaginary points, lines, etc , a conception which proved very fruitful Not only did it make possible a greater generality in the statement of theorems and give a deeper insight into geometric relations, as, for example, the characterization of a circle as any conic which passes through certain two imaginary points at infinity, but it also opened up a new field of enquiry A complex variable $x=x'+ix''$ $(i^2=-1)$ depends on two real variables x', x'' A complex line has then two real dimensions; a complex plane of points (x, y), where x and y each depend on two real variables, is a space of four real dimensions The discussions of the one-dimensional loci on the complex line, and the one-, two-, and three-dimensional spreads in the complex plane constitutes a new world for the geometer to explore

Finally, we should mention the fact that the introduction of the analytic method contributed largely to the idea of the unity of mathematics There have been several instances in the preceding paragraphs not merely illustrating the possibility of regarding every geometric situation from an analytic point of view, which is, of course, the very essence of analytic geometry, but also exemplifying the fact that analytic situations may be given a geometric interpretation It becomes increasingly difficult to distinguish analysis from geometry, these two branches of mathematics appear rather as different aspects of the same thing

Differential Geometry.—The introduction of the differential and integral calculus (Newton and Leibniz, *qq v*) only a half century after the introduction of analytic geometry, greatly increased the power of the latter The application of the fundamental ideas of the calculus to geometry introduced many new and valuable concepts The resulting discipline is known as differential geometry (*q v*) Among the more elementary concepts referred to we may cite, by way of example, the *curvature* of a plane curve The curvature at a point on a curve is a number which measures the sharpness of bending at that point More precisely, if the curve is thought of as traced by a point moving with uniform speed along the curve, and this speed is taken as unity, the curvature at a point is proportional to the rate at which the tangent to the curve is turning at the instant when the moving point is at the given point The curvature of a straight line is zero, the curvature of a circle is the same at every point and is equal to the reciprocal of the radius of the circle This conception leads to a very beautiful theorem in the general theory of surfaces The line drawn through a point on a surface perpendicular to the tangent plane at that point is called the *normal* to the surface Let us consider the plane curves obtained as sections of our surface by planes passing through this normal—the so-called normal sections Each of these plane curves has a curvature at the point. Among all these normal sections there will, in general, be one for which the curvature is a maximum, and one for which the curvature is a minimum (The exception is when all the curvatures are the same, in which case the surface is a plane or a

sphere, or the point is some sort of exceptional point. We shall consider only "general" points, *i e*, points that are not exceptional) The theorem referred to states that *these two normal sections are always at right angles to each other* (The theorem is true, as stated, for all respectable surfaces other than planes or spheres; the exceptions may be disregarded in a survey of this kind) Further, this theorem makes possible the definition of the so-called *total curvature of a surface* at a point as the product of the maximum and minimum curvatures of the normal sections just referred to The investigation of surfaces of constant total curvature leads to the result that the only such surfaces are the plane whose total curvature at every point is zero, the sphere whose total curvature at every point is a positive constant (equal to the reciprocal of the radius squared), and the so-called pseudo-sphere whose total curvature at every point is a negative constant (A negative total curvature indicates a saddle-shaped surface) The pseudo-sphere is obtained by revolving about the line *AB* the curve (known as the tractrix) in the adjoined figure These surfaces of constant curvature are of interest in connection with non-Euclidean geometry (*See* below)

Projective Geometry.—Early in the 17th century Desargues (1593–1662) proved the theorem that, if the vertices of two triangles lie on three lines meeting in a point, then their sides meet in three points lying on a line (*see* fig 4) This theorem, it will be observed, has nothing to do with measurement, while the theorems of the older geometry are metric Such theorems occur singly in the 17th century; they were not recognized as forming part of a new kind of geometry until about the beginning of the 19th century, when the so-called projective geometry (*q v*) was developed as a self-contained body of doctrine If we take a photograph of a straight railroad track, with equally spaced ties, the parallel lines of the track appear in the photograph as converging, the equal distances between the ties appear unequal in the photograph, getting shorter and shorter as they recede in the picture The right angles between the ties and the track appear as acute angles If the landscape contains a circular pond it appears in the photograph as an ellipse And yet the picture represents the scene; something of the actual relationships of the scene must be preserved, even though distances and angles are distorted, and parallel lines are no longer parallel The properties of the scene that are preserved in the photograph, *i e*, the properties that are unchanged ("invariant" is the technical term), under the transformation produced by taking the photograph, are the properties studied by projective geometry If the mechanism of this transformation is analysed, it is readily seen to consist of the following Given any plane geometric figure (we confine ourselves to plane figures for the sake of simplicity), let *O* be any point not in the plane of the figure and think of straight lines drawn from *O* to every point of the figure Let this set of lines be cut by any other plane not passing through *O* This plane section of the lines through *O* gives a new figure in the cutting plane which is said to have been obtained from the original figure by the process of projection and section It will be noted that in the case of our photograph the original scene is our first figure, the photographic plate is the cutting plane, while the point *O* is the point in the camera in which the light rays from the scene converge Corresponding to every point of the original figure there is by this process determined a definite point in the new figure; corresponding to every straight line in the original there is a straight line in the new, if a point *P* in the original lies on a line *l*, the corresponding point *P'* in the new figure will lie on the line *l'* corresponding to *l* A projective transformation consists of such a transformation by projection and section or of the result of a sequence of any number of such projections and sections A projective transformation then transforms points into points, and straight lines into straight lines, and preserves the property of the incidence of points and lines It does not preserve distances or angles, the latter, therefore, have no place in projective geometry as such Its nature is to some extent characterized by calling it the geometry of position (*Geometrie der Lage*) It is, as to structure, a very simple geometry and an extraordinarily symmetric one Further details must be sought in the article referred to above Projective geometry, moreover, furnishes a scientific basis for descriptive geometry (*q v*) which is a branch of applied rather than of pure geometry

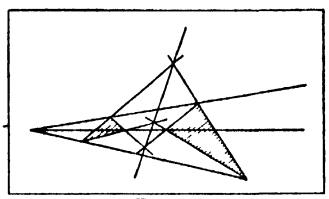


FIG 4

The set of all projective transformations (in a plane or in space) form what is known as a *group of transformations* by virtue of the fact that the result of performing any two of the operations of the set in succession is equivalent to a third transformation of the set Projective geometry is characterized completely by the fact that it studies those properties of figures which are invariant under the group of all projective transformations Similarly, the set of all rigid motions in space form a group (*see* GROUPS) Ordinary elementary metric Euclidean geometry is then the geometry which studies those properties of figures that remain invariant under the group of all such motions These are special cases of a fundamental principle, first enunciated by Felix Klein in 1872, to the effect that corresponding to every group of transformations in space there is a geometry consisting of those properties of space which are invariant under the given group This principle provides at once a general classification of geometries, it also provides a systematic method of procedure in studying geometry as a whole, by the systematic investigation of all possible groups of transformations In this project Sophus Lie (*q v*) laid the foundations in his theory of continuous groups The group of motions just referred to is a sub-group of the general projective groups, other sub-groups are equivalent to the non-Euclidean (hyperbolic or elliptic) displacements, so that ordinary Euclidean and the two forms of non-Euclidean geometry are all implicitly contained in projective geometry, from which they are obtained by specialization Furthermore, non-projective transformations may be defined by means of the projective, so that Arthur Cayley (*q v*) was led to exclaim "Projective geometry is all geometry"

Inversion Geometry.—Among other geometries that have received extensive study, and in which the point is still the primary element of space, we may mention the inversion geometry in which the fundamental transformations are the so-called inversions with respect to a circle (plane inversion geometry), or with respect to a sphere (inversion geometry in space), or with respect to a hyper-sphere (in spaces of more than three dimensions)

Analysis Situs.—The set of all possible continuous transformations, *i e*, roughly speaking, the set of all twistings, bendings, stretchings or contractions without tearing anything apart, also form a group The corresponding geometry is known as analysis situs (*q v*) It must consider, by what has been said, those properties of figures that remain invariant under any continuous transformation whatever Are there such properties? A simple closed curve in a plane divides the plane into two regions, an inside and an outside This is a theorem of analysis situs A surface may be either one-sided or two-sided (a simple one-sided surface may be obtained by taking a strip of paper and fastening together the two ends, having previously turned one of the ends over through an angle of 180°, *see* fig 5) and this property is invariant under any continuous transformation If a map is drawn on any simple closed surface, say a sphere, by any set of intersecting lines on the surface dividing the surface into a set of regions (countries), and if the number of regions is denoted by *r*, the number of sides (the portions of the lines between two points of intersection) by *s* and the number of vertices (the points of intersection of the lines) by *v*, then the relation $v+r=s+2$ always holds This, too, is a theorem of analysis situs (due to L Euler, *q v*) It has been stated that, given any such map, four different colours are sufficient to colour the countries in such a way that no two countries with a boundary line in common shall have

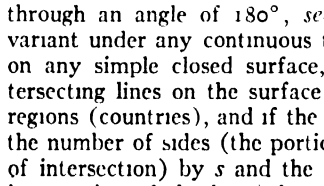


FIG 5

the same colour. The proof of this apparently simple theorem, however, presents serious difficulties; it is still one of the unsolved problems of analysis situs

Primitive Elements of Space.—We have hitherto assumed the point as the primitive element of space, except that once or twice we have hinted at the fact that this is not essential. In fact, the idea that some other geometric entity might be used as the primitive element, immediately opens up a new and vast field of geometric investigation If, for example, we think of ordinary space as made up of all the straight lines in it, and study the properties of these lines and of systems of these lines, we enter the field of line geometry (*q v*), which, as has been said, is four-dimensional If the sphere is taken as the primitive element of space, we obtain the so-called sphere geometry, and so on

There are other aspects of geometry which it might be thought desirable to include in this general survey For example, some may seek here a reference to such matters as curves without tangents, or to the so-called "crinkly" or surface-filling curves But these are essentially problems of higher analysis in geometric garb Others may look in vain for a discussion of the very important concept of elements at infinity in the various geometries, such a discussion will be found in the articles devoted to the geometries in question. Enough has been said, it is hoped, to give the reader some notion of the scope of geometry as a whole, and some idea of its fundamental conceptions and of the type of problem with which it deals

BIBLIOGRAPHY —Any one of the numerous school texts on plane or solid geometry will serve to refresh the reader's memory on these subjects The standard edition of Euclid's *Elements* in English, is that by T L Heath in 3 vols (Cambridge, 1908) For bibliographies of the various branches of geometry the reader should consult the articles referred to in this article On certain special topics the following may be helpful J W Young, *The Fundamental Concepts of Algebra and Geometry* (New York, 1911), for brief discussions of non-Euclidean geometry, construction problems, foundations of geometry, *n*-dimensional space, etc This book presupposes no mathematical preparation beyond elementary algebra and geometry Somewhat more mathematics is presupposed in *Monographs on Topics of Modern Mathematics*, edit by J W A Young (New York, 1911). It contains chapters on *The Foundations of Geometry* by O Veblen; *Modern Pure Geometry* by T F Holgate, *Non-euclidean Geometry*, by F S Woods, *Constructions With Ruler and Compasses*, by L E Dickson For imaginary elements in geometry *see* J L Coolidge, *Geometry in the Complex Domain* (Oxford, 1924) (J W Y)

HISTORY OF GEOMETRY

The history of geometry may be considered under separate heads as follows Ancient empirical geometry, ancient demonstrative geometry, sporadic developments during mediaeval times and the Renaissance, analytical geometry, modern synthetic geometry and, finally, the foundations of geometry

Ancient Empirical Geometry.—Early Babylonian records disclose the use in auguries of triangles, quadrangles and parallel lines; drawings of Babylonian carriages indicate the division of a circumference into four and six equal parts For angular measurement the circumference was divided into 360 equal parts or degrees, each degree into 60 minutes, and each minute into 60 seconds Like the Hebrews (I Kings vii 23), the Babylonians took $\pi = 3$ One tablet reveals the approximate computation of the diagonal of a rectangle, expressed in the sexagesimal notation More attention to geometry was given in Egypt Greek writers state that land surveying was practised in Egypt because frequent overflows of the Nile obliterated landmarks More reliable information is obtained from papyri and from inscriptions on the walls of temples The Ahmes papyrus written about 1550 B C or, according to others, about 1700 B C, is the most important ancient mathematical manuscript known In this more stress is laid upon arithmetic and algebra than upon geometry Ahmes calculates the areas of squares and rectangles, he approximates the area of an isosceles triangle by multiplying the slanting side by half the base, and of an isosceles trapezoid by multiplying half the sum of the two bases by the slant height Remarkable is the rule for finding the area of a circle From the diameter subtract one-ninth of it, and square the remainder This rule implies that π nearly equals 3 16. Examples on the measurement of pyramids in Ahmes are of doubtful interpretation, but in another nearly contemporaneous papyrus (see *Ancient Egypt*, 1917), a calculation is given yielding the exact volume of the frustum of a rectangular pyramid—an astounding achievement in early Egyptian times

The Greek geometry of Thales and his school, about the 7th century B C, was only just emerging from the empirical stage; it dealt with such cases as the equality of vertical angles, the equality of the base angles of an isosceles triangle and the bisection of a circle by a diameter This was a geometry of lines, Egyptian geometry was mainly one of areas and volumes Thales's measurements of the heights of the pyramids by their shadows and of the distance of ships at sea presupposes the use of similar triangles

Ancient Demonstrative Geometry.—The transition from empirical to rigorous demonstrative geometry was necessarily very slow The discovery by the Pythagoreans in Italy of the existence of incommensurable magnitudes (such as the side and diagonal of a square) marks a long step toward reasoned conclusions The story of the slaughter of a hecatomb of oxen in celebration of the discovery of a proof of the "Pythagorean theorem" of the right triangle is probably a myth, but it indicates a high appreciation of an intellectual achievement in pure geometry Another indication of progress was the proposing, by the Sophists of Athens, of the three famous problems of construction—the squaring of the circle, the trisection of any given angle, and the duplication of a cube. These are now known to be impossible under the restrictions imposed by the Greeks—the use of a pair of compasses and an ungraduated or unmarked ruler in a finite number of steps of construction The Greeks themselves found solutions of these problems when the above restrictions were abandoned Hippias of Elis invented a curve, the "quadratrix," by which angles could be trisected and the circle could be squared But the drawing of the quadratrix involved theoretically an infinite number of steps Hippocrates of Chios, evidently hoping eventually to achieve the quadrature of the circle, successfully "squared" certain lunes and thus furnished the earliest example of a curvilinear area for which under the Greek restrictions an exactly equal area could be constructed in a plane which was bounded by straight lines The duplication of the cube which, algebraically expressed, means constructing $X = \sqrt[3]{2}S$, where S is the side of a given cube, was solved "mechanically" by the aid of the conchoid of Nicomedes and by other means Progress in giving definitions of fundamental concepts like "point," "line," "surface" and in giving explicit expression to axioms, was made by Plato and his pupils The theory of proportion as related to magnitudes was developed by Eudoxus and Theaetetus Eudoxus is credited also with the "method of exhaustion" which is not the same as the modern theory of limits, even though it involves the concept of a variable and a constant The procedure as found in Euclid's *Elements*, bk xii, Prop 2, involves a part of our modern process of showing that a constant is the limit of a variable, but the Greeks did not actually pass, as we do, from the variable to its limit, but resorted, instead, to a process of *reductio ad absurdum*

A most interesting phase in the development of the Greek philosophy of mathematics is seen in Zeno of Elea's arguments on motion. As explained in Aristotle's *Physics*, Zeno tried to prove that motion is impossible Swift-footed Achilles could not catch a tortoise, the arrow in its flight is at any moment at rest, etc For centuries Zeno was branded as a paralogist, but such recent writers as Paul Tannery and Bertrand Russell (*Principles of Mathematics*, 1903) advance the view that Zeno was misunderstood and that his arguments were sound and involved profound questions which have been successfully resolved only by the theory of the continuum as developed in recent mathematics The paradoxes of Zeno, as well as Antiphon's attempt to square the circle by inscribing a series of regular polygons of an increasingly greater number of sides, the ultimate polygon coinciding with the circle, convinced Greek mathematicians that a clear and logical science of geometry could not be attained, except by eliminating the seemingly mystic concepts of infinity and of fixed infinitesimals. And thus we find Euclid excluding the infinitely little from his *Elements* by a definition (bk v, def 4). "Magnitudes are said to have a ratio to one another, when the less can be multiplied so as to exceed the other", if the less were infinitely small, any finite

multiple of it would still be infinitely small and could not satisfy this definition. Likewise, Archimedes, in the preface to his *Quadrature of the Parabola,* gives a postulate which he attributes to Eudoxus. If a and b are magnitudes, such that $a<b$, it shall be possible to find a finite number n, such that $na>b$. Thus in the classical writings of Euclid, Archimedes, and Apollonius of Perga, the infinitely small is carefully avoided

Euclid was the author of several works, the most important of which is his *Elements,* written between 330 and 320 B C It contained 13 books, of which the first six and the last three were devoted to geometry (plane and solid), the seventh, eighth and ninth to arithmetic, and the tenth to irrationals The proof of the theorem of Pythagoras on the right triangle is the only part of the geometry which Greek commentators definitely ascribe to Euclid The geometrical theorems and the methods of proof (the method of exhaustion and the definition of proportion of magnitudes) appear to be due to earlier investigators The great achievement of Euclid was the arrangement of the material handed down to him into a coherent, logical system. He ranks as a great systematizer It is one of the marvels in the history of mathematics that the *Elements,* written in the 4th century B C , should have established and maintained itself as a text-book in geometry for over 2,000 years In England it was the authorized text down to the opening of the present century

Euclid eschewed all practical applications of geometry This attitude was abandoned by Archimedes who found the relation, $3\frac{1}{7}>\pi>3\frac{10}{71}$, needed in computing the area of a circle, and who discovered theorems on the areas of the surface of a sphere and of a cylinder, as well as on the volumes of a sphere and cylinder

Besides the development of ordinary elementary geometry, the Greeks must be credited with the study of the conic sections (the ellipse, parabola, and hyperbola). The beginnings were made in the time of Plato, the culmination was reached in the work called the *Conic Sections,* written by Apollonius of Perga

With Euclid, Archimedes and Apollonius, geometry reached the highest development during ancient times Later Greek writers discovered certain curves (the conchoid of Nicomedes and the cissoid of Diocles), Pappus reached certain theorems and view points which were more fully developed in modern times But these were the afterglow following the sunset of Greek geometry

Mediaeval Times and the Renaissance.—The Hindus of this period did not excel in geometry Their creative work is limited to theorems on the area and diagonals of a quadrilateral inscribed in a circle, theorems developed mainly by Brahmagupta (*c* 628) The outstanding Arabic achievement was the geometric solution of cubic equations, by the method of intersecting conics, a process which had been foreshadowed by Archimedes. The fullest Arabic exposition of this topic was given by the poet Omar Khayyam In Europe creative work began with Johann Kepler, who made use of the concepts of infinitely small and infinitely great quantities, which Euclid and Archimedes had carefully avoided in their classical writings Kepler looked upon a circle as a polygon having an infinite number of sides, and upon a sphere as consisting of an infinite number of pyramids He arrived at the areas and volumes of figures generated by curves revolving about a line as axis The Italian, Bonaventura Cavalieri, a pupil of Galileo, developed the *Geometry of Indivisibles,* and succeeded in solving many of the problems on volumes which had been proposed by Kepler for solution Researches which foreshadowed the great achievements of a more modern period are found in the work of Evangelista Torricelli, Vincenzo Viviani, Gilles P de Roberval, and especially of Gérard Desargues and Blaise Pascal on modern synthetic geometry

The Invention of Analytic Geometry.—Analytic geometry was created by two Frenchmen, René Descartes and Pierre de Fermat The chief credit is rightly awarded to Descartes, who promptly published his results in his *La géométrie,* 1637; Fermat's treatise *Ad locos planos et solidos isagoge* appeared posthumously in 1679 The two main ideas involved in analytical geometry are the location of points in a figure by the use of co-ordinates and the algebraic representation of a curve or surface by an equation involving two or three variables. Of these, only the latter was new in the 17th century; co-ordinate representation was practised in ancient times by Apollonius and others. Descartes's *La géométrie* does not contain a systematic development of analytical geometry in the manner found in modern texts The method must be constructed from isolated statements occurring in different parts of the treatise Nevertheless, it is a work of genius occupying a conspicuous place in the history of geometry. The words "abscissa" and "ordinate" were not due to Descartes. In the technical sense of analytical geometry they were first used by Leibniz in 1692, in the *Acta Eruditorum* An important example solved by Descartes in his *La géométrie* was the "Problem of Pappus". Given several straight lines in a plane find the locus of a point such that the perpendicular drawn from the point to the given lines, shall satisfy the condition that the product of certain of them shall be in a given ratio to the product of the others This problem afforded an excellent example of the power of the analytical method, a power which Boltzmann more recently described by saying that the formula appears at times cleverer than the man who invented it

The cultivators of analytical geometry in the 18th century were Jean Paul de Gua de Malves, Gabriel Cramer, Leonhard Euler and, in general, the mathematicians who developed the differential and integral calculus Thus Newton in 1704 published a classification of cubic curves The calculus offered a general and expeditious method of finding tangents at any point of a continuous curve having derivatives

During the 19th century, new principles were introduced into analytic geometry which afforded greater power and generality to the science Thus the principle of duality was applied by Julius Plucker to equations of lines and curves The duality consisted in a double interpretation of one and the same equation so that $ux+vy+1=0$, for example, could be interpreted as having two variables x, y representing co-ordinates of points, u and v being constants, or the equation could be interpreted as having two variables u, v representing lines, x and y being constants In the first case the equation represents a straight line, in the second case, a point By this duality, one and the same process would yield two theorems But for the full analytic application of duality, Augustus F. Mobius and Plucker found it necessary to abandon the ordinary Cartesian co-ordinates and to introduce the more general homogeneous co-ordinates Plucker studied the singularities of plane curves and developed four equations (the "Plucker equations") expressing the relations between the number of double points, double tangents, stationary points, and stationary tangents of a curve of a given degree and class The discovery of these relations Arthur Cayley considered "the most important one beyond all comparison in the entire subject of modern geometry."

Etienne Bobillier and Plucker introduced an "abridged notation" J J Sylvester and Otto Hesse showed how processes of elimination could be simplified by the use of determinants. Particularly prominent in elaborating the higher fields of the science were Alfred Clebsch, Henri Halphen, and Jean Gaston Darboux Curves and surfaces of higher order afford fields of never-ending research (*See* CURVES, CURVES, SPECIAL)

Modern Synthetic Geometry.—This was cultivated in the 19th century simultaneously with analytic geometry The two movements occupied the same field of study, but differed in method of exposition Rivalry existed between the followers of the two methods, which was usually but not always friendly. The continual direct viewing of figures as existing in space adds exceptional charm to the study of synthetic geometry, but the equation of the analytic method may outrun thought itself and constitutes a powerful tool in research Jean Victor Poncelet and others used both the synthetic and the analytic methods, Jakob Steiner used only the former, Plucker only the latter Modern synthetic geometry was first cultivated by Gaspard Monge, L N M Carnot, and J V Poncelet in France, and by Mobius and Steiner in Germany and Switzerland, and was developed to still higher perfection by Michel Chasles in France and von Staudt in Germany Monge in 1795 was the first to stress the "descriptive geometry" used in engineering The principle of duality was advanced by J D Gergonne and Poncelet for the

study of descriptive properties without reference to the analytic processes elaborated by Plucker. The use of the anharmonic or cross ratio was stressed by Steiner and Chasles

The Foundations of Geometry.—The parallel postulate of Euclid (according to which two lines in a plane meet if the sum of the two interior angles on the same side of a transversal is less than two right angles) seemed unsatisfactory even to some of the ancient mathematicians Proofs of it were attempted on the assumption of the other Euclidean axioms, but were always found invalid After many failures, certain investigators tried to build up a geometry in which the postulate does not hold, in which, in other words, the angle sum in question may be less than two right angles and yet the lines may not meet, no matter how far they are produced The result was a non-Euclidean geometry, perfectly consistent with its assumptions, developed independently by the Russian, Nicolai I Lobachevski (1829) and the Hungarian mathematician, János Bolyai (1834) So novel were these creations that they failed to secure general attention for many years With reference to the assumptions about parallel lines, there are now recognized three principal geometries—the "parabolic" or Euclidean based on Euclid's parallel postulate, the "hyperbolic" or Lobachevskian based on the denial of that postulate, and the "elliptic" or Riemannian geometry in which parallel lines do not exist at all Felix Klein considered two forms of "elliptic" geometry. Two-dimensional geometric figures in the first of these geometries are visualized when drawn in a plane; those in the second geometry are partly visualized on a saddle-shaped surface like the pseudosphere, those in the third geometry are visualized on a sphere Recently, these geometries have assumed importance in cosmological speculations. According to Albert Einstein, the universe is finite and its geometry is "elliptic"

The question of the number of dimensions has agitated mathematicians and philosophers since the time of the Greeks The first to assume definitely the existence of a fourth dimension of space was the Platonist, Henry More, of Cambridge, England, a contemporary of Isaac Newton But not till the 19th century did mathematicians enter upon an extensive study of geometries of higher dimensions As a rule it was not claimed that these higher dimensions had real existence in our physical space, they were ideal creations of the human mind However, as early as the 18th century, D'Alembert and Lagrange looked upon time, which appeared as a fourth variable in mechanics, as a fourth dimension This idea was developed in more recent time by Hermann Minkowski and Einstein in a manner leading to a fourth dimensional world, a "fusion of geometry and physics" Said Minkowski (1908). "Nobody has ever noticed a place except at a time, or a time except at a place"

The foundations of geometry are the last part of the geometric structure to be firmly established Italian and German mathematicians (Giuseppe Peano, 1880, Moritz Pasch, 1882, Mario Pieri, 1899) were the first to enter upon a minute study of independent, consistent and complete sets of axioms enabling the different geometries to be built up without borrowing anything from intuition It was recognized that Euclid, who for centuries had been admired for the rigour of his demonstrations, does depend here and there upon facts not deduced from the axioms but obtained from visual inspection of the figures Thus, in Euclid's *Elements*, in the very first proposition, it is assumed without proof that two circles drawn in the figure intersect each other The study of the foundations of different geometries was continued in Germany, by David Hilbert, in France by Henri Poincaré and in the United States mainly by Oswald Veblen

BIBLIOGRAPHY.—For historical details consult the general histories of mathematics, also such special works as G Loria, *Die hauptsachlichsten Theorien der Geometrie* (1888), G Loria, *Ebene Kurven, Theorie und Geschichte* (1911), F Gomes Teixeira, *Traité des courbes spéciales remarquables* (1908); R Bonola, *Non-Euclidean Geometry* (1912), E. Kotter, *Entwickelung der synthetischen Geometrie* (1901).

(F. CA)

NON-EUCLIDEAN GEOMETRY

The various metrical geometries are concerned with the properties of the various types of congruence-groups, which are defined in the study of the *axioms of geometry* and of their immediate consequences. But this point of view of the subject is the outcome of recent research, and historically the subject has a different origin Non-Euclidean geometry arose from the discussion, extending from the Greek period to the present day, of the various assumptions which are implicit in the traditional Euclidean system of geometry In the course of these investigations it became evident that metrical geometries, each internally consistent but inconsistent in many respects with each other and with the Euclidean system, could be developed. A short historical sketch will explain this origin of the subject, and describe the famous and interesting progress of thought on the subject

History.—In 1621 Sir Henry Savile called attention to the existence of two blemishes (*duo naevi*) in geometry, namely, the theory of parallels and the theory of proportion In both respects the work of later scholars has given rise to important branches of mathematics, while at the same time showing that Euclid is in these respects more free from blemish than had been previously credible. It was from endeavours to improve the theory of parallels that non-Euclidean geometry arose; and though it has now acquired a far wider scope, its historical origin remains instructive and interesting Euclid's "axiom of parallels" appears as Postulate V to the first book of his *Elements*, and is stated thus, "And that, if a straight line falling on two straight lines make the angles, internal and on the same side, less than two right angles, the two straight lines, being produced indefinitely, meet on the side on which are the angles less than two right angles"

To Euclid's successors this axiom had signally failed to appear self-evident, and had failed equally to appear indemonstrable Without the use of the postulate its converse is proved in Euclid's 18th proposition, and it was hoped that by further efforts the postulate itself could be also proved The first step consisted in the discovery of equivalent axioms Christopher Clavius in 1574 deduced the axiom from the assumption that a line whose points are all equidistant from a straight line is itself straight John Wallis in 1663 showed that the postulate follows from the possibility of similar triangles on different scales Girolamo Saccheri (1733) showed that it is sufficient to have a single triangle, the sum of whose angles is two right angles Other equivalent forms may be obtained, but none shows any essential superiority to Euclid's Indeed plausibility, which is chiefly aimed at, becomes a positive demerit where it conceals a real assumption

Saccheri.—A new method, which, though it failed to lead to the desired goal, proved in the end immensely fruitful, was invented by Saccheri, in a work entitled *Euclides ab omni naevo vindicatus* (Milan, 1733) If the postulate of parallels is involved in Euclid's other assumptions, contradictions must emerge when it is denied while the others are maintained This led Saccheri to attempt a *reductio ad absurdum*, in which he mistakenly believed himself to have succeeded What is interesting, however, is not his fallacious conclusion, but the non-Euclidean results which he obtains in the process Saccheri distinguishes three hypotheses (corresponding to what are now known as Euclidean or parabolic, elliptic and hyperbolic geometry), and proves that some one of the three must be universally true His three hypotheses are thus obtained equal perpendiculars *AC, BD* are drawn from a straight line *AB*, and *CD* are joined It is shown that the angles *ACD, BDC* are equal The first hypothesis is that these are both right angles, the second, that they are both obtuse; and the third, that they are both acute Many of the results afterwards obtained by Lobachevski and Bolyai are here developed Saccheri fails to be the founder of non-Euclidean geometry only because he does not perceive the possible truth of his non-Euclidean hypotheses

Lambert.—Some advance is made by Johann Heinrich Lambert in his *Theorie der Parallellinien* (written 1766; posthumously published 1786) Though he still believed in the necessary truth of Euclidean geometry, he confessed that, in all his attempted proofs, something remained undemonstrated He deals with the same three hypotheses as Saccheri, showing that the second holds on a sphere, while the third would hold on a sphere of purely imaginary radius. The second hypothesis he succeeds in condemning, since, like all who preceded Bernhard Riemann, he is

unable to conceive of the straight line as finite and closed. But the third hypothesis, which is the same as Lobachevski's, is not even professedly refuted

Three Periods of non-Euclidean Geometry.—Non-Euclidean geometry proper begins with Carl Friedrich Gauss The advance which he made was rather philosophical than mathematical It was he (probably) who first recognized that the postulate of parallels is possibly false, and should be empirically tested by measuring the angles of large triangles The history of non-Euclidean geometry has been aptly divided by Felix Klein into three very distinct periods The first—which contains only Gauss, Lobachevski and Bolyai—is characterized by its synthetic method and by its close relation to Euclid The attempt at indirect proof of the disputed postulate would seem to have been the source of these three men's discoveries, but when the postulate had been denied, they found that the results, so far from showing contradictions, were just as self-consistent as Euclid They inferred that the postulate, if true at all, can only be proved by observations and measurements Only one kind of non-Euclidean space is known to them, namely, that which is now called hyperbolic The second period is analytical, and is characterized by a close relation to the theory of surfaces It begins with Riemann's inaugural dissertation, which regards space as a particular case of a *manifold* (*see* MANIFOLDS), but the characteristic standpoint of the period is chiefly emphasized by Eugenio Beltrami The conception of measure of curvature is extended by Riemann from surfaces to spaces, and a new kind of space, finite but unbounded (corresponding to the second hypothesis of Saccheri and Lambert), is shown to be possible As opposed to the second period, which is purely metrical, the third period is essentially projective in its method It begins with Arthur Cayley, who showed that metrical properties are projective properties relative to a certain fundamental quadric, and that different geometries arise according as this quadric is real, imaginary or degenerate Klein, to whom the development of Cayley's work is due, showed further that there are two forms of Riemann's space, called by him the elliptic and the spherical Finally, it has been shown by Sophus Lie, that if figures are to be freely movable throughout all space in ∞^6 ways, no other three-dimensional spaces than the above four are possible

Gauss—Gauss published nothing on the theory of parallels, and it was not generally known until after his death that he had interested himself in that theory from a very early date In 1799 he announces that Euclidean geometry would follow from the assumption that a triangle can be drawn greater than any given triangle Though unwilling to assume this, we find him in 1804 still hoping to prove the postulate of parallels In 1830 he announces his conviction that geometry is not an *a priori* science; in the following year he explains that non-Euclidean geometry is free from contradictions, and that, in this system, the angles of a triangle diminish without limit when all the sides are increased He also gives for the circumference of a circle of radius r the formula $\pi k(e^{r/k}-e^{-r/k})$, where k is a constant depending upon the nature of the space In 1832, in reply to the receipt of Bolyai's *Appendix*, he gives an elegant proof that the amount by which the sum of the angles of a triangle falls short of two right angles is proportional to the area of the triangle From these and a few other remarks it appears that Gauss possessed the foundations of hyperbolic geometry, which he was probably the first to regard as perhaps true It is not known with certainty whether he influenced Lobachevski and Bolyai, but the evidence we possess is against such a view

Lobachevski—The first to publish a non-Euclidean geometry was Nicholas Lobachevski, professor of mathematics in the new university of Kazan In the place of the disputed postulate he puts the following. "All straight lines which, in a plane, radiate from a given point, can, with respect to any other straight line in the same plane, be divided into two classes, the *intersecting* and the *non-intersecting* The *boundary line* of the one and the other class is called *parallel to the given line*" It follows that there are two parallels to the given line through any point, each meeting the line at infinity, like a Euclidean parallel Hence a line has two distinct points at infinity, and not one only as in ordinary geometry. The two parallels to a line through a point make equal acute angles with the perpendicular to the line through the point. If p be the length of the perpendicular, either of these angles is denoted by $\Pi(p)$. The determination of $\Pi(p)$ is the chief problem; it appears finally that, with a suitable choice of the unit of length,

$$\tan\tfrac{1}{2}\,\Pi(p)=e^{-p}$$

Before obtaining this result it is shown that spherical trigonometry is unchanged, and that the normals to a circle or a sphere still pass through its centre When the radius of the circle or sphere becomes infinite all these normals become parallel, but the circle or sphere does not become a straight line or plane It becomes what Lobachevski calls a limit-line or limit-surface The geometry on such a surface is shown to be Euclidean, limit-lines replacing Euclidean straight lines It is, in fact, a surface of zero measure of curvature By the help of these propositions Lobachevski obtains the above value of $\Pi(p)$, and thence the solution of triangles He points out that his formulae result from those of spherical trigonometry by substituting ia, ib, ic, for the sides a, b, c

Bolyai—John Bolyai, a Hungarian, obtained results closely corresponding to those of Lobachevski These he published in an appendix to a work by his father, entitled *Appendix Scientiam spatii absolute veram exhibens: a veritate aut falsitate Axiomatis XI Euclidei (a priori haud unquam decidenda) independentem. adjecta ad casum falsitatis, quadratura circuli geometrica* This work was published in 1831, but its conception dates from 1823 It reveals a profounder appreciation of the importance of the new ideas, but otherwise differs little from Lobachevski's Both men point out that Euclidean geometry as a limiting case of their own more general system, that the geometry of very small spaces is always approximately Euclidean, that no *a priori* grounds exist for a decision, and that observation can only give an approximate answer Bolyai gives also, as his title indicates, a geometrical construction, in hyperbolic space, for the quadrature of the circle, and shows that the area of the greatest possible triangle, which has all its sides parallel and all its angles zero, is πi^2, where i is what we should now call the space-constant

Riemann—The works of Lobachevski and Bolyai, though known and valued by Gauss, remained obscure and ineffective until, in 1866, they were translated into French by J Houel But at this time Riemann's dissertation, *Über die Hypothesen, welche der Geometrie zu Grunde liegen*, was already about to be published In this work Riemann, without any knowledge of his predecessors in the same field, inaugurated a far more profound discussion, based on a far more general standpoint, and by its (posthumous) publication in 1867 the attention of mathematicians and philosophers was at last secured

Riemann's work contains two fundamental conceptions, that of a manifold and that of the *measure of curvature* of a continuous manifold possessed of what he calls flatness in the smallest parts

There are four points in which this profound and epoch-making work is open to criticism or development—(1) the idea of a manifold requires more precise determination, (2) the introduction of coordinates is entirely unexplained and the requisite presuppositions are unanalysed, (3) the assumption that ds is the square root of a quadratic function of $dx_1, dx_2, \ldots$ is arbitrary, (4) the idea of superposition, or congruence, is not adequately analysed The modern solution of these difficulties is properly considered in connection with the general subject of the axioms of geometry

Helmholtz—The publication of Riemann's dissertation was closely followed by two works of Hermann von Helmholtz, again undertaken in ignorance of the work of predecessors In these a proof is attempted that ds must be a rational integral quadratic function of the increments of the coordinates This proof has since been shown by Lie to stand in need of correction Helmholtz's remaining works on the subject are of almost exclusively philosophical interest

Beltrami—The only other writer of importance in the second period is Eugenio Beltrami, by whom Riemann's work was brought

into connection with that of Lobachevski and Bolyai. As he gave a convenient Euclidean interpretation of hyperbolic plane geometry, his results will be stated at some length The *Saggio* shows that Lobachevski's plane geometry holds in Euclidean geometry on surfaces of constant negative curvature, straight lines being replaced by geodesics Such surfaces are capable of a conformal representation (q v) on a plane, by which geodesics are represented by straight lines Hence if we take, as coordinates on the surface, the Cartesian coordinates of corresponding points on the plane, the geodesics must have linear equations

Transition to the Projective Method.—The *Saggio* gives a Euclidean interpretation confined to two dimensions But a consideration of the auxiliary plane suggests a different interpretation, which may be extended to any number of dimensions If, instead of referring to the pseudosphere, we merely *define* distance and angle, in the Euclidean plane, as those functions of the coordinates which gave us distance and angle on the pseudosphere, we find that the geometry of our plane has become Lobachevski's All the points of the limiting circle are now at infinity, and points beyond it are imaginary If we give our circle an imaginary radius the geometry on the plane become elliptic Replacing the circle by a sphere, we obtain an analogous representation for three dimensions Instead of a circle or sphere we may take any conic or quadric With this definition, if the fundamental quadric be $\Sigma r_1 r_1 = 0$, and if $\Sigma r_1 x'$ be the polar form of Σx_1, the distance ρ between x and x' is given by the projective formula

$$\cos(\rho/k) = \Sigma r_1 r_1' / \{\Sigma x_1 \Sigma x_1'\}^{\frac{1}{2}}$$

That this formula is projective is rendered evident by observing that $e^{-2i\rho/k}$ is the anharmonic ratio of the range consisting of the two points and the intersections of the line joining them with the fundamental quadric With this we are brought to the third or projective period The method of this period is due to Cayley, its application to previous non-Euclidean geometry is due to Klein The projective method contains a generalization of discoveries already made by Laguerre in 1853 as regards Euclidean geometry The arbitrariness of this procedure of deriving metrical geometry from the properties of conics is removed by Lie's theory of congruence We then arrive at the stage of thought which finds its expression in the modern treatment of the axioms of geometry

The Two Kinds of Elliptic Space.—The projective method leads to a discrimination, first made by Klein, of two varieties of Riemann's space, Klein calls these elliptic and spherical They are also called the polar and antipodal forms of elliptic space The latter names will here be used The difference is strictly analogous to that between the diameters and the points of a sphere In the polar form two straight lines in a plane always intersect in one and only one point, in the antipodal form they intersect always in two points, which are antipodes The antipodal form may be called a "quasi-geometry" Similarly in the antipodal form two diameters always determine a plane, but two points on a sphere do not determine a great circle when they are antipodes, and two great circles always intersect in two points Again a plane does not form a boundary among lines through a point we can pass from any one such line to any other without passing through the plane But a great circle does divide the surface of a sphere So, in the polar form, a complete straight line does not divide a plane, and a plane does not divide space, and does not, like a Euclidean plane, have two sides But, in the antipodal form, a plane is, in these respects, like a Euclidean plane

Finally, it is of interest to note that, though it is theoretically possible to prove, by scientific methods, that our geometry is non-Euclidean, it is wholly impossible to prove by such methods that it is accurately Euclidean For the unavoidable errors of observation must always leave a slight margin in our measurements A triangle might be found whose angles were certainly greater, or certainly less, than two right angles, but to prove them *exactly* equal to right angles must always be beyond our powers If, therefore, any man cherishes a hope of proving the exact truth of Euclid, such a hope must be based, not upon scientific, but upon philosophical considerations

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For expositions of the whole subject, *see* F Klein, *Nicht-Euklidische Geometrie* (Gottingen, 1893), R Bonola, *La Geometria non-Euclidea* (Bologna, 1906); P Barbarin, *La Géométrie non-Euclidienne* (Paris, 1902), W Killing, *Die nicht-Euklidischen Raumformen in analytischer Behandlung* (Leipzig, 1885) The last-named work also deals with geometry of more than three dimensions, in this connection *see* also G Veronese, *Fondamenti di geometria a più dimensioni ed a più specie di unità rettilinee* . . . (Padua, 1891, German trans, Leipzig, 1894), G Fontené, *L'Hyperespace à (n–1) dimensions* (Paris, 1892); A N Whitehead, *Universal Algebra* (Cambridge, 1898); E. Study, "Über nicht-Euklidische und Liniengeometrie," *Jahr d Deutsch Math Ver* (1906); W. Burnside, "On the Kinematics of non-Euclidean Space," *Proc Lond Math Soc* (1894) A bibliography on the subject up to 1878 was published by G B Halsted, *Amer Journ of Math* vols i and ii; and one up to 1900 by R Bonola, *Index operum ad geometriam absolutam spectantium* . (Leipzig, 1903).

GEONIM: *see* TALMUD

GEOPONICI, or *Scriptores rei rusticae,* the Greek and Roman writers on husbandry and agriculture On the whole the Greeks paid less attention than the Romans to the scientific study of these subjects, which in classical times they regarded as a branch of economics Thus Xenophon's *Oeconomicus* (*see* also *Memorabilia,* ii 4) contains a eulogy of agriculture and its beneficial ethical effects, and much information is to be found in the writings of Aristotle and his pupil Theophrastus About the same time as Xenophon, the philosopher Democritus of Abdera wrote a treatise Περὶ Γεωργίας, frequently quoted and much used by the later compilers of *Geoponica* (agricultural treatises) Greater attention was given to the subject in the Alexandrian period, a long list of names is given by Varro and Columella, amongst them Hieron II and Attalus III Philometor Later, Cassius Dionysius of Utica translated and abridged the great work of the Carthaginian Mago, which was still further condensed by Diophanes of Nicaea in Bithynia for the use of King Deiotarus From these and similar works Cassianus Bassus (*q v*) compiled his *Geoponica* Mention may also be made of a little work Περὶ Γεωργικῶν by Michael Psellus (printed in Boissonade, *Anecdota Graeca,* i)

The Romans, aware of the necessity of maintaining a numerous and thriving order of agriculturists, from very early times endeavoured to instil into their countrymen both a theoretical and a practical knowledge of the subject The occupation of the farmer was regarded as next in importance to that of the soldier, and distinguished Romans did not disdain to practise it In furtherance of this object, the great work of Mago was translated into Latin by order of the senate, and the elder Cato wrote his *De agri cultura* (extant in a very corrupt state), a simple record in homely language of the rules observed by the old Roman landed proprietors rather than a theoretical treatise He was followed by the two Sasernae (father and son) and Gnaeus Tremellius Scrofa, whose works are lost The learned Marcus Terentius Varro of Reate, when eighty years of age, composed his *Rerum rusticarum libri tres,* dealing with agriculture, the rearing of cattle, and the breeding of fishes He was the first to systematize what had been written on the subject, and supplemented the labours of others by practical experience gained during his travels In the Augustan age (to make no mention of Virgil's *Georgics*) Iulius Hyginus wrote on farming and bee-keeping, Sabinus Tiro on horticulture, and during the early empire Iulius Graecinus and Iulius Atticus on the culture of vines, and Cornelius Celsus (best known for his *De medicina*) on farming The chief work of the kind, however, is that of Lucius Iunius Moderatus Columella (*q v*) About the middle of the second century the two Quintilii, natives of Troia, wrote on the subject in Greek It is remarkable that Columella's work exercised less influence in Rome and Italy than in southern Gaul and Spain, where agriculture became one of the principal subjects of instruction in the superior educational establishments that were springing up in those countries One result of this was the prepa-

ration of manuals of a popular kind for use in the schools In the third century Gargilius Martialis of Mauretania compiled a *Geoponica* in which medical botany and the veterinary art were included The *De re rustica* of Palladius (fourth century), in fourteen books, which is almost entirely borrowed from Columella, is greatly inferior in style and knowledge of the subject It is a kind of farmer's calendar, in which the different rural occupations are arranged in order of the months The 14th book (on forestry) is written in elegiacs (85 distichs) The whole of Palladius and considerable fragments of Martialis are extant

The best edition of the *Scriptores rei rusticae* is by T G Schneider (1794–97), and the subject is treated by A. Magerstedt, *Bilder aus der romischer Landwirtschaft* (1858–63) *See* also H Gummerus, *Der romische Gutsbetrieb* (*Klio*, 1st suppl vol, Leipzig, 1906), Ll Storr-Best, *Varro on Farming* (1912); *Roman Farm Management*, by a Virginia Farmer (1913), T F. Royds, *The Beasts, Birds and Bees of Virgil* (1918), L B Marshall, *L'Horticulture Antique et le poeme de Columelle* (1919), J Sergeaunt, *The Trees, Shrubs and Plants of Virgil* (1920), and W E Heitland, *Agricola, a study of agriculture and rustic life in the Graeco-Roman world from the point of view of labour* (1921)

GEORGE, SAINT (d *c* 300), the patron saint of England, Aragon and Portugal The only historical element in the intricate tradition that has grown up around his name seems to be his martyrdom at Lydda in Palestine The dubious elements include his rapid advance to high military rank, his organization of the Christian community at Urmi (Urumiah), his visit to Britain on an imperial expedition and his protest against the persecutions by Diocletian Calvin impugned the saint's existence, but two Syrian church inscriptions testify to the early date of his veneration and early pilgrims mention Lydda as the centre of an ancient cultus Again in the canon of Pope Gelasius (494) George is mentioned in a list of those "whose names are justly reverenced among men, but whose acts are known only to God" Modern criticism hesitates to identify St George with the nameless martyr described in Eusebius, *Hist eccl* viii 5, or to accept Gibbon's theory that he was a legendary double of George of Cappadocia, an opponent of Athanasius

The connection of St George with a dragon, familiar since the *Golden Legend* of Jacobus de Voragine, can be traced to the close of the 6th century At Arsuf or Joppa—neither of them far from Lydda—Perseus had slain the sea-monster that threatened the virgin Andromeda, and George, like many another Christian saint, entered into the inheritance of veneration previously enjoyed by a pagan hero His popularity in England has never reached the height attained by St Andrew in Scotland, St David in Wales or St Patrick in Ireland The council of Oxford in 1222 ordered that his feast should be kept as a national festival, but it was not until the time of Edward III that he was made patron of the kingdom His feast is celebrated on April 23

See P Heylin, *The History of S George of Cappadocia* (1631), Fr Gorres, "Der Ritter St Georg in der Geschichte, Legende und Kunst" (*Zeitschrift fur wiss Theologie*, xxx, 1887), E A W Budge, *The Martyrdom and Miracles of St George of Cappadocia* the Coptic texts edited with an English translation (1888), Delehaye, *Les saintes militaires* (1909), E O Gordon, *Saint George* (1907), M. H Bulley, *St George for Merrie England* (1908)

GEORGE I. (George Louis) (1660–1727), king of Great Britain and Ireland, born in 1660, was heir through his father Ernest Augustus to the hereditary lay bishopric of Osnabruck, and to the duchy of Calenberg, which formed one portion of the Hanoverian possessions of the house of Brunswick, whilst he secured the reversion of the other portion, the duchy of Celle or Zell, by his marriage (1682) with the heiress, his cousin Sophia Dorothea The marriage was not a happy one George Louis was a bad husband Count Konigsmark—a handsome adventurer—seized the opportunity of paying court to the deserted wife Conjugal infidelity was held at Hanover to be a privilege of the male sex Count Konigsmark was assassinated Sophia Dorothea was divorced in 1694, and remained in seclusion till her death in 1726

The prince's mother was Sophia, the youngest daughter of Elizabeth (*q v*) the daughter of James I of England Sophia found herself, upon the death of the duke of Gloucester, the next Protestant heir after Anne The Act of Settlement in 1701 secured the inheritance to herself and her descendants Being old and unambitious she rather permitted herself to be burthened with the honour than thrust herself forward to meet it Her son George took a deeper interest in the matter In his youth he had fought with determined courage in the wars of William III Succeeding to the electorate on his father's death in 1698, he had sent a welcome reinforcement of Hanoverians to fight under Marlborough at Blenheim With prudent persistence he attached himself closely to the Whigs and to Marlborough, refusing Tory offers of an independent command, and receiving in return for his fidelity a guarantee by the Dutch of his succession to England in the Barrier treaty of 1709

In 1714 when Anne was growing old, and Bolingbroke and the more reckless Tories were coquetting with the son of James II, the Whigs invited George's eldest son, who was duke of Cambridge, to visit England in order to be on the spot in case of need Neither the elector nor his mother approved of a step which was likely to alienate the queen, and which was specially distasteful to himself, as he was on very bad terms with his son Yet they did not set themselves against the strong wish of the party to which they looked for support, and it is possible that troubles would have arisen from any attempt to carry out the plan, if the deaths, first of the electress (May 28) and then of the queen (Aug 1, 1714), had not laid open George's way to the succession without further effort of his own

George I arrived in England when a great military struggle had come to an end He had therefore no reason to call upon the nation to make great sacrifices All that he wanted was to secure for himself and his family a high position which he hardly knew how to occupy, to fill the pockets of his German attendants and his German mistresses, to get away as often as possible from the uncongenial islanders whose language he could not speak, and to use the strength of England to obtain petty advantages for his German principality He attached himself entirely to the Whig party, though he refused to place himself at the disposal of its leaders He gave his confidence, not to Somers and Wharton and Marlborough, but to Stanhope and Townshend, the statesmen of the second rank At first he seemed to be playing a dangerous game The Tories, whom he rejected, were numerically superior to their adversaries, and were strong in the support of the country gentlemen and the country clergy The strength of the Whigs lay in the towns and in the higher aristocracy In 1715 a Jacobite insurrection in the north, supported by the appearance of the Pretender, the son of James II, in Scotland, was suppressed, and its suppression not only gave to the Government a character of stability, but displayed its adversaries in an unfavourable light as the disturbers of the peace

The policy of George I's reign is the policy of his ministers Stanhope and Townshend from 1714 to 1717 were mainly occupied with the defence of the Hanoverian settlement After the dismissal of the latter in 1717, Stanhope in conjunction with Sunderland took up a more decided Whig policy The Occasional Conformity Act and the Schism Act were repealed in 1719 But the wish of the liberal Whigs to modify if not to repeal the Test Act remained unsatisfied In the following year the bursting of the South Sea bubble, and the subsequent deaths of Stanhope in 1721 and of Sunderland in 1722, cleared the way for the accession to power of Sir Robert Walpole, to whom and not to the king was due the conciliatory policy which quieted Tory opposition by abstaining from pushing Whig principles to their legitimate consequences

Nevertheless something of the honour due to Walpole must be reckoned to the king's credit It is evident that at his accession his decisions were by no means unimportant The royal authority was still able within certain limits to make its own terms This support was so necessary to the Whigs that they made no resistance when he threw aside their leaders on his arrival in England When by his personal intervention he dismissed Townshend and appointed Sunderland, he had no such social and parliamentary combination to fear as that which almost mastered his great-grandson in his struggle for power If such a combination

arose before the end of his reign it was owing more to his omitting to fulfil the duties of his station than from the necessity of the case As he could talk no English, and his ministers could talk no German, he absented himself from the meetings of the cabinet, and his frequent absences from England and his want of interest in English politics strengthened the cabinet in its tendency to assert an independent position

Walpole at last by his skill in the management of parliament rose as a subject into the almost royal position denoted by the name of prime minister. In connexion with Walpole the force of wealth and station established the Whig aristocracy in a point of vantage from which it was afterwards difficult to dislodge them Yet, though George had allowed the power which had been exercised by William and Anne to slip through his hands, it was understood to the last that if he chose to exert himself he might cease to be a mere cipher in the conduct of affairs As late as 1727 Bolingbroke gained over one of the king's mistresses, the duchess of Kendal, and though her support of the fallen Jacobite took no effect, Walpole was not without fear that her reiterated entreaties would lead to his dismissal The king's death in a carriage on his way to Hanover, in the night of June 10–11 in the same year, put an end to these apprehensions

His only children were his successor George II and Sophia Dorothea (1687–1757), who married in 1706 Frederick William, crown prince (afterwards king) of Prussia She was the mother of Frederick the Great (S R G, X)

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GEORGE II. (George Augustus) (1683–1760), king of Great Britain and Ireland, the only son of George I, was born in 1683 In 1705 he married Wilhelmina Caroline of Anspach. In 1706 he was created earl of Cambridge In 1708 he fought at Oudenarde It was most unwillingly that, on his first journey to Hanover in 1716, George I, who was on bad terms with his son, appointed the prince of Wales guardian of the realm during his absence In 1717 the existing ill-feeling ripened into an open breach At the baptism of one of his children, the prince selected one godfather whilst the king persisted in selecting another The young man spoke angrily, was ordered into arrest, and was subsequently commanded to leave St James's and to be excluded from all court ceremonies The prince took up his residence at Leicester House, and did everything in his power to support the opposition against his father's ministers

When therefore George I died in 1727, it was generally supposed that Walpole would be at once dismissed The first direction of the new king was that Sir Spencer Compton would draw up the speech in which he was to announce to the privy council his accession Compton, not knowing how to set about his task, applied to Walpole for aid Queen Caroline took advantage of this evidence of incapacity, advocated Walpole's cause with her husband and procured his continuance in office This curious scene was indicative of the course likely to be taken by the new sovereign His own mind was incapable of rising above the merest details of business He made war in the spirit of a drill-sergeant, and he economized his income with the minute regularity of a clerk A blunder of a master of the ceremonies in marshalling the attendants on a levee put him out of temper He took the greatest pleasure in counting his money piece by piece, and he never forgot a date He was above all things methodical and regular "He seems," said one who knew him well, "to think his having done a thing to-day an unanswerable reason for his doing it to-morrow."

Most men so utterly immersed in details would be very impracticable to deal with. George II was exempt from this failing He seemed to have an instinctive understanding that such and such persons were either wiser or even stronger than himself, and when he had once discovered that, he gave way with scarcely a struggle. Though in his domestic relations he was as loose a liver as his father, he was guided by the wise, unobtrusive counsels of his wife until her death in 1737, and when once he had recognized Walpole's superiority he was guided by the political sagacity of the great minister It is difficult to exaggerate the importance of such a temper upon the development of the constitution The apathy of the nation in all but the most exciting political questions, fostered by the calculated conservatism of Walpole, had thrown power into the hands of the great landowners They maintained their authority by supporting a minister who was ready to make use of corruption, wherever corruption was likely to be useful, and who could veil over the baseness of the means which he employed by his talents in debate and in finance To shake off a combination so strong would not have been easy George II submitted to it without a struggle

So strong indeed had the Whig aristocracy grown that it began to lose its cohesion Walpole dismissed all who opposed him. An opposition formidable in talents was gradually formed In its composite ranks were Tories and discontented Whigs, discarded official hacks hungry for the emoluments of office, and youthful purists who fancied that if Walpole were removed corruption would cease Behind them was Bolingbroke, excluded from parliament but suggesting every party move In 1737 the opposition acquired the support of Frederick, prince of Wales His marriage in 1736 to Augusta of Saxony brought on a quarrel with his father In 1737, just as the princess of Wales was about to give birth to her first child, she was hurried away by her husband from Hampton court to St James's palace at the imminent risk of her life, simply in order that the prince might show his spite to his father who had provided all necessary attendance at the former place George ordered his son to quit St James's, and to absent himself from court Frederick in disgrace gave the support of his name, and he had nothing else to give, to the opposition. Later in the year 1737, on Nov 20, Queen Caroline died In 1742 Walpole, weighed down by the unpopularity both of his reluctance to engage in a war with Spain and of his supposed remissness in conducting the operations of that war, was driven from office His successors formed a composite ministry in which Walpole's old colleagues and opponents were alike to be found

War of the Austrian Succession.—The years which followed settled conclusively, at least for this reign, the constitutional question of the power of appointing ministers The war between Spain and England had broken out in 1739 In 1741 the death of the emperor Charles VI brought on the War of the Austrian Succession The position of George II as a Hanoverian prince drew him to the side of Maria Theresa through jealousy of the rising Prussian monarchy. Jealousy of France led England in the same direction, and in 1741 a subsidy of £300,000 was voted to Maria Theresa The king himself went to Germany, and attempted to carry on the war according to his own notions Those notions led him to regard the safety of Hanover as of far more importance than the wishes of England Finding that a French army was about to march upon his German States, he concluded with France a treaty of neutrality for a year without consulting a single English minister. In England the news was received with feelings of disgust The expenditure of English money and troops was to be thrown uselessly away as soon as it appeared that Hanover was in the slightest danger In 1742 Walpole was no longer in office Lord Wilmington, the nominal head of the ministry, was a mere cipher The ablest and most energetic of his colleagues, Lord Carteret (afterwards Granville), attached himself specially to the king, and sought to maintain himself in power by his special favour and by brilliant achievements in diplomacy

In part at least by Carteret's mediation the peace of Breslau

was signed, by which Maria Theresa ceded Silesia to Frederick (July 28, 1742). Thus relieved on her northern frontier, she struck out towards the west Bavaria was overrun by her troops In the beginning of 1743 one French army was driven across the Rhine On June 27th another French army was defeated by George II at Dettingen Victory brought elation to Maria Theresa Her war of defence was turned into a war of vengeance Bavaria was to be annexed. The French frontier was to be driven back George II and Carteret after some hesitation placed themselves on her side Of the public opinion of the political classes in England they took no thought. Hanoverian troops were indeed to be employed in the war, but they were to be taken into British pay. Collisions between British and Hanoverian officers were frequent A storm arose against the preference shown to Hanoverian interests After a brief struggle Carteret, now Lord Granville, was driven from office in 1744.

Henry Pelham, who had become prime minister the year before, thus saw himself established in power By the acceptance of this ministry, the king acknowledged that the function of choosing a ministry and directing a policy had passed from his hands In 1745 indeed he recalled Granville, but a few days were sufficient to convince him of the futility of his attempt, and the effort to exclude Pitt at a later time proved equally fruitless

Opposition to Pitt.—Important as were the events of the remainder of the reign, therefore, they can hardly be grouped round the name of George II The resistance to the invasion of the Young Pretender in 1745, the peace of Aix-la-Chapelle in 1748, the great war ministry of Pitt at the close of the reign, did not receive their impulse from him He had indeed done his best to exclude Pitt from office He disliked him on account of his opposition in former years to the sacrifices demanded by the Hanoverian connection When in 1756 Pitt became secretary of State in the Devonshire administration, the king bore the yoke with difficulty Early in the next year he complained of Pitt's long speeches as being above his comprehension, and on April 5, 1757, he dismissed him, only to take him back shortly after, when Pitt, coalescing with Newcastle, became master of the situation.

Before Pitt's dismissal George II had for once an opportunity of placing himself on the popular side, though, as was the case of his grandson during the American war, it was when the popular side happened to be in the wrong In the true spirit of a martinet, he wished to see Admiral Byng executed Pitt urged the wish of the House of Commons to have him pardoned. "Sir," replied the king, "you have taught me to look for the sense of my subjects in another place than in the House of Commons" When George II died in 1760, he left behind him a settled understanding that the monarchy was one of the least of the forces by which the policy of the country was directed To this end he had contributed much by his disregard of English opinion in 1743, but it may fairly be added that, but for his readiness to give way to irresistible adversaries, the struggle might have been far more bitter and severe than it was

Of the connection between Hanover and England in this reign two memorials remain more pleasant to contemplate than the records of parliamentary and ministerial intrigues With the support of George II, amidst the derision of the English fashionable world, the Hanoverian Handel produced in England those masterpieces which have given delight to millions, whilst the foundation of the University of Gottingen by the same king opened a door through which English political ideas afterwards penetrated into Germany

George II had three sons, Frederick Louis (1707–51); George William (1717–18); and William Augustus, duke of Cumberland (1721–65); and five daughters, Anne (1709–59), married to William, prince of Orange, 1734, Amelia Sophia Eleonora (1711–1786); Elizabeth Caroline (1713–1757); Mary (1723–72), married to Frederick, landgrave of Hesse-Cassel, 1740, Louisa (1724–1751), married to Frederick V, king of Denmark, 1743

(S R G)

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GEORGE III. (George William Frederick), king of Great Britain and Ireland, was born June 4 (New Style), 1738, the son of George II's eldest son Frederick, Prince of Wales, and of Augusta, a princess of Saxe-Gotha Almost from birth he was introduced to the ungainly squabbles that divided his father and grandfather; and Dr Ayscough, the tutor assigned to him at the age of six, was chiefly remarkable as an adherent of the opposition When George was thirteen his absurd father died, Ayscough was dismissed, and the unfortunate boy's education became a matter of acute political controversy, with the result that he had barely time to become accustomed to one set of instructors before they were changed for another In later life the old king's recollection of his two successive governors was that Harcourt, though well-intentioned, was wholly unfit for his job, while Waldegrave was a "depraved, worthless man", and though he had a kindly remembrance of his second episcopal preceptor, Thomas of Peterborough, and of his sub-preceptor, Scott, he called Thomas's predecessor, Hayter of Norwich, an "intriguing, unworthy man, more fitted to be a Jesuit than an English bishop" Though his mother was devoted to him, she was a foolish, ignorant woman, who once remarked that logic was "an odd study" for children of her son's condition Unfortunately, too, she kept him almost isolated from the world except for the remnants of the little Leicester House clique, such as Egmont and Bubb Dodington and the Earl of Bute, who used to encourage Frederick in his futile intrigues against George II and his ministers George is described in his youth as lethargic, an epithet which certainly cannot be applied to him when he became king, but a certain "vanity and obstinacy" and a tendency to let "his anger be turned into sulkiness" and to "behave like a child," which Lady Sarah Lennox noted as traits in his character, remained and are confirmed by his own admission to George Rose in 1804 that "his memory being a good one . what he did not *forget* he could not *forgive*," a point he illustrated by his grim declaration that he would not admit Fox to his councils, "even at the hazard of civil war" This reserved and authoritative disposition was much encouraged by the training he received at his mother's court, where Bolingbroke's "Patriot King" was laid down as the guide for his conception of royal duties, while the constantly whispered injunction of his mother, "George, be a king," in contrast to his grandfather's dependence on a Whig oligarchy, was allowed to sink into his mind

His first actions on being called to the throne on the death of George II (Oct 25, 1760) showed his determination to "be a king" Dismissing Pitt, who had come to announce his accession, to await his pleasure, he consulted none of his ministers on the speech he addressed to the Council, but only Bute Pitt had then been gloriously conducting the Seven Years' War since 1756, but there was as yet no prospect of peace George III, however, had realized that, as long as Pitt, supported by the Whig oligarchy, was directing a successful war, it would be impossible for the king to obtain control over the machinery of government, accordingly from the outset he proclaimed his intention to bring to an end what he termed a "bloody and expensive war" On Pitt's vehement expostulations this phrase was toned down in the printed version to "expensive, but just and necessary war," and a promise made to consider the interests of the allies, notably Frederick the Great, but the king's resolution was not thereby shaken Bute was very soon substituted for Holderness, Pitt's docile fellow-secretary, and encouraged those members of the cabinet who were outraged by Pitt's supercilious method of treating them as nonentities but who till then had been too timid to combine against him Thus the great minister's resignation was brought about when he failed to persuade his colleagues to declare war on Spain in 1761

But the king's greatest stroke was in forcing Newcastle to resign a few months later; for Newcastle was the arch-schemer of Whig majorities, powerful from his control over elections and over all the patronage necessary to keep electors and members of

parliament contented. With the fall of Newcastle the king took into his own hands all the Treasury patronage, and showed that he meant to be master by turning out some of the greatest Whig lords from their offices in the household or from their lord-lieutenancies in the counties Negotiations for peace were energetically pushed on by Bute, who succeeded Newcastle at the Treasury, and when the Preliminaries of Paris were ready for submission to parliament, a favourable majority was ensured by the ruthless determination of the king's agent, Henry Fox, who not only bribed existing members profusely, but secured future majorities in the constituencies by a further holocaust of great Whig office holders and by turning out the humblest official voters, such as tide-waiters and other Treasury satellites At the end of December 1762 the king's victory was made patent to all by a majority of 319 for the Preliminaries, and the Princess of Wales was able to exclaim, "Now my son is king of England!" For the next twenty years of his reign he could summon or dismiss his ministries almost at pleasure

But though George III had thus early in his reign obtained control over the government, he had by no means succeeded in obtaining the affection of his people In his first speech to parliament he had made a bid for this affection by his boast, "Born and bred in this country, I glory in the name of Briton," in pointed allusion to the German upbringing of his two predecessors, but unfortunately the appeal fell flat, largely owing to the use of the word *Briton* instead of *English*, at the presumed suggestion of Bute, whose unpopularity was enhanced by his Scottish nationality Nor was his marriage in 1761 of a nature to awaken any romantic enthusiasm In the early days of his reign he had been much attracted by the beauty and unconventional charm of Fox's niece, Lady Sarah Lennox, and had even made a clumsy attempt at a proposal of marriage to her, but the influence of his surroundings, aghast at the prospect of his marriage with a subject, allied too to a powerful Whig clique, overcame his incipient passion, and he chose as his wife Charlotte of Mecklenburg, consoling Lady Sarah by assigning to her the post of bridesmaid Queen Charlotte, though a lady of no special beauty or charm, made an excellent wife for the king, for both shared a taste for homely domesticity, which, though a subject of derision in court circles, eventually proved one of the chief sources of their people's affections But for the time being any natural inclination to rejoice at the marriage was overshadowed by the king's partiality to the unpopular Scotsman, Bute, and by the dismissal of the national hero, Pitt, who, it was noted, was shortly afterwards greeted with frenzied enthusiasm in the City, while the king was received with marked coldness This unpopularity was expressed with cold, almost malignant insolence by Wilkes in his famous No 45 of the *North Briton* (April 23, 1763) The king felt himself insulted by comments on his speech to parliament, which, Wilkes maintained as we should now, were constitutionally applicable only to ministers; and for the next seven years devoted himself with remarkable pertinacity to securing Wilkes's exclusion from parliament, browbeating ministers and influencing private members to carry out the vendetta against him

By 1763 King George III had recovered for the throne a good deal of the power and influence which had nominally been left to it by the Revolution, but which had largely lapsed during the reigns of the first two Georges Constitutionally the king could choose and direct his own ministers, subject of course to the power left to parliament to force their dismissal if they failed to obtain the support of the majority to the king's policy But now that the king had wrested from the Whigs the means of influencing electors and members of the unrepresentative House of Commons, he was comparatively untrammelled by parliament It is true that the old parliamentary groups, from which he had to make his choice of ministers, remained but by his power of patronage he was able in every group to secure a section of personal adherents, always ready to vote for the king's measures even against their own party and hence soon known collectively as "king's friends" But even so there was always a danger that a minister of determination and pronounced views might run counter to the king's wishes, so George III took the additional precaution of having always a familiar, changed from time to time, either in the cabinet or on its outer fringes, who should report confidentially on the attitude of his colleagues and generally act as the king's spy. Egmont is perhaps the first who emerged in this character, and for short periods Hertford and Rochford seem to have played a similar part But Northington was the most efficient of these adjuncts, especially in breaking up the first Rockingham administration; until finally the king found the ideal man in North, the prime minister himself Such, in short, was the system by which the king tried to establish his personal rule as the Patriot King, on whom, as Bolingbroke lyrically exclaimed, "the eyes of a whole people are fixed, filled with admiration and glowing with affection" He was to decide on all measures, his ministers were to be chosen, not from one party, but each according to his fitness for the post he occupied, in the duties of which he was to be responsible to the king alone in fact, when the system was at its zenith during North's ministry, the cabinet met as a body only when the king summoned it to consider some report of one of his ministers on which he desired further advice

But the system was not perfected in a day In spite of all precautions the right ministers to carry it out were not easy to find Bute, whom the king afterwards described as "deficient in political firmness," resigned immediately after the Treaty of Paris (1763), and George Grenville was tried But he and his allies, the Bedfords, had not learned the lesson and still attempted to lecture and browbeat the king, as if they were the masters, as in the old days of the Whig supremacy So Grenville had to go (1765)—not, however, before he had passed the Stamp Act with the king's full approbation—and was succeeded by Rockingham and his party of remnants from the glorious days of Newcastle Such a ministry was obviously not what the king wanted, was only tolerable for the moment as a means of escape from Grenville, and was intrigued against by the king almost from the start

When the Rockingham ministry had been sufficiently sapped by Northington, George was able to turn to the one man whom he expected to share his views about a non-party ministry Pitt indeed had always declared for "measures, not men," and was supremely indifferent to the claims of party when it was a question of national policy, so that superficially there appeared to be the elements of agreement between the two, especially when Pitt formed his ministry (1766) from men of all parties without distinction No doubt had Chatham, as he had become, retained his faculties and been able to guide the ministry, he, not the king, would have settled its policy, for he was not apt to take his orders from anyone But, after his virtual retirement within a few months, the ministry he had formed to carry out his own policy proved to be exactly the one best suited to carry out the king's system of government When by 1770 Chatham, Shelburne, Grafton and Camden had all resigned and Lord North was promoted to the Treasury, the king at last had a ministry in which all the members, and above all their chief North, took their orders directly from him Not only the general policy but the minutest details of administration were conveyed in the king's daily letters to North and other ministers For the succeeding twelve years, therefore, the policy of the country was essentially that of the king

Not only was the king the director of the national policy during the war with America (1776–83), but there is little doubt that he had the country on his side in that policy George III stood for the principle that Parliament, under his guidance, had the right to legislate for the colonies, and though Chatham might quite fairly insist on the distinction between general legislation applicable to the whole empire as within the purview of the imperial parliament and legislation affecting only the colonies, on which they had a clear right to decide through their own representatives, and Burke point to the calamitous consequences of alienating America, such distinctions or appeals left cold the bulk of the population of England, who felt that the colonies were ungrateful children, ready to profit from the security our arms had gained for them, but unwilling to pay the price It was not indeed the merits of the war in which the king was the prime mover that finally disgusted the country, but the series of calamities which marked its

progress. For these the king's system of government was chiefly responsible He himself did all that such a man could do He supervised the general policy and even more meticulously the details of administration As is made abundantly clear in his correspondence recently published[1], he delighted in taking responsibility upon his own shoulders He practically assumes the duty of leader of the House by his constant and detailed directions to North as to the conduct of business, he thinks no labour too great in inspecting troops or dockyards, in settling how regiments are to be raised, foreign mercenaries to be hired or naval expeditions to be equipped and, incidentally, devotes quite as much care to deciding how, on a journey to Portsmouth, his equerries and other attendants are to travel and what horses and carriages are to be taken from the royal stables He certainly did not want courage, either physical or moral, as he showed throughout his life "Let not this check dismay You," he wrote to Grafton, "in this World these things will happen, therefore rest assured that it will if possible stimulate me to act with greater vigour" as is well known, during the Gordon riots he and his old enemy Wilkes seem to have been the only people who did not lose their heads when poor North moaned to him about the expense of the war he rebukes him for "weighing such events in the Scale of a Tradesman behind his Counter" he tells Sandwich that "the English Lion when roused has not only his wonted resolution but has added the swiftness of the Race Horse" and when there is some difficulty about Howe accepting the American command he writes to poor North, "Before I get to dinner I just take up my pen to acquaint You that things are very far from desperate, that if no one will interfere I do not despair of bringing things to rights . . therefore rest satisfied till You hear more from Me"

But the trouble was that, though in some respects a shrewd judge of men when he was not crossed, George III had not the eagle eye of a Chatham in planning and supervising a campaign, and still less the ability to make lesser men carry out his bidding And owing to his calculated aversion to really able men who would undertake responsibility, he had to rely on ministers like Lord George Germain, incompetent and quarrelsome, odious too for his behaviour at Minden, North, a timorous soul, Sandwich, an evil liver, as the king himself admitted Scandals in his own family, which led to the Royal Marriages Act of 1770, and his patent inability to control the excesses of his graceless heir did not add to the king's popularity, and cast doubts on his competence Above all, his extravagant methods of securing a complacent parliament by the distribution of sinecures and even direct money bribes were at last beginning to awaken alarm Debts amounting to over £1,000,000 on his ample civil List, which had to be paid by the nation while engaged in this "bloody and expensive" war, and the wasteful extravagance of the royal household under a king notoriously parsimonious were rightly attributed to the unavowed exercise of "influence," and tended to unite opposition in the country and even in the House, in a way that Wilkes, the American war and Junius's gross attack on the king had all failed to do Finally in 1780 the hitherto docile House of Commons accepted Dunning's motion that "the power of the Crown has increased, is increasing and ought to be diminished" a resolution that George III attributed merely to a few "factious Leaders and ruined men," who wished to overturn "this excellent Constitution the most beautiful Combination that ever was framed"

But two years later, when England, with almost all Europe against her, was forced, after Yorktown, to give up the struggle in America, George at last realized that his attempt to govern on the lines of the "Patriot King" had finally failed So fully was he aware of this that on two separate occasions he seriously contemplated abdication, and on both occasions drew up messages to announce his decision to Parliament The first occasion was in 1782, when he was forced to take a Rockingham ministry after North's fall, the second when, on the defeat of Shelburne (1783), he saw no alternative to the hated Fox-North coalition These draft messages are drawn up with a dignity of language all the more striking as they are a complete admission of failure He emphasizes his scrupulous respect for the "Rights of Parliament," a perfectly true claim, since in normal times its composition gave him complete control over it His more detailed reasons set forth in the drafts of 1783 give the best exposition of his principles of government and incidentally suggest the reasons for their ultimate failure His "pleasing hope," he declares to have been that, "He might have proved the happy Instrument of conciliating all Parties, and thus collecting to the Service of the State, the most able Persons this Nation produced This Patriotic Endeavour has proved unsuccessful, by the Obstinacy of a Powerful Combination that has long manifested a resolution of not entering into Public Service, unless the whole Executive management of affairs is thrown entirely into their hands" In other words George III was beaten by the demand for full responsibility of the people's representatives for the executive as well as the legislative functions of government

The year 1783, therefore, marks a clear epoch, not only in the reign of George III, but also in our constitutional history It is perfectly true that the king did not in a day give up his ingrained ambition "to be a king," and that there are many instances after the date of his draft abdication in 1783 of successful attempts by him to influence the government He took an active part in securing the rejection of Fox's India Bill in 1783 and in dismissing the Coalition, and the *Parliamentary Papers of John Robinson* (Camden Series, 1922) afford conclusive evidence that Pitt's victory at the polls in 1784 was largely due to the active interference of the king in the elections Pitt's resignation in March 1801 was entirely due to the king's refusal to agree to his minister's policy of conciliation to the Catholics, his refusal to admit Fox into Pitt's reconstituted ministry of 1804 was decisive Although he admitted Fox into the ministry of All the Talents in 1806 and even went so far as to tell him that "I have no desire to look back upon old grievances, and you may rest assured that I never shall remind you of them," yet when, after Fox's death, the ministry wished to allow Roman Catholics to join the army, he not only flatly refused, but forced their resignation by demanding a written assurance that they would never again bring up the Catholic question in any form All this is true, just as it is true that George IV and William IV and even Victoria and Edward VII still could exercise a certain amount of personal influence in the composition of a ministry or on the execution of its measures But largely owing to the long ministry of Pitt, who, no more than his father, was one to take directions from a king or anyone else as to the policy he thought good, the growth of the cabinet's and still more of a strong prime minister's independence became an established understanding of the constitution It is to be remembered too that the unwillingness of Pitt and other ministers to oppose a strong prejudice of the king, such as that against the Catholic claims or against Fox, was almost entirely due to the fear of inducing another bout of insanity in their master and not to any concession to the king's view of his own powers

As early as 1765 there appeared symptoms of insanity in the king during a comparatively trivial illness, but they soon passed off In October 1788, however, his madness was unmistakable He became violent and a danger even to those who loved him best, and had to be put under restraint Unfortunately he was at first put under the care of ignorant doctors, whose only idea of treating madness was by means of a strait waistcoat and even more brutal measures At last he came under the charge of Dr Willis, who had introduced a new method of soothing and persuasive treatment Even more pathetic were the political squabbles that ensued over the Regency Bill The obvious regent was the Prince of Wales, but, as he was a bitter opponent of the king and consequently an ally of Fox and all the disappointed Whigs, Pitt naturally thought that his powers during the king's temporary illness should be limited Feeling grew very bitter on the subject, the doctors were dragged into the dispute, and the Prince's ribaldry about his unfortunate father became a public scandal Fortunately under Willis's treatment the king recovered by March 1789, and the contentious Regency Bill was dropped Again in the first half of 1801 he had bouts of madness under the excitement of the Catholic question and again in 1804 and 1810, in 1811 after the

[1] *Correspondence of George III from 1760 to 1783* edited by Hon Sir John Fortescue, 6 vols, 1927–28

death of his favourite daughter, Amelia, his insanity became permanent, a Regency Bill was passed, and the old king remained in seclusion, blind as well as mad, till his death on Jan 29, 1820

During the first twenty-three years of his reign, when he was attempting to revive personal government, George III enjoyed little of his people's affection The dynasty had never yet achieved popularity, and George III, in spite of the bright hopes with which he ascended the throne, had done very little to win it for himself At first he was overshadowed by the popular hero, Pitt, and his predilection for the Scotsman Bute did not help him. Few stories likely to endear him with the people radiated from the court, for he hardly saw any even of his ministers except on business or at formal levees, and for choice lived frugally in the dull seclusion of his domestic circle His devotion to public business took no romantic turn, for he rarely captivated his people by such appeals as Pitt's in the Seven Years' War, and his industry was rather that of a clerk than of a great statesman. So immersed was he in the routine duties of his office that until 1788, when he went to drink the waters at Cheltenham, he had never, according to Wraxall, stirred further from London than the Nore, Coxe Heath, Oxford and Portsmouth But, paradoxically, when he was no longer the real master in the state his popularity increased enormously The first strong demonstration of this new popularity was on his recovery from his illness in 1789, partly no doubt from sympathy with his affliction, partly in indignation at his son's and his friends' hardly concealed hope that he would not recover. After that his popularity never waned His sturdy conservatism—"I will have no innovations in my time," as he said to Eldon—and even his narrow obstinacy in the American War and in resisting Catholic claims, still more his determination to fight on against the French regardless of defeats and desertions by allies, struck a sympathetic chord in the hearts of his subjects And as he became better known, with his little trick of repetition and his "What? What?" at the end of every sentence, especially during his visits to Weymouth, where he talked unceasingly and shrewdly, if not always cleverly, with all and sundry about their homely concerns, their apple-dumplings and so on, he won the love of his countrymen as "farmer George," one of themselves, with the same tastes, though a king, as the country folk with whom he loved to gossip, in fact, as Wraxall observed, by the end of his reign "his virtues had obtained for him a higher place in our esteem than any prince has occupied since the conquest"

Viewing him from a greater distance of time, we can say of him that few kings have shown greater courage, both moral and physical, in accepting responsibility or affronting actual danger—"he could not bear," he once said, "that any of his family should want courage." With little appreciation of beauty he preferred West to Reynolds, thought little of Shakespeare's "sad stuff," and had "no taste for what was called the fine, wild, beauties of nature; he did not like mountains and other romantic scenes, of which he sometimes heard much"; still he had a good taste in music and was a generous and interested patron of science and learning—for is it not to him that we owe the nucleus of the British Museum Library? Though almost malignant in his vendettas against greater men such as Chatham who had crossed his purposes, yet when he had accepted defeat he could be a generous loser, as in his remark to Fox already quoted and in his speech to Adams, the first envoy to St James's from the United States.—"I will be very frank with you I was the last to consent to the separation but the separation having been made and having become inevitable, I have always said, as I say now, that I would be the first to meet the friendship of the United States as an independent power" Lastly, not the least service he rendered the country was the homely domesticity, even the dullness of his life Thereby he set a standard of faithful troth in the relations of private life, which was new at any rate in the court circles of England and which has survived even the Regency to become almost a commonplace of modern English life (*See* genealogical table in article ENGLISH HISTORY)

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GEORGE IV. [George Augustus Frederick] (1762–1830), king of Great Britain and Ireland, eldest son of George III, was born at St. James's Palace, London, on Aug 12, 1762. He was naturally gifted, was well taught in the classics, learnt to speak French, Italian and German fluently, and had considerable taste for music and the arts, and in person he was remarkably handsome His tutor, Bishop Richard Hurd, said of him when 15 years old that he would be "either the most polished gentleman or the most accomplished blackguard in Europe—possibly both" Reaction from the strict and parsimonious style of his parents' domestic life had its natural effect in plunging the young prince of Wales, flattered and courted as he was, into a whirl of pleasure-seeking At the outset his disposition was brilliant and generous, but it was essentially unstable, and he started even before he came of age on a career of dissipation which in later years became wholly profligate He had an early amour with the actress Mary ("Perdita") Robinson, and in the selection of his friends he opposed and annoyed the king, with whom he soon became (and always remained) on the worst of terms, by associating himself with Fox and Sheridan and the Whig party When in 1783 he came of age, a compromise between the coalition ministry and the king secured him an income of £50,000 from the Civil List, and £60,000 was voted by parliament to pay his debts and start his separate establishment at Carlton House There, under the auspices of Fox and Georgiana, duchess of Devonshire, he posed as a patron of Whig politics and a leader in all the licence and luxury of gay society—the "First gentleman of Europe," as his flatterers described him as years went on And at this early age he fell seriously in love with Mrs. Fitzherbert

His connection with this lady was for some time the one redeeming and restraining factor in his life Mary Anne (or as she always called herself, Maria) Fitzherbert (1756–1837) was the granddaughter of Sir John Smythe, Bart, of Acton Burnell Park, Shropshire, and came of an old Roman Catholic family Her second husband, Thomas Fitzherbert, died in 1781, leaving his widow with a comfortable fortune She became a prominent figure in London society, and the young prince wooed her with all the ardour of a violent passion. The Act of Settlement (1689) entailed his forfeiture of the succession if he married a Roman Catholic, apart from the fact that the Royal Marriage Act of 1772 made any marriage illegal without the king's consent, which was out of the question They were secretly married by the Rev. R Burt, a clergyman of the Church of England, on Dec 15, 1785 There is no doubt as to Mrs Fitzherbert's belief, supported by ecclesiastical considerations, in her correct and binding, though admittedly illegal, relationship to the prince as his canonical wife, and their relationship was treated by their intimates on the footing of a morganatic marriage The position nevertheless was inevitably a false one, Mrs Fitzherbert had promised not to publish the evidence of the marriage (which, according to a strict interpretation of the Act of Settlement might have barred succession to the crown), and the rumours which soon got about led the prince to allow it to be disavowed by his political friends He became heavily involved in debt, and as the king would not assist him, shut up Carlton House, and went to live with Mrs Fitzherbert at Brighton In 1787 a proposal was brought before the House of Commons by Alderman Newnham for a grant in relief of his embarrassments It was on this occasion that Fox publicly declared in the House of Commons, as on the prince's own authority, in answer to allusions to the marriage, that the story was a malicious falsehood A little later Sheridan, in deference to Mrs Fitzherbert's pressure and to the prince's own compunction, made a speech guardedly modifying Fox's statement; but though in private the denial was understood, it effected its object, the House voting a grant of £221,000 to the prince and the king adding £10,000 to his income; and Mrs Fitzherbert, who at first thought

of severing her connection with the prince, forgave him Their union—there was no child of the marriage—was brutally broken off in June 1794 by the prince, when further pressure of debts (and the influence of a new Egeria in Lady Jersey) made him contemplate his official marriage with princess Caroline; in 1800, however, it was renewed, after urgent pleading on the prince's part, and after Mrs. Fitzherbert had obtained a formal decision from the pope pronouncing her to be his wife, and sanctioning her taking him back, her influence over him continued till shortly before the prince became regent, when his relations with Lady Hertford brought about a final separation For the best years of his life he had at least had in Mrs Fitzherbert the nearest approach to a real wife, and this was fully recognized by the royal family[1] But his dissolute nature was entirely selfish, and his various liaisons ended in the dominance of Lady Conyngham, the "Lady Steward" of his household, from 1821 till his death

In 1788 his father's first attack of insanity made the prince's position in the State one of peculiar importance Fox maintained and Pitt denied that the prince of Wales, as the heir-apparent, had a right to assume the regency independently of any parliamentary vote Pitt, with the support of both Houses, proposed to confer upon him the regency with certain restrictions The recovery of the king in Feb 1789 put an end, however, to the prince's hopes. In 1794 the prince consented to a marriage with a German Protestant princess, because his father would not pay his debts on any other terms, and his cousin, Princess Caroline of Brunswick, was brought over from Germany and married to him in 1795 Her behaviour was light and flippant, and he was brutal and unloving The ill-assorted pair soon parted, and soon after the birth of their only child, the princess Charlotte, they were formally separated With great unwillingness the House of Commons voted fresh sums of money to pay the prince's debts

In 1811 he at last became prince regent in consequence of his father's definite insanity He had always lived in close connection with the Whig opposition, and he now empowered Lord Grenville to form a ministry There soon arose differences of opinion between them on the answer to be returned to the address of the Houses, and the prince regent then informed the prime minister, Mr Perceval, that he should continue the existing ministry in office The ground alleged by him for this desertion of his friends was the fear lest his father's recovery might be rendered impossible if he should come to hear of the advent of the opposition to power Lord Wellesley's resignation in Feb 1812 made the reconstruction of the ministry inevitable As there was no longer any hope of the king's recovery, the former objection to a Whig administration no longer existed Instead of taking the course of inviting the Whigs to take office, he asked them to join the existing administration The Whig leaders, however, refused to join, on the ground that the question of the Catholic disabilities was too important to be shelved, and that their difference of opinion with Mr Perceval was too glaring to be ignored The prince regent was excessively angry, and continued Perceval in office till that minister's assassination on May 11, when he was succeeded by Lord Liverpool, after a negotiation in which the proposition of entering the cabinet was again made to the Whigs and rejected by them In the military glories of the following years the prince regent had no share When the allied sovereigns visited England in 1814, he played the part of host to perfection So great was his unpopularity at home that hisses were heard in the streets as he accompanied his guests into the city In 1817 the windows of the prince regent's carriage were broken as he was on his way to open parliament

The death of George III on Jan 29, 1820, gave to his son the title of king without altering the position which he had now held for nine years The relations between the new king and his wife unavoidably became the subject of public discussion In 1806 a charge against the princess of having given birth to an illegitimate child had been conclusively disproved, and the old king had consequently refused to withdraw her daughter, the princess Charlotte, from her custody In the regency the prince was able to interfere, and prohibited his wife from seeing her daughter more than once a fortnight On this, in 1813, the princess addressed to her husband a letter setting forth her complaints, and receiving no answer published it in the *Morning Chronicle* The prince regent then referred the letter, together with all papers relating to the inquiry of 1806, to a body of 23 privy councillors for an opinion whether it was fit that the restrictions on the intercourse between the princess Charlotte and her mother should continue in force All except two answered as the regent wished them to answer But the general public leaned towards the wife of a notorious profligate Addresses of sympathy were sent up to the princess from the city of London and other public bodies

The discord again broke out in 1814 in consequence of the exclusion of the princess from court during the visit of the allied sovereigns In August in that year she left England, and after a little time took up her abode in Italy The accession of George IV brought matters to a crisis He ordered that no prayer for his wife as queen should be admitted into the Prayer Book On June 7 she arrived in London Before she left the continent she had been informed that proceedings would be taken against her for adultery if she landed in England Two years before, in 1818, commissioners had been sent to Milan to investigate charges against her, and their report, laid before the cabinet in 1819, was made the basis of the prosecution On the day on which she arrived in London a message was laid before both Houses recommending the criminating evidence to parliament A secret committee in the House of Lords after considering this evidence brought in a report on which the prime minister founded a Bill of Pains and Penalties to divorce the queen and to deprive her of her royal title The bill passed the three readings with diminished majorities, and when on the third reading it obtained only a majority of nine, it was abandoned by the Government The king's unpopularity, great as it had been before, was now greater than ever In the following year (1821) Caroline attempted to force her way into Westminster Abbey to take her place at the coronation On this occasion popular support failed her, and her death in August relieved the king from further annoyance

Immediately after the death of the queen, the king set out for Ireland His good reception in Dublin encouraged him to attempt a visit to Edinburgh in the following year (Aug 1822) Since Charles II had come to play the sorry part of a covenanting king in 1650 no sovereign of the country had set foot on Scottish soil Sir Walter Scott took the leading part in organizing his reception, which was enthusiastic He returned from Edinburgh to face the question of the appointment of a secretary of state which had been raised by the death of Lord Londonderry (Castlereagh) It was upon the question of the appointment of ministers that the battle between the Whigs and the king had been fought in the reign of George III George IV had neither the firmness nor the moral weight to hold the reins which his father had grasped He disliked Canning for having taken his wife's side very much as his father had disliked Fox for taking his own But, Lord Liverpool insisted on Canning's admission to office, and the king gave way Tacitly and without a struggle the constitutional victory of the last reign was surrendered But it was not surrendered to the same foe as that from which it had been won The coalition ministry in 1784 rested on the great landowners and the proprietors of rotten boroughs Lord Liverpool's ministry had hitherto not been very enlightened, and it supported itself to a great extent upon a narrow constituency But it did appeal to public

[1] Mrs Fitzherbert herself, after her final separation from the prince, with an annuity of £6,000 a year, lived an honoured and more or less retired life mainly at Brighton There she died in 1837 William IV on his accession offered to create her a duchess, but she declined, she accepted, however, his permission to put her servants in royal livery The actual existence of a marriage tie and the documentary evidence of her rights were not definitely established for many years, but in 1905 a sealed packet, deposited at Coutts's bank in 1833, was at length opened by royal permission and the marriage certificate and other conclusive proofs therein contained were published in W H Wilkins's *Mrs Fitzherbert and George IV* In 1796 the prince had made a remarkable will in Mrs. Fitzherbert's favour, which he gave her in 1799, and it is included among these documents (now in the private archives at Windsor) In this he speaks of her emphatically throughout as "my wife" It also contained directions that at his death a locket with her miniature, which he always wore, should be interred with him, and Mrs Fitzherbert was privately assured, on the duke of Wellington's authority, that when the king was buried at Windsor the miniature was on his breast

opinion in a way that the coalition did not, and what it wanted itself in popular support would be supplied by its successors. What one king had gained from a clique another gave up to the nation

Once more, on Lord Liverpool's death in 1827, the same question was tried with the same result. The king not only disliked Canning personally, but he was opposed to Canning's policy. Yet after some hesitation he accepted Canning as prime minister, and when, after Canning's death and the short ministry of Lord Goderich, the king in 1828 authorized the duke of Wellington to form a ministry, he was content to lay down the principle that the members of it were not expected to be unanimous on the Catholic question When in 1829 the Wellington ministry unexpectedly proposed to introduce a Bill to remove the disabilities of the Catholics, he feebly strove against the proposal and quickly withdrew his opposition The worn-out debauchee had neither the merit of acquiescing in the change nor the courage to resist it

George IV died on June 26, 1830, and was succeeded by his brother, the duke of Clarence, as William IV His only child by Queen Caroline, the princess Charlotte Augusta, was married in 1816 to Leopold of Saxe-Coburg, afterwards king of the Belgians, and died in childbirth on Nov 6, 1817

George IV was a bad king, and his reign did much to disgust the country with the Georgian type of monarchy, but libertine and profligate as he became, the abuse which has been lavished on his personal character has hardly taken into sufficient consideration the loose morals of contemporary society, the political position of the Whig party, and his own ebullient temperament Thackeray, in his *Four Georges*, is frequently unfair in this respect The just condemnation of the moralist and satirist requires some qualification in the light of the picture of the period handed down in the memoirs and diaries of the time, such as Greville's, Croker's, Creevey's, Lord Holland's, Lord Malmesbury's, etc

(S R G , H C)

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GEORGE V. [George Frederick Ernest Albert] (1865–), king of Great Britain and Ireland and of the British Dominions beyond the Seas, emperor of India, second son of King Edward VII , was born at Marlborough House, London, on June 3, 1865 When 6½ years old, he and his elder brother, Prince Albert Victor, two years his senior, were placed under the tutorship of John Neale Dalton, then curate of Sandringham In 1877 the two princes became naval cadets on the "Britannia" at Spithead, where they passed through the ordinary curriculum, and in 1879 they joined H M S "Bacchante" under the command of Captain Lord Charles Scott, making a voyage to the West Indies, in the course of which they were rated midshipmen After a month at home in 1880 they returned to the ship to make another prolonged cruise in H M S "Bacchante," in the course of which they visited South America, South Africa, Australia, the Fiji Islands, Japan, Ceylon, Egypt, Palestine and Greece A narrative of this voyage, *The Cruise of H M S "Bacchante,"* compiled from the letters, diaries and notebooks of the princes, was published in 1886 At the close of this tour in 1882 the brothers separated Prince George, who remained in the naval service, was appointed to H M S "Canada," commanded by Captain Durrant, on the North American and West Indian station, and was promoted sub-lieutenant. On his return home he passed through the Royal Naval college at Greenwich and the gunnery and torpedo schools, being promoted lieutenant in 1885 A year later he was appointed to H.M S "Thunderer" of the Mediterranean squadron, and was subsequently transferred to H M S "Dreadnought" and H M S "Alexandra " In 1889 he joined the flagship of the Channel squadron, H M S "Northumberland," and in that year was in command of torpedo boat No 79 for the naval manoeuvres In 1890 he was put in command of the gunboat H M S. "Thrush" for service on the North American and West Indian station After his promotion as commander in 1891 he commissioned H M S "Melampus," the command of which he relinquished on the death of his brother, Albert Victor, the duke of Clarence, in Jan. 1892, since his duties as eventual heir to the crown precluded him from devoting himself exclusively to the navy He was promoted captain in 1893, rear-admiral in 1901, and vice-admiral in 1903

He was created duke of York, earl of Inverness and Baron Killarney in 1892, and on July 6, 1893 he married Princess Victoria Mary (b May 26, 1867), daughter of Francis, duke of Teck, and Princess Mary Adelaide, duchess of Teck, daughter of Adolphus Frederick, duke of Cambridge Their eldest son, Prince Edward Albert, was born at White Lodge, Richmond, on June 23, 1894, Prince Albert Frederick George was born at Sandringham on Dec 14, 1895, Princess Victoria Alexandra Alice Mary on April 25, 1897, Prince Henry William Frederick Albert on March 31, 1900, Prince George Edward Alexander Edmund on Dec 20, 1902, and Prince John Charles Francis on July 12, 1905 (d Jan 18, 1919) The duke and duchess of York visited Ireland in 1899, and it had been arranged before the death of Queen Victoria that they should make a tour in the colonies On the accession of King Edward VII (1901) this plan was confirmed They sailed in the "Ophir" on March 16, 1901, travelling by the ordinary route, and landed at Melbourne in May, when they opened the first parliament of the Commonwealth They then proceeded to New Zealand, returning by way of South Africa and Canada An official account of the tour was published by Sir Donald Mackenzie Wallace as *The Web of Empire* (1902) In Nov 1901 the duke was created prince of Wales

He succeeded to the British throne on the death of his father, King Edward VII , on May 6, 1910 By the Regency Act, 1910 (a temporary constitutional necessity in view of the fact that King George's eldest son, Prince Edward, was then not 16) his consort Queen Mary was at once nominated regent in the event of a demise of the Crown while the heir to the throne was under age A new civil list fixed at £470,000 a year, was approved by parliament in 1910 An important change in the King's accession declaration was also embodied in an act of that year, the following short and simple formula being substituted for the old manifesto

> I do solemnly and sincerely in the presence of God profess, testify and declare, that I am a faithful Protestant, and that I will, according to the true intent of the enactments which secure the Protestant succession to the Throne of my Realm, uphold and maintain the said enactments to the best of my power according to law

The coronation at Westminster Abbey, on June 22, 1911, was attended by representatives from all parts of the Empire and other countries and, in order to complete the public assumption of royal authority throughout the United Kingdom, the King and Queen, with the prince of Wales and Princess Mary, made State visits to Ireland, Wales and Scotland during July Later in the year Their Majesties visited India, and coronation ceremonies took place at the ancient capital of Delhi (Dec 12, 1911) From the very first King George and Queen Mary showed in all their actions their earnest desire to use their royal position in the most public spirited manner Great Britain was fortunate in the fact that so much had already been done, by Queen Victoria and King Edward VII , to establish the Throne in the hearts of the people as a central and unifying national and Imperial force, distinct from sectional interests of party or class Under King George this tradition was steadily maintained He and Queen Mary devoted themselves to the task of making the influence of the court a pure, useful and kindly one in the life of the country;

they mingled with different classes of society and were ever active in accepting new opportunities of service The personal tastes of both were known to lie in characteristically domestic directions The royal stamp collection is the most complete in existence, and in 1920 the King assured the Junior Philatelic Society of his "unabated interest in stamp-collecting"

The War Period.—The value of the influence of the Crown, as standing above and outside domestic party politics, was emphasized by the Buckingham Palace conference of 1914 on the Irish deadlock, and by the conduct during the World War of the King and Royal Family who in various ways strengthened their hold on the affections of the British people From the opening of the World War in Aug 1914 the King and Queen jointly and severally set themselves to make the royal influence an encouragement to every form of national activity in aid of the fighting forces The King and Queen regularly went in state to prorogue and open Parliament in successive sessions and on frequent occasions during the war royal visits were paid to important factories and workshops at the munitions centres throughout Great Britain, as well as to shipbuilding yards, hospitals and other institutions engaged in war-work of one kind or another The King's inspections of provincial industrial establishments included visits to Glasgow and the Clyde, Coventry and Birmingham, Leeds and Sheffield, Nottingham, Liverpool, Manchester, Barrow and Gretna, Newcastle-on-Tyne, Hull and Rosyth, Bristol, Bradford and Huddersfield Moreover, periodical visits were made by him to the Grand Fleet In 1917 Queen Mary accompanied the King to France The King made frequent visits to the French and Belgian fronts Finally, after the Armistice, the King made another visit to Paris and to the battle-fields, Nov 27–Dec 10, 1918, and had an enthusiastic reception in the French capital (Nov 28–30).

In other directions during the war period, the King's desire to set an example of patriotic self-abnegation was frequently apparent The long record of royal attendances at notable ceremonies included such occasions as the funeral services at St Paul's for Lord Roberts (Nov 19, 1914) and Lord Kitchener (June 13, 1916), the commemoration service there on the entry of the United States into the war (April 20, 1917), the Albert Hall commemoration of the first Seven Divisions (Dec 15, 1917), the thanksgiving at St Paul's on Their Majesties' silver wedding (July 6, 1918), the presentation to the King at Buckingham Palace by the special Japanese mission of the sword and badge of a Japanese field-marshal (Oct 29, 1918), and other events On the occasion of Their Majesties' silver wedding, the King and Queen were received at the Guildhall (July 6, 1918) and were presented with a cheque for £53,000, subscribed by the citizens of London, to be devoted to charities by Their Majesties' wish, together with a silver tankard once owned by Charles II.

On July 17, 1917 it was announced that King George V had abandoned all German titles for himself and his family. At the same time a proclamation was issued to the effect that henceforth the royal house of Great Britain and Ireland would be known, not as the house of Saxe-Coburg-Gotha, but as the house of Windsor It had previously been announced (June 20, 1917) that the King had decided that those princes of his family who were British subjects but bore German titles should relinquish those titles in favour of British names

Post-War Incidents.—With the return of peace it was possible for the more normal activities of court life to be resumed, but in the long list of later royal functions some stand out as worthy of record for their special appeal to contemporary public interest Immediately after the Armistice in 1918, the King and Queen on successive days made popular progresses through different sections of London, and received general ovations, in carriage drives through the city (Nov 11), to a special thanksgiving at St Paul's (Nov 12), through the East End (Nov 13), the south (Nov 14), the north (Nov 15), the north-west (Nov 18) and the south-west (Nov 22) On Dec 27 a banquet was given in honour of President Wilson at Buckingham Palace, where he and Mrs Wilson were staying with the King and Queen

On June 21–22, 1921, the King and Queen visited Belfast, where His Majesty inaugurated the new parliament of Northern Ireland The King, in his speech on that occasion, made an appeal to all Irishmen to pause and stretch out the hand of forbearance, to forgive and forget and to make for the land they loved a new era of peace, contentment and good-will When, in the following December, an agreement was at last reached with the Irish Free State, the King in his telegram of congratulation to Mr Lloyd George, ventured to hope that his own speech at Belfast might have contributed to bring it about

On Feb 28, 1922 the King's only daughter, Princess Mary, was married in Westminster Abbey to Viscount Lascelles (*q v*), eldest son of the earl of Harewood The King and Queen paid a state visit to Belgium on May 8 After the visit to Brussels the King made a pilgrimage to the cemeteries in France and Belgium On May 13th the King and Queen were present at the ceremony at Terlincthun cemetery where His Majesty delivered an address

On April 26, 1923 the duke of York was married to Lady Elizabeth Bowes-Lyon, fourth daughter of the earl of Strathmore and Kinghorne Two days later the King inaugurated the new Stadium at Wembley, Middlesex, constructed in connection with the projected British Empire Exhibition, by attending the final cup tie of the English Football Association On May 5 the King and Queen paid a state visit to the king and queen of Italy, remaining in Rome for some days They were received by the pope at the Vatican on May 9, and on May 12 the King visited Montecchio to inspect the graves of British soldiers, who had fallen in Italy

The outstanding event of 1924 was the opening by the King on April 23 of the British Empire Exhibition at Wembley He and the Queen made frequent subsequent visits to the Exhibition, both privately and accompanied by their royal guests, the king and queen of Rumania and the king and queen of Italy, who made state visits to London during May On Sunday, May 25, an Empire Thanksgiving Service was held in the Stadium, conducted by the archbishop of Canterbury and attended by the King and Queen On July 19 the King and Queen visited Liverpool and were present at the dedication of the new cathedral On May 9, 1925, the King and Queen opened the second year of the Wembley exhibition

The close of 1928 was darkened by the serious illness of the King creating the gravest anxiety for more than two months, but by the beginning of 1929 His Majesty had reached a convalescent stage (H C, J E C)

GEORGE V., king of Hanover (1819–1878), was the only son of Ernest Augustus, king of Hanover and duke of Cumberland, and consequently a grandson of the English king George III Born in Berlin on May 27, 1819, his youth was passed in England and in Berlin until 1837, when his father became king of Hanover He lost the sight of one eye during illness when a child, and the other by an accident in 1833 Blindness prevented him from acquiring a knowledge of the world, he formed a fantastic conception of the dignity of the house of Guelph in the divine economy, and had ideas of founding a great Guelph state in Europe From the time of his accession in Nov 1851 he was constantly engaged in disputes with the diet Having supported Austria in the diet of the German confederation in June 1866, he refused, contrary to the wishes of his own diet, to assent to the Prussian demand that Hanover should observe an unarmed neutrality during the war Consequently his country and his capital were at once occupied by the Prussians, to whom his army surrendered on June 29, 1866, and in September Hanover was formally annexed by Prussia From his retreat at Hietzing near Vienna, George appealed in vain to the powers of Europe The king passed the remainder of his life at Gmunden in Austria, or in France, refusing to the last to be reconciled with the Prussian government He died in Paris on June 12, 1878, and was buried in St George's chapel, Windsor In Feb 1843 he had married Marie of Saxe-Altenburg, by whom he left a son and two daughters His son, Ernest Augustus, duke of Cumberland (b 1845), continued to maintain the claim of his house to the kingdom of Hanover The latter's son, also ERNEST AUGUSTUS, is separately noticed

See O Klopp, *Konig Georg V* (Hanover, 1878), O Theodor,

Erinnerungen an Georg V. (Bremerhaven, 1878); and O. Meding, *Memoiren zur Zeitgeschichte* (Leipzig, 1881–84). *See* also HANOVER.

GEORGE I., king of the Hellenes (Prince Christian William of Schleswig-Holstein) (1845–1913), second son of King Christian IX of Denmark, was born at Copenhagen on Dec 24, 1845 He was nominated for the Greek throne by the British Government, at the request of the Greek national assembly, on the expulsion of King Otto I in 1862, his election being recognized by the Powers on June 6, 1863 On his accession, King George resigned his right of succession to the Danish throne in favour of his younger brother, Prince Waldemar

For the events of his reign, *see* GREECE· *History* King George abstained from interference in Greek internal politics, and ruled constitutionally while not hestitating to use the royal prerogative where necessary His family connections were of great value in consolidating the international situation of Greece, for not only was his father king of Denmark, but one sister, Alexandra, married Edward VII of England, and another, Dagmar, the tsar Alexander III of Russia King George was about to celebrate his jubilee when he was assassinated at Salonica by a Greek named Schinas (March 18, 1913)

King George married (Oct 27, 1867) the grand duchess Olga Constantinovna of Russia Their children were Prince Constantine, duke of Sparta (b 1868), who married in 1889 Princess Sophia of Prussia, daughter of the emperor Frederick, and granddaughter of Queen Victoria, and who succeeded his father as King Constantine I (*q v*), Prince George (b 1869) high commissioner of the powers in Crete (1898–1906); Prince Nicholas (b 1872, married in 1902 the grand duchess Helen-Vladimirovna of Russia); Prince Andrew (b 1882, m 1903 Princess Alice of Battenberg, Prince Christopher (b 1888), and a daughter, Princess Marie (b 1876, m 1900 the grand duke George Michailovich of Russia)

GEORGE II. (1890–), ex-king of the Hellenes, eldest son of King Constantine, was born on July 20, 1890 at Tatoi, the royal villa near Athens On account of his supposed Germanophile tendencies during the World War, he was excluded from the succession by the Allies in favour of his younger brother, Alexander, upon the deposition of his father by the ultimatum of June 11, 1917 After his father's restoration to the throne in 1920, he married on Feb 27, 1921, Princess Elizabeth, elder daughter of King Ferdinand and Queen Marie of Rumania Upon the second deposition of his father by the revolution of General Plasteras, his younger brother Alexander I having died in 1920 he succeeded to the throne on Sept 27, 1922. After the unsuccessful counter-revolution of Oct 1923, his position became more difficult, although there was no proof that he had been a party to that rising Republican feeling grew under the leadership of Papanastasiou and others, and, despite Venizelos' advice to await the decision of the National Assembly, a number of military and naval officers demanded the deposition of the Glucksburg dynasty On Dec 19, 1923 the King and Queen left Greece Next day, Admiral Condouriotes, for the second time, became regent On March 25, 1924 the Assembly deposed the dynasty and forbade its members to reside in Greece, and the plebiscite of April 13 confirmed the vote of the Assembly (*see* GREECE)

GEORGE, king of Saxony (1832–1904), younger son of King John of Saxony (d 1873) and Queen Amelia, was born at Dresden on Aug 8, 1832 In the Austro-Prussian War of 1866 he commanded a Saxon cavalry brigade, and in the early part of the war of 1870–71 a division, but later succeeded to the supreme command of the XII (Saxon) army corps in the room of his brother, the crown prince Albert (afterwards king) of Saxony His name is inseparably associated with this campaign, during which he showed undoubted military ability and an intrepidity which communicated itself to all ranks under his command, notably at the battles of St Privat and Beaumont, in which he greatly distinguished himself After his brother's accession to the throne he became commander-in-chief of the Saxon army, and was in 1888 made a Prussian field marshal by the emperor William I He succeeded on Albert's death in 1902 to the throne of Saxony He died on Oct 15, 1904, at Pillnitz

GEORGE, HENRY (1839–1897), American author and political economist, was born in Philadelphia (Pa), on Sept 2, 1839. He settled in California in 1858; removed to New York, 1880; was first a printer, then an editor, but finally devoted his life to economic and social questions In 1871 he published *Our Land Policy,* which, as further developed in 1879 under the title of *Progress and Poverty,* speedily attracted the widest attention both in America and in Europe. In 1886 he published *Protection or Free Trade* Henry George had no political ambition, but in 1886 he received an independent nomination as mayor of New York city, and became so popular that only a coalition of the two strongest political parties prevented his election He received 68,000 votes, against 90,000 for the coalition candidate His death on Oct 29, 1897, was followed by one of the greatest demonstrations of popular feeling and respect that ever attended the funeral of any private citizen in American history The fundamental doctrine of Henry George, the equal right of all men to the use of the earth, did not originate with him, but his clear statement of a method by which it could be enforced, without increasing State machinery, and indeed with a great simplification of government, gave it a new form This he named the *Single Tax*

His doctrine may be condensed as follows The land of every country belongs of right to all the people of that country This right cannot be alienated by one generation, so as to affect the title of the next, any more than men can sell their yet unborn children for slaves Private ownership of land has no more foundation in morality or reason than private ownership of air or sunlight But the private occupancy and use of land are right and indispensable Any attempt to divide land into equal shares is impossible and undesirable Land should be, and practically is now, divided for private use in parcels among those who will pay the highest price for the use of each parcel This price is now paid to some persons annually, and it is called *rent* By applying the rent of land, exclusive of all improvements, to the equal benefit of the whole community, absolute justice would be done to all As rent is always more than sufficient to defray all necessary expenses of government, those expenses should be met by a tax upon rent alone, to be brought about by the gradual abolition of all other taxes Landlords should be left in undisturbed possession and nominal ownership of the land, with a sufficient margin over the tax to induce them to collect their rents and pay the tax They would thus be transformed into mere land agents Obviously this would involve absolute free trade, since all taxes on imports, manufactures, successions, documents, personal property, buildings or improvements would disappear Nothing made by man would be taxed at all The right of private property in all things made by man would thus be absolute, for the owner of such things could not be divested of his property, without full compensation, even under the pretence of taxation

The idea of concentrating all taxes upon ground-rent has found followers in Great Britain, North America, Australia and New Zealand In practical politics this doctrine is confined to the "Single Tax, Limited," which proposes to defray only the needful public expenses from ground-rent, leaving the surplus, whatever it may be, in the undisturbed possession of land-owners

The principal books by Henry George are *Progress and Poverty* (1879), *The Irish Land Question* (1881), *Social Problems* (1884), *Protection or Free Trade* (1886), *The Condition of Labor* (1891), *A Perplexed Philosopher* (1892), *Political Economy* (1898). His son, Henry George (b 1862), has written a *Life* (1900). For the Single Tax theory *see* Shearman's *Natural Taxation* (1899). (T. G S)

GEORGE, STEFAN (1868–), German poet, was born at Budesheim, Hesse, on July 12, 1868 After attending the grammar school at Darmstadt, he studied philosophy and the history of art in Paris, Munich and Berlin He travelled extensively in Italy, France, England, Spain, Holland and Belgium and became associated with the Baudelaire and Mallarmé School in Paris and the disciples of the Pre-Raphaelites in London His early poems were first published privately for a select circle of friends, for whom in 1892 he founded the *Blatter fur die Kunst* George is the leader of the school of "art for art's sake" in Germany He writes consciously as the high priest of an esoteric poetic cult in revolt against modern naturalism and achieves great beauty of

form and an austere power. Among his works are *Hymen* (1890), *Algabal* (1892); *Die Bucher der Hirten* (1895); *Jahr der Seele* (1897), *Der Teppich des Lebens* (1899); *Tage und Taten* (1900); *Die Fibel* (1901), *Der siebente Ring* (1907); *Stern des Bundes* (1914); *Der Krieg* (1917); *Drei Gesange* (1921). He also translated Baudelaire, Dante and the sonnets of Shakespeare

See L. Klage, *Stefan George* (1902); F. Düberg, *Stefan George* (1908).

GEORGE, LAKE, a long and narrow lake in the eastern part of New York State in the foothills of the Adirondack mountains, which rise more than 2,000ft above it Prospect mountain, rising some 1,700ft above sea-level, and Black mountain, about 2,600ft in height, are the most prominent It has a maximum depth of about 400ft, is 325ft above sea-level and 224ft above Lake Champlain, into which it has an outlet to the north through a narrow channel containing many rapids and falls The lake is about 33m long and varies in width from ¾ of a mile to 3 miles Its clear water, coming from mountain brooks and submerged springs, its clean, sandy bottom and its beautiful tints of green and blue make it a gem of beauty It is also noted for its beautiful mountain scenery and islands and is a favourite summer resort Lake steamers ply between the village of Lake George (formerly Caldwell), at the southern end of the lake, and other points along its shore to the northern end at Baldwin, whence there is rail connection with steamers on Lake Champlain Geologists are of the opinion that Lake George is of glacial origin

Before the advent of the white man the lake was a part of the natural trail over which the Iroquois Indians frequently made their way northward to attack the Algonquins and Hurons During the struggle between the English and the French for supremacy in America, and during the American Revolution, this natural pathway was still the best route of communication between New York and Canada and was of great strategic importance Samuel de Champlain explored Lake Champlain in 1609, and at that time heard from the Indians of the beautiful lake, called by them "Andiatarocte" (place where the lake contracts); but there are no records to show that Champlain ever visited Lake George The first white man to see the lake (Aug 18, 1642) appears to have been Father Jogues, a Jesuit missionary, who in company with René Goupil and Guillaume Conture was being taken by his Mohawk Indian captors from the St Lawrence to the town of the Mohawks In 1646 Father Jogues, while on a half-religious, half-political mission to the Mohawks, again visited the lake on the eve of Corpus Christi He gave it the name "Lac Saint Sacrement," in allusion to the day of his visit This name it bore until 1755, when Gen William Johnson renamed it Lake George in honour of the British king James Fenimore Cooper refers to it in his novels as Lake Horicon

In the French and Indian War the plan of the British for operations against the French in North America included an expedition by Gen William Johnson against the French at Crown Point on Lake Champlain When this expedition was in camp at the head of Lake George, Gen Johnson learned that Baron Ludwig August Dieskau, with a force of French and Indians, was marching from Crown Point to Ft Lyman (later Ft Edward), some 14m to the south of his camp On the morning of Sept 8 Johnson sent a detachment of about 1,000 colonials, under Col Ephraim Williams, and 200 Indians under Hendrick, a chief of the Mohawks, to the aid of Ft Lyman Dieskau prepared an ambuscade for this detachment, and in the engagement that followed both Williams and Hendrick were killed The survivors of the fight retreated to their camp, pursued by the French forces. A severe engagement followed on this same day (Sept 8) in which the British colonial forces, at first fighting behind hastily prepared defences, afterwards counter-attacked their opponents and gained a signal victory. Both Johnson and Dieskau were wounded, and the latter was captured. Gen Johnson now proceeded to build on the shores of Lake George, near the battlefield, a fort of logs and earth, which he called Ft William Henry. In the meantime the French entrenched themselves at Ticonderoga on Lake Champlain at the foot of the falls of the stream draining Lake George into Lake Champlain Two years later, in March, 1757, the governor of Canada sent an expedition of about 1,600 men to capture the fort, but the expedition failed to accomplish its mission In August of this same year the garrison, in desperate straits because of loss of ammunition and supplies, surrendered to the Marquis de Montcalm The terms of the surrender provided that the garrison would be permitted to proceed under escort to Ft Edward, but the strength of the escort was not sufficient to prevent the Indian allies of Gen Montcalm from massacring or taking prisoner a large part of the force Ft William Henry was destroyed Lake George was the scene of many other engagements during the French and Indian wars and during the Revolution Gen Abercrombie's large army marched from the lake to its defeat at Ticonderoga in July, 1758 Lord Amherst advanced along the lake *en route* to Ft Ticonderoga, which he captured in July, 1759 Near the site of Ft William Henry, Gen Amherst later built a new fort known as Ft George Its ruins still remain

See H Marvin, *A Complete History of Lake George* (1853), B C Butler, *Lake George and Lake Champlain* (Albany, 1868), B F Da Costa, *A Narrative of Events at Lake George* (1868), Francis Parkman, *Historic Handbook of the Northern Tour* (Boston, 1885), Elizabeth E Serlve, *Saratoga and Lake Champlain in History* (Lake George, N Y, 1898), Caroline H Royce, *The First Century of Lake Champlain* (1909), W M Reid, *Lake George and Lake Champlain* (1910), F W Halsey, "The Historical Significance of the Hudson and Champlain Valleys," *N Y State Hist Assoc Proc*, vol ix, pp 227–236 (Albany, 1910), and E T Gillespie, "The War Path," ib, vol x, pp 139–155 (Albany, 1911). (E JA.)

GEORGE JUNIOR REPUBLIC, THE, an American colony of boys and girls located at Freeville, N Y It was founded in 1895 by W R George who conceived the idea that youth in their teens have sufficient brain power and physical strength to assume responsibilities of self-government and self-support, and contended that lack of such responsibility developed indifference to law and order and the dignity of labour His little colony, composed of 144 boys and girls from New York city, was established on the basis of any other village, except that its citizens were between the ages of 16 and 21 The laws of New York State are followed, and in addition the citizens make special laws in their own town meetings for their particular needs The same social, civic and economic conditions prevail in the Junior Republic as in other communities

The Junior Republic has served to launch the self-government movement for youth in schools, institutions, prisons and communities in various parts of the world, and has demonstrated the applicability of its principles to youth of all classes and conditions of society Other republics, modelled on the George Junior Republic, have been established in several other states (W R G)

GEORGE OF LAODICEA in Syria, often called "the Cappadocian," from 356 to 361 Arian archbishop of Alexandria, was born probably at Epiphania, in Cilicia After many wanderings, in which he amassed a fortune, first as an army-contractor and then as a receiver of taxes, he reached Alexandria, where in 356 he was promoted by the prevalent Arian faction to the vacant see A semi-Arian or Homoiousian, George instigated the second Sirmian formula (promulgated by the third council of Sirmium 357), which was conciliatory towards strict Arianism, was opposed at the council of Ancyra in 358 His persecutions of the orthodox raised a rebellion which compelled him to flee for his life, but his authority was restored by a military demonstration On the accession of Julian, he was killed by the people on Dec 24, 361 Though brutal in character, George possessed a cultivated literary taste, and collected a splendid library, which Julian ordered to be conveyed to Antioch for his own use An anonymous work against the Manicheans discovered by Lagarde in 1859 in a ms of Titus of Bostra has been attributed to him

The sources for the life of George of Laodicea are Ammianus, Gregory Nazianzen, Epiphanius and Athanasius Gibbon's theory of his identification with the patron saint of England is now rejected (*see* GEORGE, SAINT) *See* J H Newman, *The Arians of the 4th Century* (1871); C S. Hulst, *St George of Cappadocia in Legend and History* (1910).

GEORGE OF TREBIZOND (1395–1484), Greek philosopher and pioneer of the revival of letters in the West, was born in the island of Crete In Italy, he learned Latin from Vittorino

da Feltre His reputation as a teacher and a translator of Aristotle was very great, and he was selected as secretary by Pope Nicholas V, an ardent Aristotelian His attacks upon Plato (in the *Comparatio Aristotelis et Platonis* [1464]), drew forth a powerful response from Bessarion (*q v*), and his inaccurate translations of Plato, Aristotle and other classical authors, combined to ruin his fame He retired to the court of Alphonso V at Naples, but returned to Rome where he died unheeded on Aug 12, 1484

See G Voigt, *Die Wiederbelebung des klassischen Altertums* (1893) For a complete list of his translations from Greek into Latin (Plato, Aristotle and the Fathers) and original essays in Greek (chiefly theological) and Latin (grammatical and rhetorical), *see* Fabricius, *Bibliotheca Graeca* (ed Harles), xii

GEORGE PISIDA (Georgios Pisides), Byzantine poet, born in Pisidia, flourished during the 7th century AD He was a deacon and keeper of the records of the church of St Sophia His works include a poem in three cantos on the campaign of the emperor Heraclius against the Persians, apparently the work of an eye-witness, the *Avarica,* an account of a futile attack on Constantinople by the Avars (626), the *Heraclias,* a survey of the exploits of Heraclius down to the overthrow of Chosroes (627), a didactic poem, *Hexaemeron* or *Cosmourgia,* on the creation of the world, a treatise on the vanity of life, after the manner of *Ecclesiastes,* a controversial composition against Severus, bishop of Antioch, and a poem on the resurrection of Christ The metre chiefly used is the iambic As a versifier Pisida is correct and even elegant, as a chronicler of contemporary events he is exceedingly useful, but though later Byzantines admired his work, modern criticism pronounces it dull

Complete works in J P Migne, *Patrologia Graeca,* xcii, *see* also *De Georgii Pisidae apud Theophanem aliosque historicos reliquiis* (1900), by S L Sternbach, who has edited several new poems for the first time from a Paris ms in *Wiener Studien,* xiii, xiv (1891–92), C Krumbacher, *Geschichte der byzantinischen Literatur* (1897), C F Bahr in Ersch and Gruber's *Allgemeine Encyklopadie*

GEORGE THE MONK (Georgios Monachos), called Hamartolos (Greek for "sinner"), Byzantine chronicler, lived during the reign of Michael III (842–867) He wrote a *Chronicle* of events, in four books, from the creation of the world to the death of the emperor Theophilus (842), whose widow Theodora restored the worship of images in the same year It is the only original contemporary authority for the years 813–842, and therefore so far indispensable, the early parts of the work are merely a compilation In the introduction the author declares that his only object was to relate with strict truth such things as were "useful and necessary" Far too much attention, however, is devoted to religious matters, the iconoclasts are fiercely attacked, and the work is full of theological discussions The mss give a continuation down to 948, the author of which is indicated simply as "the logothete," by whom probably Symeon Metaphrastes (second half of the 10th century) is meant In this more attention is devoted to political history Still further continuations of little value go down to 1143 The large circulation of the work and its subsequent reissues, with alterations and interpolations, make it very difficult to arrive at the original text

Editions E de Muralt (1859), J P Migne, *Patrologia Graeca,* cx; C de Boor (in Teubner series, 1904)

See F Hirsch, *Byzantinische Studien* (1876), C de Boor in *Historische Untersuchungen* (in honour of Arnold Schafer, Bonn, 1882), C Krumbacher, *Geschichte der byzantinischen Literatur* (1897)

GEORGE THE SYNCELLUS (Georgios Synkellos), of Constantinople, Byzantine chronicler and ecclesiastic, lived at the end of the 8th and the beginning of the 9th century AD He was the *syncellus* (cell-mate, the confidential companion assigned to the patriarchs, in reality sometimes little more than a spy) of Tara(u)sius, patriarch of Constantinople (784–806), after whose death he retired to a convent, and wrote his *Chronicle* of events from Adam to Diocletian (285) At his request, the work was continued after his death by his friend Theophanes Confessor The *Chronicle,* which is rather a chronological table (with notes) than a history, is valuable, in spite of its religious bias and dry and uninteresting character, for the fragments of ancient writers and apocryphal books preserved in it (*e g*, considerable portions of the *Chronicle* of Eusebius)

Editio princeps, by J Goar (1652), in Bonn *Corpus scriptorum hist Byz*, by W. Dindorf (1829). *See* also H Gelzer, *Sextus Julius Africanus,* ii 1 (1885), C Krumbacher, *Geschichte der byzantinischen Literatur* (1897)

GEORGETOWN, capital of British Guiana (*see* Guiana), population (1921) 59,623, and seat of the colonial government, situated on the left bank of the Demerara river at its mouth, in 6° 29′ 24″ N and 58° 11′ 30″ W Known during the Dutch occupation as Stabroek, it was established as the seat of government of the combined colonies of Essequibo and Demerara (now with Berbice forming the three counties of British Guiana) in 1784, its name being changed to Georgetown in 1812 The streets are wide and straight, intersecting each other at right angles, several having double roadways with lily-covered canals between the grass banks carrying rows of handsome shade trees In Main Street, the finest street in Georgetown, the canal has been filled in to form a broad walk The principal residences, standing in their own gardens, are scattered over the town Water Street, the business centre, runs parallel to the river for about 2½ m and contains the stores of the wholesale and retail merchants, their wharves running out into the river to allow steamers to come alongside Most of the houses and public buildings are constructed of wood, the former generally raised on brick pillars some 4–10 ft from the ground, the bright colouring of the wooden walls, jalousies and roofs adding to the beauty of the best streets The Public Buildings in the centre of the city, containing the offices of the government and the hall of the Court of Policy, were erected between 1829 and 1834 They form a handsome, E-shaped, brick-plastered block with deep porticos and marble-paved galleries carried on cast-iron columns The law courts, built in the '80s, have a ground floor of concrete and iron, the upper storey being of hardwood Among other public buildings are the town hall, the Anglican and Roman Catholic cathedrals, several handsome churches, the local banks and insurance offices, and the almshouse The public hospital consists of several large blocks The Royal Agricultural and Commercial Society has a large reading-room and lending library The museum of the Royal Agricultural and Commercial Society is chiefly devoted to the fauna of British Guiana, but also contains collections of local economic, mineral and botanical exhibits, foreign birds and mammals, and views of the colony The extensive botanical gardens to the east of the city are admirably laid out The nurseries are devoted chiefly to the raising of plants of economic importance which can be purchased at nominal rates The collections of ferns and orchids are very fine In the gardens are located the fields of the board of agriculture, where experimental work in the growth of sugar-cane, rice, cotton, etc, is carried on Other popular resorts are the sea wall and the promenade gardens in the centre of the city

The local government of Georgetown is vested in a mayor and town council elected under a very restricted franchise The city is divided into nine wards, each with one representative Three Councillors are nominated by the governor There were, in 1921, 977 registered municipal voters The revenue, just over £100,000 annually, is mainly derived from a direct rate on house property The colonial government gives a grant-in-aid towards the upkeep of the streets Water for public and domestic purposes is taken from the conservancy of the east coast and is delivered by pumping throughout the city, but drinking-water is collected in tanks from rain There is an excellent service of telephones and a trolley service and a halfpenny postage within the city boundaries Georgetown has two well-equipped foundries, a dry dock, and factories for the manufacture of rice, cigars, soap, boots, chocolate, candles, aerated waters and ice It is connected by rail and ferry with New Amsterdam, by ferry and rail with the west coast of Demerara, and by steamer with all coastal districts and up the principal rivers

GEORGETOWN, formerly a city of the District of Columbia, U S A, and now part of the city of Washington, U S A, at the confluence of the Potomac river and Rock Creek, about 2½m W N W of the National Capitol The streets are old-fashioned, narrow and well shaded On the "Heights" are many fine residences with beautiful gardens, the Monastery and Academy of Visitation for Girls, founded in 1799 by Leonard Neale, second

archbishop of Baltimore; and the college and the astronomical observatory (1842) of Georgetown university, founded in 1789 Rising in terraces from Rock Creek is Oak Hill cemetery, a beautiful burying-ground containing the graves of John Howard Payne, the author of "Home, Sweet Home," Edwin McMasters Stanton and Joseph Henry On the bank of the Potomac is a brick house which was for several years the home of Francis Scott Key, author of "The Star-Spangled Banner", on Analostan island in the river was a home of James Murray Mason; Georgetown Heights was the home of the popular novelist, Mrs Emma Dorothy Eliza Nevitte Southworth (1819–99) Georgetown was settled late in the 17th century, was laid out as a town in 1751, chartered as a city in 1789, merged in the District of Columbia in 1871, and annexed to the city of Washington in 1878 In the early days of Washington it was a social centre of some importance, where many members of Congress as well as some cabinet officers and representatives of foreign countries lived and the President gave State dinners, and here were the studio, for two years, of Gilbert Stuart, and "Kalorama," the residence of Joel Barlow

See R P Jackson, *The Chronicles of Georgetown, D C from 1751 to 1878* (1878), H T Taggard, *Old Georgetown* (Lancaster, Pa, 1908); W A Gordon, "Old Homes on Georgetown Heights," *Columbia Hist Soc Rec*, vol xviii, pp 70–91 (1915), and W Tindall, "The Executives and Voters of Georgetown," ib, vol xxiv, pp 89–117 (1922).

GEORGETOWN, a town of Kentucky, U S A, 65m E of Louisville, the county seat of Scott county It is on Federal highway 25, and is served by the Frankfort and Cincinnati and the Southern railways The population was 3,904 in 1920 (31% negroes) It is the seat of Georgetown college (Baptist), chartered in 1829 as the successor of an academy founded in 1789 A remarkable spring in the centre of the town has a flow of 200,000 gal an hour, and furnishes power for the street railway and various factories, as well as the municipal water-supply Georgetown was settled in 1775, and was called at first McClellan's and then Lebanon, until in 1790 it was incorporated under its present name in honour of George Washington

GEORGETOWN, a city of South Carolina, U S A, at the head of Winyah bay, 14m from the ocean, a port of entry and the county seat of Georgetown county It is served by the Seaboard Air Line railway and by river and ocean steamers The population was 4,579 in 1920 (63% negro) It has turpentine distilleries and other factories, and is a shipping point for cotton, turpentine, resin, lumber and rice The commerce of the bay in 1925 amounted to 273,866 tons, valued at $6,907,038 The first settlement here was made about 1700, and the town was laid out before 1734 In 1757 the Winyah Indigo Society (growing out of a social club organized about 1740) was founded by a group of planters interested in the cultivation of indigo During the Revolution Georgetown was the scene of several skirmishes, and here Gen Lafayette first landed on American soil (April 24, 1777) The town was incorporated in 1805 and was chartered as a city in 1895

GEORGETOWN, a city of central Texas, U S A, 25m N by E of Austin, on the Meridian highway and served by the Missouri-Kansas-Texas and the Missouri Pacific railways, the county seat of Williamson county The population in 1920 was 2,871 Williamson is one of the leading cotton counties of the State North and west of the city are extensive forests, to the east is the black-land belt, and there are mineral springs and large deposits of building stone near by Georgetown is primarily an academic centre, the seat of South-western university (Methodist Episcopal, South), formed in 1873 by the consolidation of four pioneer Methodist institutions of the State, founded in 1840, 1844, 1848 and 1856 The first settlement here was made in 1848

GEORGETOWN INDIANS: *see* SALISHAN

GEORGETTE. The name of a textile fabric, also sometimes described as "crêpe georgette" It is a light and gossamer-like tissue of silk of the plain weave, used for ladies' dresses, blouses, millinery, etc, and for other purposes when refinement and delicacy of texture are advantageous

A georgette fabric has a somewhat subdued sheen, without being dull, and also a crêpe-like texture without the crimped surface of a true crêpe This lustre and texture of georgette result from the employment both of warp and weft threads of "reverse" twist yarn spun and woven in the "gum," the yarn being subsequently "de-gummed" by boiling-off prior to dyeing and finishing The warp and weft threads of "reverse" twist may be disposed either alternately, *i e*, with an "end-and-end" disposition in the warp series of threads, and a "pick-and-pick" disposition in the weft series, or in alternate pairs, *i e*, with a "two-and-two" disposition either in one or in both series of threads The employment, in the same fabric, of threads of "reverse" twist in the manner described gives the threads the tendency to untwist in reverse directions and so develops the crêpe or crimp effect, which is also for the same cause a distinctive feature of a true voile texture (*q v*)

Georgine is the description of a very light silk tissue having the general appearance and characteristics of the true "crêpe georgette" but without the same degree of elasticity (H N)

GEORGIA (Russian *Gruzia*, Armenian *Vrastan*), an Autonomous Socialist Soviet Republic in the Transcaucasian Federation of the Russian S F S R, created in 1921, with an area of 54,469 sq km, exclusive of the autonomous South Ossetian district Its boundaries are west, the Black sea, north, the main ridge of the Caucasus, fringed by the Karachaev, Kabardine-Balkarsk, North Ossetian, Ingushetian, Chechen and Daghestan autonomous areas and republics, south-east, Azerbaijan, and south, Armenia and Turkey It is a mountain and plateau region, including the southern slopes of the Caucasus, with glaciers and lofty peaks, and the northern slopes of the Armenian plateau, sometimes called the Anti-Caucasus or lesser Caucasus Between them lie the valleys of the Rion flowing into the Black sea and the Kura and its tributaries flowing into the Caspian, and along these valleys goes the railway linking Poti to Baku

The Suram or Meskhiysk range, a spur from the Caucasus to the Armenian plateau, not only forms the watershed between the Black sea and Caspian drainage, but also markedly influences the climate To the west is a Mediterranean region, with a maximum winter rainfall and a luxuriance of sub-tropical vegetation To the east is a climate of greater extremes of temperature with a scanty rainfall having its maximum in Spring, while between the Alazan and the Kura rivers is bare steppe only cultivable if irrigated The eastern region is exposed to the winds from Central Asia The broad coastal plain, with its luxuriant vegetation and malaria infested swamps, extends from Batum to Sukhum and continues inland almost to the Suram range, along the western slopes of which lies Imeretia Eastwards from the Black sea, on the higher slopes of the Caucasus are the wild and inaccessible valleys of Swanetia, with Mingrelia below Further east is the trachytic cone of Kazbek, 16,541 ft, towering above the Dariel gorge along which goes the Georgian military road West of the Mamison pass, as far as Klukhor, the only passes are glacial, used occasionally by the mountain peasants, but eastward are grassy passes where horses can cross the chain in many places, and this key region between the sources of the Terek and the Ardon on the north and those of the Rion and the Kura on the south, has been held by the Ossetes from time immemorial There is no plain in eastern Georgia, but from Gori a plateau slopes south eastward, with the Alazan river on the north, the Kura on the south and the valley of the Yora in the centre Round the Alazan, with its numerous left bank mountain tributaries, is the fertile vine-growing Kakhetian region In addition to the sharp east and west climatic division in Georgia, there are vertical climatic zones, ranging from the warm valleys, through the leafy forest and pine forest zone to the Alpine pastures with their short, hot summer and long cold winter, and to the region of perpetual snow and glaciation

This complexity of relief and climate has led to the development and preservation of scattered populations, each with its own language and culture, remote from communication with one another and the outside world There are three main linguistic Georgian groups, Karthelian or Georgian proper now the administrative language, Mingrelian and Mingrelian-Lazi and Swanetian In western Georgia are the historic divisions of Imeretia, Racha, Lechkhum, Swanetia, Guria and Mingrelia and in eastern Georgia,

Kartalinia, Kakhetia, Meskhetia, Dzhavakhetia, Mtskheta, Khevsuria, Pshavia, Borchalo and South Ossetia Elements of the population from other regions include Russians, Armenians, Persians, Tatars, Turks and Jewish colonies of ancient date in the hill regions Near Tiflis are German settlements dating from the 18th century The population in 1926 was 2,666,388, and the Georgian element with its varied dialects, formed about 65% The greater part of the population, especially in the rural areas, is illiterate, and the new republic thus has to face great difficulties

Agriculture, mostly of a primitive kind, is the chief occupation. In western Georgia, in the absence of grass for working cattle, the leaves and stalks of maize are used, and maize flour is the common food In Guria, Mingrelia and Imeretia, the spring floods spread alluvium on the fields and maize can be sown year after year Cotton production in the two latter areas has almost reached pre-war level (1928) Tobacco for export is grown in Ozurgeti district Orchard fruits, berries, peaches, apricots, vines, pomegranates, citrous fruits, tomatoes, cucumbers, beetroot, melons and vegetables are cultivated, but so unscientifically that they have little export value, and preserve-making is primitive Bamboo and various narcotic and medicinal plants are also grown, and tea cultivation has markedly increased Silkworm breeding flourishes in the Kutais district, where the mulberry is better cultivated In eastern Georgia irrigation is often necessary; cotton, rice, wheat and barley are the chief crops The fertile regions of Kakhetia and West Kartalinia are noted for their vines and fruits, though hailstorms often ruin the crop, and phylloxera is a constant scourge. Beekeeping is everywhere profitable Wheat and barley are grown on the hills and foothills, the latter in Racha and Suanetia where wheat cultivation is impossible On the high hills summer wheat, and in the valleys winter wheat is grown All three varieties, the hard yellow and red and the soft white are found, and every variety of culture, one, two, three and many field, manured and fallow. Only the German colonists carry on an intensive system which provides them with winter food for their cattle, and allows of dairy produce for export Nomad cattle and sheep breeding is going through a crisis An unforeseen result of the creation of autonomous republics and of the cession of the south to Turkey has been an interference with the balance between the Alpine summer pastures, and the lowland winter grazing In Georgia there are 641,000 hectares of summer pasture, and only 234,000 of winter, while in Azerbaijan the proportions are reversed An added difficulty is that the lowland pastures have an inadequate water supply and late spring snow may cause damage to the flocks as in 1924 and 1927 The insanitary habits of the nomads bring plague in their train and their low cultural grade will make it long before scientific provision of winter food can remedy the present difficulties. Buffaloes are used as working cattle in the wet west, and have not diminished much, but the number of sheep, goats and horses is markedly less than in pre-war times, and there is still a deficiency of working cattle Irrigation problems are also complicated by the division of the republics, since the upper and lower courses of the rivers lie in different units and, though a federal committee is considering policy, no agreement has been reached Local irrigation canals were ruined in a lesser degree than the larger mechanical schemes, the Karayask plant, built in 1867, was destroyed in 1917 and has not yet been replaced A new mechanical irrigation plant is in course of construction in Kakhetia The general level of agriculture is also lowered by the paucity of means of communication and the absence of towns to create a demand Moreover widespread malaria in the plains has lowered the vitality of the workers

Georgia is heavily timbered with forests of many varieties, but the timber industry is little developed, partly because of the inaccessibility of the region and the lack of communications and partly because the streams are not suitable for floating the logs Its development will need great care, for the forests on these steep slopes regulate the river flow and prevent landslides Boxwood for spinning shuttles, greeknut, beech, oak and pine are the chief commercial varieties For an account of the forests, *see* CAUCASUS

Minerals, etc.—The chief mineral product is manganese in the Chiatura district. This was being worked by an American firm, the Harriman manganese concession whose advent was considered to be a most important thing for Russia financially but which has since been liquidated as it proved to be impossible to work it on a profit for a variety of reasons. Coal of poor quality is mined at Tkvibuli on the Kvirila river, and at Gelati, north of Tiflis, and iron at Chataksk, south of Tiflis Naphtha exists north of the Yorak Mineral springs are numerous, Tiflis, Abbas-tuman and Borzhom are noted spas Georgia has vast possibilities of hydro-electric development, and in 1926–27 the Zemo-Avchal station on the river Kura near Tiflis was completed, with a production of 13,000 kw , the power is to be used for electrification of the railway and for irrigation works on the steppe, as well as for the Tiflis factories Another station on the Abasha river in the Novo-Senaka district west of Kutais is being constructed and should supply Poti, Kutais and Chiatura. Manufactures are little developed, the only industrial centres being Tiflis, Kutais and Poti (*qq v*), the chief are foodstuffs, tobacco, leather and bricks. *Koustar* (peasant) industries are widespread, and include the weaving of carpets in the Borchalinsk district, of silk and dyed stuffs in Imeretia, the making of wooden and iron goods for daily use and the artistic silver work of the south western district There is at present (1928) no railway crossing the Caucasus from Georgia, and no direct railway link with the north, but a coastal line to link Poti with Tuapse is under construction

HISTORY

Georgia existed as a kingdom for 2,000 years. Its earliest name was Karthli or Karthveli from Karthlos, an eponymous king, whose son Mtskhethos founded Mtskhetha, the modern Mtskhet, the Persians knew it as Gurjistan, the Romans and Greeks as Iberia, though the latter placed Colchis also in the west of Georgia Kakhetia and Karthli formed the nucleus of a kingdom which varied much, including at different times Guria, Mingrelia, Abkhasia, Imeretia and Daghestan Georgia was conquered by one of Alexander's generals, but Pharnavaz or Pharnabazus (302 to 237 B C) shook off the Macedonian yoke At the end of the 2nd century B C the last Pharnavazian prince was dethroned by his own subjects and the crown given to Arsaces, king of Armenia, thus founding the Arsacid dynasty The Romans under Pompey in 65 B C and under the emperor Trajan, A D 114, invaded the country with little success The Sassanian dynasty began with Mirhan or Mirian (265–342), son of a Persian king and a princess of the Arsacid dynasty Christianity was introduced and the first church erected at Mtskhet In 379 a Persian general built Tphilis (Tiflis) as a counterpoise to Mtskhet Tiridates (393–405) freed the country from Persian rule In 446–499 Vakhtang, surnamed Gurgaslan or Gurgasal (the "wolf lion"), established a patriarchate at Mtskhet and made Tphilis his capital After conquering Mingrelia, Abkhasia, the Ossetes and part of Armenia, he joined Persia in an attack on India His son Dachi or Darchil (499–514) permanently transferred the seat of government to Tphilis (Tiflis).

In 571 the Georgians, while Persia was being attacked by Turks and Byzantine Greeks, appealed to the Byzantine emperor, Justin II , who placed Guaram, a prince of the Bagratid family of Armenia on the throne The Bagratid dynasty ruled until 1803 Byzantine influence was strong in the Georgian church until the Arab invasions in the 7th and 8th centuries, when Islamism was repeatedly imposed on the Georgians at the point of the sword Under Bagrat III , who built in Kutais in 1003 a fine cathedral, peace was restored and his kingdom extended from the Black Sea to the Caspian In the 11th century the Seljuk Turks overran the country, but David II (1089–1125), the Renovator, with the help of the Kipchak Mongol horde, forced them back over the Armenian mountains Under George III (1156–1184), Armenia was in part conquered and Ani, one of its capitals, taken His daughter Tamara or Thamar succeeded him and extended her power over Trebizond, Erzerum, Tovin and Kars, while her son George IV (1212–1223) conquered Ganja and repulsed the Persians In 1220 and 1222 the Mongol hordes under

a son of Jenghiz Khan overran the country and under his sister Rusudan, Tiflis was twice captured by the Persians and in 1236 Georgia was devastated by the Mongols After a recovery under George V. (1318–1346), who reconquered Imeretia, the Mongols under Timur (Tamerlane) laid the country waste until 1403 Alexander I. (1413–1442) freed the country from the Mongols, but divided it among his three sons, whom he made sovereigns of Imeretia, Kakhetia and Karthli (Georgia) respectively; Imeretia remained a separate state till its annexation by Russia (1810).

In 1492, the king of Kakhetia sought the protection of Ivan III against the Turks and Persians In the 17th century, Theimuraz (1629–1634), king of Georgia, appealed to Michael, the first of the Romanov tsars of Russia, against Shah Abbas of Persia, as did Imeretia and Guria In 1638 the prince of Mingrelia took the oath of allegiance to the Russian tsar, and in 1650 the prince of Imeretia took the same step Vakhtang VI of Georgia put himself in the 18th century under the protection of Peter the Great. After the 18th century Afghan conquest of Persia, the Turks captured Tiflis and compelled Vakhtang to abdicate, but in 1735 withdrew their claim Peter the Great in 1722 extorted from Persia her prosperous Caspian provinces, but left her the predominating power in Georgia Heraclius II of Georgia (1783) declared himself a vassal of Russia and in 1795 appealed to Russia for help against Agha Mohammed, shah of Persia, who had laid Tiflis in ruins George XIII, the next king of Georgia, renounced his crown in favour of the tsar and in 1801 Georgia became a Russian province Guria submitted to Russia in 1829

Under the tsars Georgia was divided between the Russian provinces of Tiflis and Kutais (*see* TRANSCAUCASIA) After the Oct 1917 revolution a period of civil war followed in Georgia, which ended in 1921, upon the creation of the Georgian A S S R

In spite of her illiterate masses, Georgia has a cultural heritage which should prove a valuable asset to the new Georgian university Her language is of the Asianic group, and has a sacerdotal and an ordinary alphabet The extant version of the Georgian bible dates from the eighth century, and the famous national poem "The man clothed in the panther's skin," by Roustaveli, memorized by many Georgians to-day, dates from the reign of Queen Tamara, in the 11th century An English translation of it has been published by the Royal Asiatic Society.

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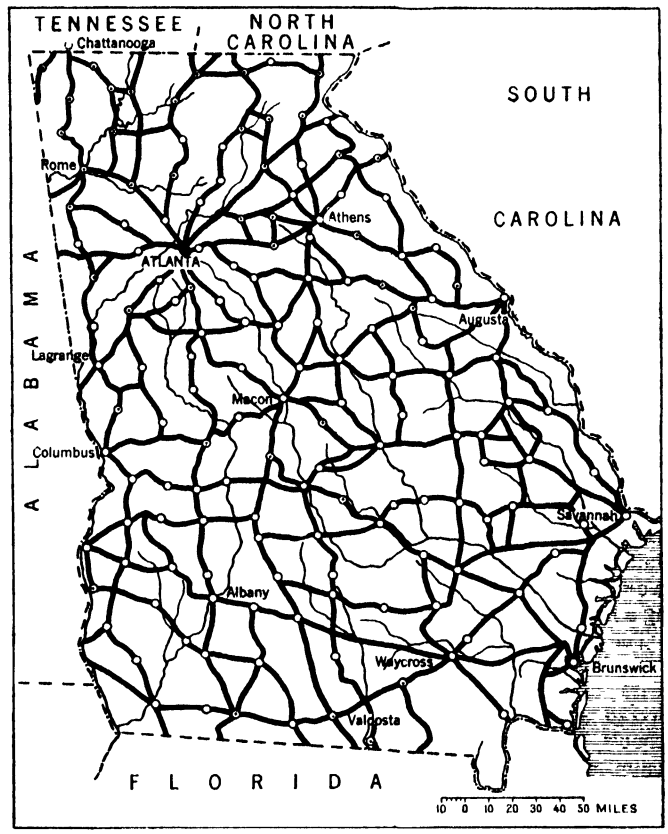
GEORGIA, popularly called the "Empire State of the South," is a southern State of the U S A, and one of the 13 original States It is situated between 30° 31′ 39″ and 35° N. and between 81° and 85° 53′ 38″ W Georgia is bounded on the north by Tennessee and North Carolina, east by South Carolina and the Atlantic ocean, south by Florida and west by Alabama The extreme length and width of the State are 320m and 254m respectively. Its total area is 59,265 sq m

Physical Features.—The surface of Georgia is divided into five physical zones From the sea coast, which is skirted by fertile, semi-tropical islands, a plain of 35,000 sq m, known as South Georgia, extends northward to the "fall-line" passing from Augusta, through Milledgeville and Macon, to Columbus. This is a part of the great Atlantic coastal plain. The average elevation for the entire region is about 250 feet. North of the line mentioned, and collectively known as North Georgia, are the four other regions, each with well-defined characteristics The largest and southernmost is known as the Piedmont belt or plateau, being a region of faint relief eroded on highly complicated crystalline rocks The Blue Ridge escarpment, a striking topographic feature in Virginia and the Carolinas, extends into Georgia along the north-eastern border of this belt, but is less strongly developed here than elsewhere, dying out entirely towards the south-west North of the Piedmont belt lie the Appalachian (Blue Ridge) mountains region and the Great Valley region, the former to the east, the latter to the west of a dividing line from Cartersville northward The former region consists of detached mountain masses of crystalline rocks, not yet eroded down to the level of



MAP OF THE ROADS OF GEORGIA

the Piedmont belt In Towns county, in the Appalachian region, is the highest point in the State, Brasstown Bald (4,768 ft), the approximate mean elevation of the State being 600 feet The Great Valley region consists of folded sedimentary rocks, extensive erosion having removed the soft layers to form valleys, leaving the hard layers as ridges, both layers running in a north-east to south-west direction. In the extreme north-west corner of the State is a small part of the Cumberland plateau, represented by Lookout and Sand mountains On the Blue Ridge escarpment near the north-east corner of the State is a water-parting separating the waters which find their way respectively north-west to the Tennessee river, south-west to the Gulf of Mexico and south-east to the Atlantic ocean West of where the escarpment dies out, the Great Valley region and a considerable portion of the Appalachian mountains region are drained by the Coosa, the Tallapoosa and their tributaries, into Mobile bay, but the Cumberland plateau, like that part of the Appalachian mountains region which lies directly north of the Blue Ridge escarpment, constitutes a part of the Tennessee basin The principal rivers of the State are the Chattahoochee and the Flint, which unite in the south-west corner to form the Apalachicola, the Ocmulgee and the Oconee, which unite in the south-east to form the Altamaha, and the Savannah, which forms the boundary between Georgia and South Carolina All these rise in the upper part of the Piedmont plateau, through which they pursue a rapid course over rocky beds, and are navigable only south of the "fall-line"

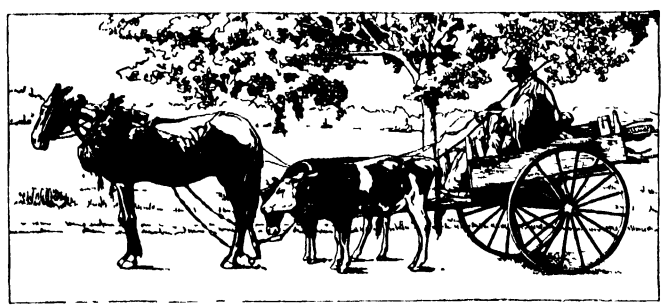
The climate of Georgia, though temperate, differs considerably in various parts of the State The lowest mean annual temperature, 40° F and below, is that of some of the mountain tops of northern Georgia, from the mountain sides to the Piedmont pla-

teau this mean temperature varies from 45° to 60°, on the Piedmont plateau from 60° to 65°; and on the coastal plain from 60 to 70 degrees. The mean July temperature for the whole State is 81·8 degrees The average rainfall for the State is 49 3in

Georgia is also notable for the variety of its soils In the Cumberland plateau and Great Valley regions are a red or brown loam, rich in decomposed limestone and calcareous shales and sandy or gravelly loams. In the Piedmont plateau and Appalachian mountain regions the surface soil is generally sandy, but in large areas the sub-soil is a red clay derived largely from the decomposition of hornblende By far the greatest variety of soils is found in that part of the coastal plain region extending from the "fall-line" as far south as a line bisecting Early county in the west and passing through Baker, Worth, Dooly, Dodge, Laurens, Johnson, Jefferson and Burke counties, a sand, forming what is known as the sand-hill region, red clay derived from silicious rock in the red hills, and grey, sandy soils with a sub-soil of yellow loam South-west of this belt is the lime sink region The soft limestone underlying this region is covered, in the uplands, with grey, sandy soils, which have a sub-soil of loam, in the lowlands the surface soils are loams, the sub-soils clays Adjoining the lime sink region are what were formerly known as the pine barrens Here the prevailing soils are grey and sandy with a subsoil of loam, but they are less fertile than those of the regions mentioned above The coast counties of the south-east and generally those on the Florida frontier, are not suitable for cultivation, on account of the numerous marshes and swamps

Government.—The present Constitution, which was adopted in 1877 and subsequently amended, provides for a system of government similar in general to that of the other States of the Union An amendment to the Constitution may be proposed by a two-thirds vote of the legislature, and comes into effect on receiving a majority of the popular vote

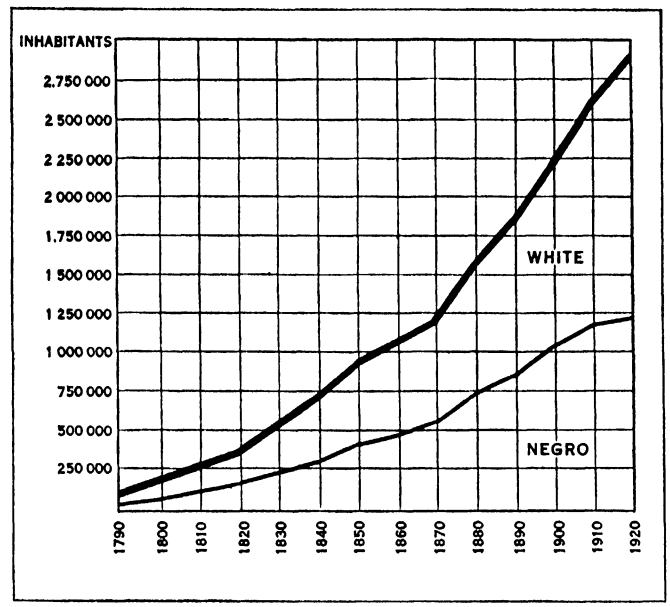
The State executive officers are a governor, secretary of State, controller-general and treasurer, all elected for a term of two years, except the controller, whose term is four years Other elected administrative officials are the State superintendent of schools, and attorney-general, a commissioner of agriculture, a commissioner of commerce and labour, a pension commissioner, a prison commissioner and public service commissioners There are also numerous commissions, boards and offices to carry on the administrative work In case of the governor's "death, removal or disability" the duties of his office devolve, in the first instance, upon the president of the Senate, and in the second upon the speaker of the house of representatives The governor's power of veto extends to separate items in appropriation bills, but in every case his veto may be overridden by a two-thirds vote of the legislature. The legislature, consisting of a Senate and house of representatives, meets in regular session at Atlanta, the capital, on the fourth Wednesday in June, on odd-numbered years The Senate consists of 51 members, elected from senatorial districts for a term of two years Representatives, 207 in number, are likewise elected for two years They are apportioned one to each county, except the eight more populous, which have three each, and the 30 of next greatest population, which have two each The judicial power is vested in a supreme court, a court of appeals consisting of two divisions, 32 circuit courts, 81 city and county courts, an ordinary and justice of the peace courts All judges are elected; those of the supreme court, six in number, and those of the court of appeals, three for each of the two divisions, for six years; those of the circuit courts, city and county courts, ordinaries and justices of the peace for four years Each judicial circuit has a solicitor-general elected for a term of four years The counties, 161 in number, are the chief units of local government The more important affairs of each county are managed by a board of commissioners, but each county elects also a clerk of court, a sheriff, a tax receiver, a tax collector, an ordinary, a county agent and a board of education



BY COURTESY OF THE UNITED STATES BUREAU OF RECLAMATION

A GEORGIAN NEGRO OF THE POOREST CLASS ON HIS WAY TO TOWN

Before 1909 there was no constitutional discrimination aimed against the exercise of suffrage by the negro; but, in fact, the negro vote had in various ways been reduced By a constitutional amendment adopted by a large majority at a special election in Oct 1908, new requirements for suffrage, designed primarily to exclude paupers and illiterates, especially illiterate negroes, were imposed, the amendment coming into effect on Jan 1, 1909 As the result of a general campaign against child labour, an act was passed in 1906 providing that no child under ten years of age should be employed or allowed to labour in or about any factory, under any circumstances This law was soon amended, raising the age and conditions of employment, and by an act of 1914 the employment of children under 14 years of age was prohibited Factory inspectors were provided in 1916 and in 1920 an Employer's Liability Act, which provided for compensation for industrial accidents, became operative By another act of the same year, rehabilitation of persons disabled in industry or otherwise was undertaken by the State, with Federal aid A new banking code (1920), modelled on the National Bank Act, corrected many defects in the old banking system and provided for adequate inspection



GRAPH SHOWING GROWTH OF POPULATION IN GEORGIA 1790–1920, INDICATING THE PROPORTIONS OF NEGRO AND WHITE INHABITANTS AT EACH CENSUS THE CENSUS OF 1870 WAS "GENERALLY DEFICIENT IN THE SOUTHERN STATES"

Population.—The population of Georgia at stated censuses was as follows 82,548 in 1790, 162,686 in 1800, 516,823 in 1830, 1,057,286 in 1860; 1,542,180 in 1880, 1,837,353 in 1890, 2,216,331 in 1900, 2,609,121 in 1910, and 2,895,832 in 1920, or an increase of 11% for the decade The estimated population of Georgia on July 1, 1928, was 3,203,000, a figure exceeding that of any other State of the old South During 1910–20 negroes increased from 1,176,987 to 1,206,365, but, relatively, they decreased from 45 1% of the total population to 41 7% The urban population was 25 1% as compared with 20 6% in 1910 The density of population in 1920 was 49 3 per square mile as compared with 44 4 in 1910 The total foreign-born white population was 16,186 or 1% of the total population The census of 1920 revealed an important movement of population from the mountain

counties of the northern portion of the State and from central Georgia to south-central and south-eastern Georgia, due to the presence of large areas of undeveloped land in the southern half of the State The highest density of population, however, was still to be found in the northern half The largest city is Atlanta, the State capital, with 203,550 inhabitants in 1920, and an estimated population of 249,000 in 1927 The other cities in the State with a population estimated at more than 30,000 in 1927 were Savannah (99,700), Macon (60,100), Augusta (56,200) and Columbus (45,800).

Finances.—By the Constitution the tax rate is limited to $5 on the $1,000, and as the governmental expenses have increased faster than taxable property, urgent need has been felt for reforming the revenue system Up to 1927 the legislature had failed to act on reports urging the classification of property for taxation purposes, the adoption of the income tax and other changes in the system The principal source of revenue in 1926 was the general property tax ($6,757 449) Other important sources of revenue were a motor fuel tax, motor vehicle licences, subventions and grants by the U S Government and business licence taxes The State has an inheritance tax and a poll tax The total revenue for the year was $19,295,556 The disbursements for the same period were $19,453,655, the chief items being education ($7,620,627), pensions ($4,995,112), highways ($2,366,557), charities and correction ($1,519,277) and general administration ($1,169,621) The net funded and floating debt at the close of 1926 was $9,370,373, or a per caput debt of $2 99

Education.—Georgia's system of public instruction was not instituted until 1870, but as early as 1817 the legislature provided a fund for the education, in the private schools of the State, of children of indigent parents The Constitution of 1868 authorized "a thorough system of general education, to be forever free to all children of the State," and in 1870 the first public school law was enacted The Constitution, as amended in 1904, empowered counties and school districts within counties to supplement by local taxation the State appropriation for schools Many school districts, however, continued to have poor schools because they failed to levy the local school tax To remedy this defect in the former amendment, another was adopted in 1919 by which the counties were required to levy local taxation of not less than one mill or more than five mills for the support of elementary schools as a supplement to the State appropriation Already (1910) the constitutional clause limiting the taxing power of the counties to taxation for elementary schools only had been removed, and in 1912 the high schools were made a part of the public school system of the State The State Board of Education, hitherto composed of State officials, was made a professional board (1911), and a uniform text-book law passed, the duty of selecting the books being placed upon the board Compulsory education dates from 1916 The law, as amended by the new school code of 1919, required attendance through the seventh grade

To encourage the consolidation of small schools, the legislature appropriated (1919) $100,000, from which the State offered to pay annually a bonus of $500 to any county which combined small schools into larger ones, and where a four year high school was provided, an additional bonus of $1,000 was authorized This fund has since been increased to $400,000 The number of consolidated schools increased from 209 in 1918 to 882 in 1926 An Illiteracy commission was established (1919) to make a study of adult illiteracy, and in 1920 local taxation for the support of schools for adult illiterates was authorized Noteworthy progress is being made in the eradication of illiteracy During the period 1905–26 the number of public four year high schools increased from seven to 349 Between 1920 and 1926 the high school attendance increased 58%, and the number of schools 106% The enrolment in the public schools in 1926 was 692,907, the average daily attendance was 513,017 The private and parochial school enrolment in 1924 was 13,392 The number of public school teachers in 1926 was 17,881, the number of school buildings 6,867 The public school expenditures in the above year were $18,536,369, or a per caput expenditure, based on average daily attendance, of $29 65. The average annual salary was for whites, $785 13, and for coloured $289 84

In addition to the public schools, the State also supports the University of Georgia and its numerous branches The limiting clause of the Constitution of 1877, restricting State appropriations to elementary schools and the University of Georgia, caused all subsequently established schools to be, in law, members of the university system The more important branches of the parent university at Athens include the Georgia School of Technology



BY COURTESY OF THE UNITED STATES BUREAU OF RECLAMATION

A FAMILIAR SCENE IN GEORGIA DURING THE TOBACCO DRYING SEASON
The tobacco is brought from the fields in the "sled" at the right, hung on sticks and dried in the tobacco barn, in which a slow fire is kept night and day

(Atlanta), Georgia A and M college (Athens), Bowdon State Normal and Industrial college (Bowdon), Georgia Normal school (Statesboro), Georgia State College for Women (Milledgeville), Georgia State Women's college (Valdosta), State Normal school (Athens), State Agricultural Normal college (Americus), South Georgia A and M college (Tifton), North Georgia Agricultural college (Dahlonega), Georgia State Industrial College for Coloured Youths (Savannah), Georgia Normal and Agricultural college (coloured, Albany), Georgia State Medical college (Augusta) and the Georgia Experiment station at Experiment The denominational and non-sectarian institutions within the State include Agnes Scott college at Decatur, Piedmont college at Demorest, Emory university near Atlanta, Bessie Tift college at Forsyth, Brenau college at Gainesville, Lagrange college at Lagrange, Mercer university and Wesleyan college, both at Macon, Oglethorpe university at Oglethorpe and Shorter college at Rome Of the five colleges for negroes, the best known is Atlanta university

Charities and Corrections.—The various charitable and penal institutions of Georgia are governed by separate boards of trustees appointed by the governor The State-supported benevolent institutions include a State insane sanatorium for whites and negroes at Milledgeville, an institute for the deaf and dumb at Cave Spring, an academy for the blind at Macon, a Confederate soldiers' home at Atlanta, a tuberculosis sanatorium at Alto, a training school for mental defectives at Gracewood, a training school for delinquent boys at Milledgeville and a similar institution for girls in Fulton county There are also a number of private orphanages and charitable institutions The State has no penitentiary in the ordinary sense, but maintains a convict farm at Milledgeville where the aged, infirm, minors and females are kept Able-bodied male convicts are worked on the State roads

Industry, Trade and Transportation.—Agriculture is the principal occupation in Georgia, but its economic pre-eminence has been supplanted by manufacturing In 1925 the total value of all farm crops was $232,000,000 as compared with manufactured products valued at $648,852,000 The farm population in 1920 was 1,685,213, or 58 2% of the entire population, in 1925 it was 1,309,584 or 42 2% of the total The number of farms and the acreage in farms have suffered a like decrease In 1920 there were 25,441,000ac , or 67 7% of the total land surface, in farms, by 1925 the acreage had decreased to 21,945,000, or 58 4% The value of all farm property rose from $580,546,000 in 1910 to

$1,356,685,000 in 1920, but after 1920 it declined sharply, the values in 1925 being $686,673,000 Of the total number of farmers in 1925, 165,018 were whites and 84,077 negroes.

The chief product is cotton, to which about one-fourth of the cultivated land was devoted in 1926. It is grown in all counties of the State except Rabun, Towns and Fannin in the extreme northern part of the State Georgia has at times ranked second only to Texas as a cotton producer but in 1926, with 1,475,000 standard bales, its rank was sixth among the States of the Union This decrease in rank was due in part to increased production in other States and in part to damage caused by boll-weevils since 1914 The cotton and cotton-seed produced in 1926 were worth $95,617,000, as compared with $128,159,000 in 1925

The principal cereals cultivated are Indian corn, wheat and oats In 1926, the 3,817,000ac devoted to Indian corn produced 55,346,000bu , valued at $42,063,000 The cultivation of wheat, formerly remunerative, declined on account of the competition of the western States The product in 1926 was 1,710,000bu , valued at $2,565,000. In 1926, 496,000ac. planted in oats produced 11,408,000bu , ($7,872,000). Both white and sweet potatoes are produced, the latter, in 1926, amounting to 9,460,000bu , worth $7,568,000 The sugar-cane crop declined in value after 1890, and each year more of it was made into syrup In 1926, 6,125,000 gal of syrup, valued at $4,594,000, were produced from 35,000ac of cane Tobacco and peanuts have been the most remunerative of the new crops The tobacco crop in 1926 was 39,963,000lb , worth $9,591,000, a production slightly under that for previous years The acreage (211,000) devoted to peanuts gave the State the rank of first, but a product (110,775,000lb) exceeded by both North Carolina and Virginia Truck farming and the cultivation of orchard fruits have long been remunerative occupations The Georgia peach crop (9,400,000bu) was exceeded in 1926 by California only. Pecan-nuts are an increasingly important crop, the product in 1926 being 6,732,000lb , valued at $1,952,000 The value of all farm crops in 1926 was $211,600,000 The total dairy product in 1924 had a value of only $12,332,730 The live stock on farms on Jan 1, 1927, consisted of 48,000 horses, 341,000 mules, 880,000 cattle, 51,000 sheep and 1,164,000 swine

The forests of Georgia, next to the fields, furnish the largest amount of raw materials for manufactures The yellow pines of the southern part of the State yielded in 1925, 10,301,750gal of turpentine and 679,915 500lb barrels of rosin, a product not exceeded by any other State in the Union From the same source was derived most of the lumber product, valued in 1925 at $30,036,857, a value approximately double that for 1905

The chief features of the State's industrial activity are its early beginning and steady development As far back as 1850 there were 1,522 manufacturing establishments (35 of which were cotton-mills) in the State, whose product was valued at $7,082,075. In 1925 there were 2,876 industries giving employment to 141,173 wage-earners with a product valued at $648,852,294 The chief product of the factories was cotton goods, which had a value in 1925 of $193,423,660 In the quantity of cotton consumed Georgia was exceeded by North Carolina and South Carolina only This growth in cotton manufacturing is due to various causes, among them being the proximity of raw material, convenient water-power, favourable taxation and an abundance of cheap labour Other important manufacturing industries and their products were as follows Lumber and other timber products, $36,705,327, fertilizer, $28,261,583; food products, $22,865,209; construction and repair in steam railway shops, $22,357,215; cotton-seed oil, meal and cake, $21,925,257, planing-mill products, $18,628,954, knit goods, $17,020,011; foundry and machine shop products, $13,716,473; and printing and publishing newspapers and periodicals, $12,454,296 Georgia ranks first among the States as a producer of fertilizer and holds the same position as a consumer

The mineral resources of Georgia are varied, but because of the absence of petroleum and coal in great quantities the total product is relatively low In 1925 minerals were produced to the value of $16,503,741, an amount which gave Georgia the rank of 36th among the States of the Union Clay products, stone, cement and Fuller's earth were the principal mineral products in the order of their value Of the stone products, granite and marble are the most important. The output of the quarries in 1924 was 308,730 tons of granite, valued at $1,438,281; and 71,040 tons of marble, valued at $2,651,217 Stone mountain (1,686ft) in Dekalb county, near Atlanta, is a remarkable mass of light-coloured muscovite granite, having a circumference at its base of 7 miles Stone mountain granite is extensively used as a building material in Georgia and other southern States It is on the face of this mas-



BY COURTESY OF THE UNITED STATES BUREAU OF RECLAMATION

THE HOME OF A CASH-RENTER NEGRO FAMILY ON A SMALL GEORGIA FARM
The era of large plantations ended with the Civil War The many small farms that sprang up in succeeding years were at first operated on the share system, which finally gave way to a system of cash rental

sive piece of granite that the gigantic Confederate memorial is being sculptured Georgia white marble, first quarried on a large scale in Pickens county in 1884, was used in the capitol buildings of Georgia, Rhode Island, Mississippi, Minnesota, in the Corcoran Art Gallery, Washington, D C , and in other well-known buildings Other colours than the snowy white are found in the main marble belt of the State, which runs from Canton, Cherokee county, 60m generally north to the northern boundary of the State The annual marble production of Georgia is exceeded by that of Vermont only Barytes, produced chiefly in Bartow county, had a value in 1925 of $475,618 or approximately 30% of that produced in the country Clay products, principally brick and tile, had in 1925 a value of $6,369,225 The coal-fields of Georgia are situated in the Allegheny region in Dade and Walker counties; in 1925 the value of the coal mined in the State was $220,000 (66,174 short tons). Iron ore, bauxite, gold, manganese, talc and sand and gravel are other products of commercial importance

Means of transportation are furnished by the rivers, which are generally navigable for light-draught boats as far north as the "fall-line"; by ocean, steamship lines which have piers at St Marys, Brunswick, Darien and Savannah, and chiefly by railways, whose mileage in Jan 1925 was 6,980, a slight decline from the 7,427m in operation in 1915 The most important of the railways are the Central of Georgia, the Southern, the Atlantic Coast Line, the Seaboard Air Line, the Georgia and the Georgia Southern and Florida In 1925 there were ten electric railway companies operating 460m of track within the State The State highway department, created in 1916 and reconstituted in 1919, had under its control on Jan 1, 1927, 6,258 8m of roadway The total motor vehicle registration for 1926 was 278,402

History.—Georgia, the last to be established of the English colonies in America, derived its name from King George II of Great Britain Its formation was due to a desire of the British Government to protect South Carolina from invasion by the Spaniards from Florida, and by the French from Louisiana, as well as to the desire of James Edward Oglethorpe (*q v*) to found a refuge for the persecuted Protestant sects and the unfortunate but worthy indigent classes of England A charter was granted in 1732 to "the trustees for establishing the colony of Georgia in America," and parliament gave £10,000 to the enterprise The first settlement was made at Savannah in 1733 under the personal supervision of Oglethorpe. The early colonists were English,

German Lutherans (Salzburgers), Piedmontese, Scottish Highlanders, Swiss, Portuguese and Jews, but the main tide of immigration, from Virginia and the Carolinas, did not set in until 1752 As a bulwark against the Spanish the colony was successful, but as an economic experiment it was a failure The trustees desired that there should be grown in the colony wine grapes, hemp, silk and medical plants, for which England was dependent upon foreign countries, they required the settlers to plant mulberry trees, and forbade the sale of rum, a chief commercial staple of the colonies. They also forbade the introduction of negro slaves The industries planned for the colony did not thrive, and as sufficient labour could not be obtained, the importation of slaves was permitted, under certain conditions, in 1749 About the same time the House of Commons directed the trustees to remove the prohibition on the sale of rum In 1753 the charter of the trustees expired and Georgia became a royal province.

Under the new régime the colony was so prosperous that Sir James Wright (1716–85), the last of the royal governors, declared Georgia to be "the most flourishing colony on the continent" The people were led to revolt against the mother country through sympathy with the other colonies rather than through any grievance of their own. The centre of revolutionary ideas was St. John's parish, settled by New Englanders (chiefly from Dorchester, Mass). The Loyalist sentiment was so strong that only five of the 12 parishes sent representatives to the first provincial congress, which met on Jan 18, 1775, and its delegates to the continental congress therefore did not claim seats in that assembly But six months later all the parishes sent representatives to another provincial congress which met on July 4, 1775

The war that followed was really a severe civil conflict, the Loyalist and Revolutionary parties being almost equal in numbers In 1778 the British seized Savannah, which they held until 1782, meanwhile reviving the British civil administration, and in 1779 they captured Augusta and Sunbury, but after 1780 the Revolutionary forces were generally successful Civil affairs also fell into confusion In 1777 a State Constitution was adopted, but harmony was not secured until 1781

Georgia's policy in the formation of the U S Government was strongly national In the Constitutional Convention of 1787 its delegates almost invariably gave their support to measures designed to strengthen the Central Government Georgia was the fourth State to ratify (Jan 2, 1788), and one of the three that ratified unanimously, the Federal Constitution But a series of conflicts between the Federal Government and the State Government caused the growth of States rights theories First of these was the friction involved in the case, before the U S Supreme Court, of *Chisolm* v *Georgia,* by which the plaintiff, one Alexander Chisolm, a citizen of South Carolina, secured judgment in 1793 against the State of Georgia (*see* 2 Dallas Reports, 419) In protest, Georgia resolved that any Federal marshal who should attempt to execute the court's decision would be "guilty of felony, and shall suffer death, without benefit of clergy, by being hanged" No effort was made to execute the decision, and in 1798 the 11th amendment to the Federal Constitution was adopted, taking from Federal courts all jurisdiction over any suit brought "against one of the United States by citizens of another State, or by citizens or subjects of any foreign State"

The position of Congress and of the Supreme Court with reference to Georgia's policy in the Yazoo frauds also aroused distrust of the Federal Government In 1795 the legislature granted, for $500,000, the territory extending from the Alabama and Coosa rivers to the Mississippi river, and between 35° and 31° N lat (almost all the present State of Mississippi and more than half of the present State of Alabama) to four land companies, but in the following year a new legislature rescinded the contracts, on the ground that they had been fraudulently and corruptly made In the meantime the U S Senate had appointed a committee to enquire into Georgia's claim to the land in question, and as this committee pronounced that claim invalid, Congress, in 1800, established a territorial government over the region The legislature of Georgia remonstrated, but expressed a willingness to cede the land to the United States, and in 1802 the cession was ratified, it being stipulated, among other things, that the United States should pay to the State $1,250,000, and should extinguish "at their own expense, for the use of Georgia, as soon as the same can be peaceably obtained on reasonable terms," the Indian title to all lands within the State of Georgia In 1824 the State remonstrated in vigorous terms against the dilatory manner in which the National Government was discharging its obligation, and the effect of this was that in 1825 a treaty was negotiated at Indian Springs by which nearly all the Lower Creeks agreed to exchange their remaining lands in Georgia for $5,000,000 and equal territory beyond the Mississippi But President J Q Adams, learning that this treaty was not approved by the entire Creek nation, authorized a new one, signed at Washington in 1826, by which the Creeks kept certain lands west of the Chattahoochee The Georgia Government, under the leadership of Governor George M Troup (1780–1856), had proceeded to execute the first treaty, and the legislature declared the second treaty illegal and unconstitutional In reply to a communication of President Adams, early in 1827, that the United States would take strong measures to enforce its policy, Governor Troup declared that he felt it his duty to resist to the utmost any military attack which the U S Government should think proper to make



BY COURTESY OF TALLULAH FALLS INDUSTRIAL SCHOOL

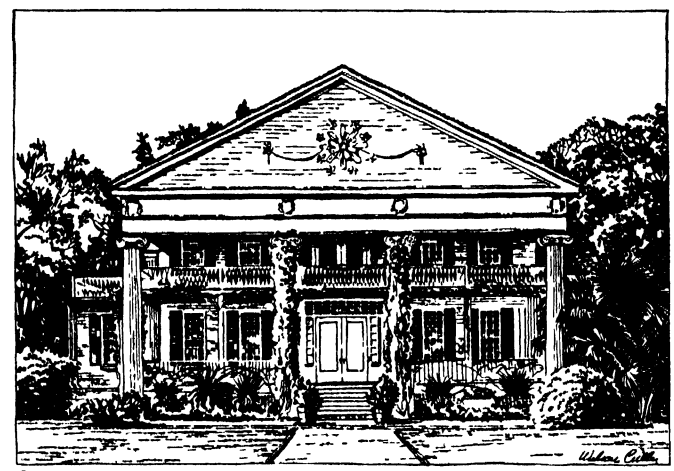
A TYPICAL SHACK IN THE MOUNTAINS OF GEORGIA

There was similar conflict in the relation of the United States and Georgia with the Cherokees In 1828 the legislature extended the jurisdiction of Georgia law to the Cherokee lands Then President Jackson, holding that Georgia was in the right on the Indian question, informed the Cherokees that their only alternative to submission to Georgia was emigration Thereupon the chiefs resorted to the U S Supreme Court, which in 1832 declared that the Cherokees formed a distinct community "in which the laws of Georgia have no force," and annulled the decision of a Georgia court that had extended its jurisdiction into the Cherokee country (*Worcester* v *Georgia*) But the governor of Georgia declared that the decision was an attempt at usurpation which would meet with determined resistance, and President Jackson refused to enforce the decree The president did, however, work for the removal of the Indians, which was effected in 1838 On account of these conflicts a majority of Georgians adopted the principles of the Democratic-Republican Party, and early in the 19th century the people were virtually unanimous in their political ideas Local partisanship centred in two factions, one, led by George M Troup, which represented the interests of the aristocratic and slave-holding communities, the other, formed by John Clarke (1766–1832), and his father Elijah, found support among the non-slave-holders and the frontiersmen The Troup faction, under the name of States Rights Party, endorsed the nullification policy of South Carolina, while the Clarke faction, calling itself a Union Party, opposed South Carolina's conduct, but on the grounds of expediency rather than of principle On account, however, of its opposition to President Jackson's hostile attitude toward nullification, the Troup Party affiliated with the new Whig Party, while the Clarke Party was merged into the Democratic Party led by Jackson The anti-slavery and nationalistic views of the Whig Party during the '50s caused its members in Georgia to shift to the Democratic Party

The activity of Georgia in the controversy was important As early as 1835 the legislature adopted a resolution which asserted the legality of slavery in the Territories, a principle adopted by Congress in the Kansas-Nebraska bill in 1854, and in 1847 ex-Governor Wilson Lumpkin (1783–1870) advocated the organization of the Southern States to resist the aggression of the North, but his views were considered untimely by many of the party leaders. Popular opinion at first opposed the Compromise of 1850, and some politicians demanded immediate secession from the Union Others contended that the Compromise was a great

victory for the South, and in a campaign on this issue secured the election of such delegates to the State convention (at Milledgeville) of 1850, that that body adopted, on Dec 10, by a vote of 237 to 19, a series of conciliatory resolutions, since known as the "Georgia Platform" The approval in other States of the Georgia platform in preference to the Alabama platform (*see* ALABAMA) caused a reaction in the South against secession The reaction was followed for a short interval by a return to approximately the former party alignment, but in 1854 the rank and file of the Whigs joined the American or Know-Nothing Party while most of the Whig leaders went over to the Democrats The Know-Nothing Party was nearly destroyed by its crushing defeat in 1856 and in the next year the Democrats, by a large majority, elected for governor Joseph Emerson Brown (1821–94), who, by three successive re-elections, was continued in that office until the close of the Civil War The Kansas question and the attitude of the North toward the decision in the Dred Scott case were arousing the South when he was inaugurated the first time, and in his inaugural address he clearly indicated that he would favour secession in the event of any further encroachment on the part of the North On Nov 7, following the election of President Lincoln, the governor, in a special message to the legislature, recommended the calling of a convention to decide the question of secession, and Alexander H Stephens was about the only prominent political leader who contended that Lincoln's election was insufficient ground for such action On Nov 17 the legislature passed an act directing the governor to order an election of delegates on Jan 2, 1861, and their meeting in a convention on the 16th On the 19th this body passed an ordinance of secession by a vote of 208 to 89 Already the 1st Regiment of Georgia Volunteers, under Col Alexander Lawton (1818–96), had seized Ft Pulaski at the mouth of the Savannah river, and now Governor Brown proceeded to Augusta and seized the Federal arsenal there Toward the close of the same year, however, Federal warships blockaded Georgia's ports, and early in 1862 Federal forces captured Tybee island, Ft Pulaski, St Mary's, Brunswick and St Simon island Georgia had responded freely to the call for volunteers, but when the Confederate Congress had passed, in April 1862, the Conscript law which required all white men (except those legally exempted from service) between the ages of 18 and 35 to enter the Confederate service, Governor Brown, in a correspondence with President Davis, offered serious objections

In 1863 north-west Georgia was involved in the Chattanooga campaign. In the following spring Georgia was invaded from Tennessee by a Federal army under Gen William T Sherman, the resistance of Gen Joseph E Johnston and Gen J B Hood proved ineffectual; and on Sept 1 Atlanta was taken Then Sherman began his famous "march to the sea," from Atlanta to Savannah, which revealed the weakness of the Confederacy In the spring of 1865, Gen J H Wilson, with a body of cavalry, entered the State from Alabama, seized Columbus and West Point on April 16, and on May 10 captured Jefferson Davis, president of the Confederacy, at Irwinville in Irwin county In accord with President Andrew Johnson's plan for reorganizing the Southern States, a provisional governor, James Johnson, was appointed on June 17, 1865, and a State convention reformed the Constitution to meet the new conditions, rescinding the ordinance of secession, abolishing slavery and formally repudiating the State debt incurred in the prosecution of the war A governor and legislature were elected in Nov 1865, the legislature ratified the 13th amendment on Dec 9, and five days later the governor-elect was inaugurated But both the convention and legislature incurred the suspicion and ill-will of Congress Georgia was placed under military government, as part of the third military district, by the Reconstruction Act of March 2, 1867 Under the auspices of the military authorities registration of electors for a new State convention was begun, and 95,168 negroes and 96,333 whites were registered The acceptance of the proposition to call the convention, and the election of many conscientious and intelligent delegates, were largely due to the influence of ex-Governor Brown, who was strongly convinced that the wisest course for the South was to accept quickly what Congress had offered The convention met in Atlanta on Dec 9, 1867, and by March 1868 had revised the Constitution to meet the requirements of the Reconstruction Acts The Constitution was duly adopted by popular vote, and elections were held for the choice of a governor and legislature. Rufus Brown Bullock, Republican, was chosen governor, the Senate had a majority of Republicans, and in the house of representatives by the close vote of 76 to 74, a Republican was elected speaker On July 21, the 14th amendment was ratified, and as evidence of the restoration of Georgia to the Union the congressmen were seated on July 25 in that year In September of the same year the Democrats in the State legislature, being assisted by some of the white Republicans, expelled the 27 negro members and seated their defeated white contestants In retaliation the 41st Congress excluded the State's representatives on a technicality, and, on the theory that the Government of Georgia was a provisional organization, passed an act requiring the ratification of the 15th amendment before the admission of Georgia's senators and representatives The War Department now concluded that the State was still subject to military authority, and placed Gen A H Terry in command With his aid and that of congressional requirements that all members of the legislature must take the test oath and none be excluded on account of colour, a Republican majority was secured for both houses, and the 15th amendment was ratified Georgia was now finally admitted to the Union by act of Congress, July 15, 1870



A SOUTHERN COLONIAL PLANTATION-HOME, BUILT BEFORE THE CIVIL WAR

As was the case with many of the houses erected during the days of slavery, the bricks for this building were made by negroes on the plantation The timber came from pine forests, also on the plantation, and the rest of the material was hauled by wagon from Savannah, a distance of 500 miles

The reconstruction period in Georgia is remarkable for its comparative moderation The explanation lies in the fact that there were comparatively few "carpet-baggers" or adventurers in the State, and that a large number of conservative citizens, under the leadership of ex-Gov Brown, supported the reconstruction policy of Congress The election of 1871 gave the Democrats a majority in the legislature, Governor Bullock, fearing impeachment, resigned, and at a special election James M Smith was chosen to fill the unexpired term After that the control of the Democrats was complete

The recent history of Georgia has been one of social and economic progress In 1907 a State law was passed prohibiting, after Jan 1, 1908, the manufacture or sale of intoxicating liquors, nine-tenths of the counties of the State under local option laws were already dry at the passage of this act Many reforms in the educational policy, additional appropriations and a constitutional amendment, adopted in 1926, providing for a fund of $3,500,000 to be expended for public school teachers' salaries, have helped much to raise the State's educational standards Laws seeking to protect labour in the State's growing industries are among the most notable measures adopted To encourage further industrial development, a constitutional amendment was adopted in 1924, giving the electors of a county or municipality the power to exempt from taxation for a period of five years certain new industrial establishments.

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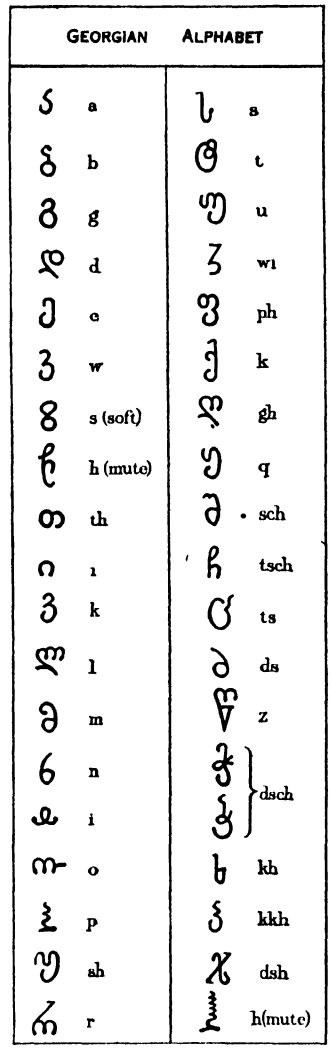
GEORGIAN BAY, the north-east section of Lake Huron, separated from it by Manitoulin island and the Saugeen, or Bruce, peninsula It is about 100 m long and 50 m wide It receives numerous rivers draining a large extent of country, of these the chief are the French river draining Lake Nipissing, the Maganatawan, the Muskoka draining the Muskoka chain of lakes, the Severn draining Lake Simcoe and the Nottawasaga The Trent valley canal connects Georgian bay with the Bay of Quinte and Lake Ontario, and a canal system has been projected to Montreal by way of the French and Ottawa rivers and Lake Nipissing

GEORGIAN LITERATURE. The earliest extant Georgian literature dates from soon after the conversion of Georgia by St Nino, early in the 4th century, and the oldest mss known are biblical, liturgical and hagiological, all of great value They show a stage of linguistic development, a wealth of words and grammatical forms which prove that the language must already have had an ancient literary history There were early translators of the Greek classical authors, and one of these says, in a preface, that he has endeavoured to give so exact a rendering of the text that he has converted philosophical terms syllable by syllable, a method which has endowed Georgia, from the 12th century, with a metaphysical terminology of great exactitude The folk-lore (*cf* vol i of the Grimm library, London, 1894) is of deep interest for comparative purposes, and its views of the under-world may throw light on the religions of Egypt and Assyria One folk-tale, *Et'heriani,* in prose and verse, the theme of which has been used for a successful opera in our own day, evidently assumed a literary form before the Christian era, and there is reason to believe that this may also be the case with the cycle of poems about Tariel, the hero of the greatest masterpiece of Georgian literature, attributed to Shot'ha Rust'haveli, an epic of over 1,500 rhyming quatrains written in the reign of Queen T'hamar (1184–1212) This has been rendered into English prose (*The Man in the Panther's Skin, a Romantic Epic,* Roy Asiat Soc, 1911), and it gives Georgia a high place in the literature of the world The T'hamarian age has also left us a large number of odes of great rhythmic variety, full of allusions to Greek and oriental writers, and translations or adaptations of foreign works, such as the *Story of the Loves of Vis and Ramin* (*Visramiani,* Eng trans published by Roy Asiat Soc, 1914), a romance of ancient Persia Persian influence in Georgian literature was strong in the 17th century, and among the poets may be mentioned King T'heimuraz I (lyrics and translations) In the 18th century a revival of nationalism was aided by the founding of a printing press at Tiflis, where, in 1712, King Vakhtang VI published, with an elaborate commentary, the work of Rust'haveli, he also compiled a Code of Laws in which the ancient customary laws are of special interest Of this period also are compilations on the history and geography of Georgia (by Prince Vakhusht), both texts with a vast amount of other matter, published and translated by M F Brosset, by far the greatest, as he was the first, of Western students of the literature A great name is that of Prince Sulkhan Orbeliani (1655?–1725?), who in 1714 was Georgian envoy at Versailles. He kept a diary of his travels in Europe (partial French and Latin trans in *Journ Asiat*, Paris, 1832 and 1834), and among his published works are a valuable dictionary of the language (Tiflis, 1884), and a rhymed translation of parts of the Persian Anvar-i-Suhaili His *Book of Wisdom and Lies* (Eng trans, 1894) is, after Rust'haveli, the most popular of Georgian books, in the form of interwoven apologues it highly recommends a sporting and Spartan education In the early part of the 19th century the influence of Europe grew, and in the lyrics of A Chavchavadze (1786–1846) and N Barat'hashvili (1816–46) there is a Byronic strain, but G Erist'havi the first dramatist and founder of the national theatre, who translated poems of Petrarch, Schiller, Mickiewicz and others, had a steadying effect The oppression of an alien rule (Russia, since 1801) inspired the patriotic verse of G Orbeliani (1801–23) and Ilia Chavchavadze (1837–1907), who was the greatest Georgian of his generation in all branches of literature and public life Acaci Tseret'heli (1840–1915) was the popular lyric poet of the century I Machabeli and D Qiphiani translated Shakespeare into Georgian



THE GEORGIAN NATIVE ALPHABET The Georgian, together with the majority of other Caucasian languages, composes a group fundamentally distinct from the Indo-European linguistic family

BIBLIOGRAPHY —A general history of Georgian literature was published in 1895–1901 by A Khakhanov (in Russian) There is a good Georgian library at the Bodleian in Oxford and another at Harvard At Oxford there is a fund for the encouragement of the study of Georgian literature

GEORGIAN STYLE: *see* MODERN ARCHITECTURE

GEORGSWALDE, a small town in northern Bohemia in the district of Sluknov near the German frontier It has a long history of industrial prosperity based upon textile manufactures, mainly linen, supported in recent times by engineering industries and the manufacture of pianos Pop 7,482

GEPHYREA, the name used for several groups of worm-like animals with certain resemblances but of doubtful affinity W C McIntosh followed the accepted view in associating in this group the *Echuridae, Sipunculidae,* and *Priapulidae* E Ray Lankester, in the preface to the English translation of C Gegenbaur's *Comparative Anatomy* (1878) added the *Phoronidae* to these forms The old group *Gephyrea* is now broken up into *Echiuroidea* (*q v*), which are modified Annelids, the *Sipunculoidea* (*q v*), an independent group of doubtful affinity, the *Priapuloidea* (*q v*), also of doubtful affinity, and the *Phoronidea*

GERA, a town of Germany in the republic of Thuringia, on the banks of the White Elster, 45 m S S W of Leipzig Pop. (1925) 80,899 Gera (in ancient chronicles *Geraha*) became a town in the 11th century, and in the 12th century it came into the possession of the lords of Reuss It was sacked by the Bohemians in 1450, was burned down by the Swedes in 1639, and suffered from fires in 1686 and 1780, after which it has been mostly rebuilt.

Its educational establishments include a weaving school Osterstein, the former residence of the princes of Reuss, stands on the site of a 9th century castle Gera is noted for its industrial activity Its industries include wool-weaving and spinning, dyeing, iron-founding, the manufacture of textiles, machinery, musical instruments, leather and tobacco, and printing (books and maps) and flower gardening

GERALDTON, a town in the district of Victoria, West Australia, on Champion bay, 306 m by rail N W of Perth Pop. (1925) 4,199 It is the seat of a Roman Catholic bishop, an important seaport carrying on a considerable trade with the surrounding gold-fields and agricultural districts, the centre of a considerable railway system and a seaside resort The harbour is safe and extensive, the chief exports are gold, copper, lead, wool and sandalwood.

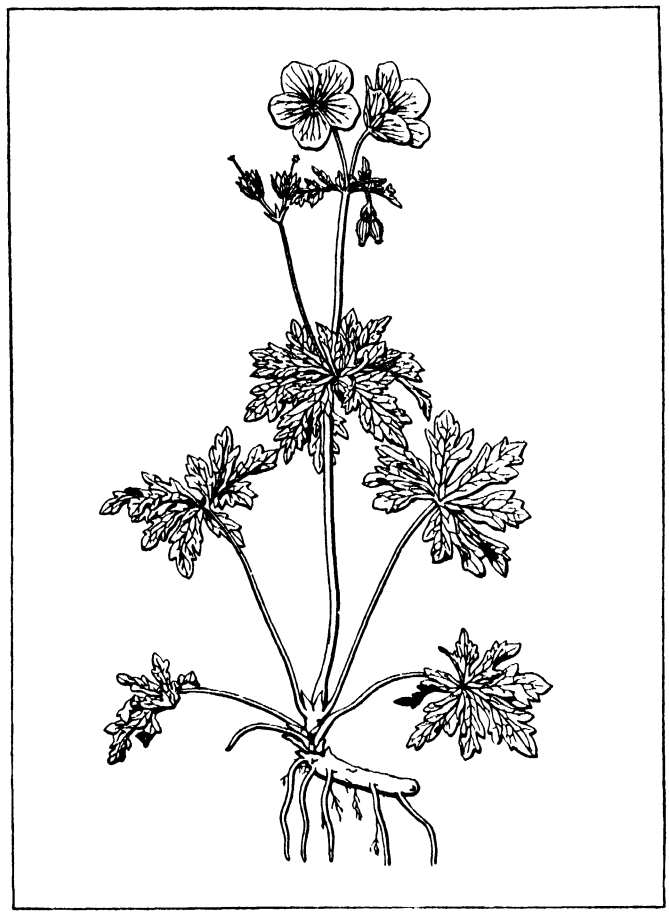
GERANIACEAE, in botany, a small but widely distributed family of Dicotyledons belonging to the Archichlamydeae, containing about 650 species in 11 genera It is represented in Britain by two genera, *Geranium* (crane's-bill) and *Erodium* (stork's-bill), to which belong nearly two-thirds of the total number of species The same two genera are the only representatives of the family in North America The plants are mostly herbs, rarely shrubs, with generally simple glandular hairs on the stem and leaves The opposite or alternate leaves have a pair of small stipules at the base of the stalk and a palminerved blade. The flowers, generally in a cymose inflorescence, are hermaphrodite, hypogynous, and, except in *Pelargonium,* regular The parts are arranged in fives There are five free sepals, overlapping in the bud, and, alternating with these, five free petals. In *Pelargonium* the flower is zygomorphic with a spurred posterior sepal and the petals differing in size or shape In *Geranium* the stamens are obdiplostemonous, *i e* , an outer whorl of five opposite the petals alternates with an inner whorl of five opposite the sepals; at the base of each of the antisepalous stamens is a honey-gland In *Erodium* the members of the outer whorl are reduced to scale-like structures (staminodes), and in *Pelargonium* from two to seven only are fertile There is no satisfactory explanation of this break in the regular alternation of successive whorls There are five, or fewer, carpels, which unite to form an ovary with as many chambers, in each of which are one or two, rarely more, pendulous anatropous ovules, attached to the central column in such a way that the micropyle points outwards and the raphe is turned towards the placenta The long beak-like style divides at the top into a corresponding number of slender stigmas

The larger-flowered species of *Geranium* are markedly protandrous, the outer stamens, inner stamens and stigmas becoming functional in succession. For instance, in meadow crane's-bill, *G pratense,* each whorl of stamens ripens in turn, becoming erect and shedding their pollen, as the anthers wither the filaments bend outwards, and when all the anthers have diverged the stigmas become mature and ready for pollination By this arrangement self-pollination is prevented and cross-pollination ensured by the visits of bees which come for the honey secreted by the glands at the base of the inner stamens

In species with smaller and less conspicuous flowers, such as *G molle,* self-pollination is possible, since the divisions of the stigma begin to separate before the outer stamens have shed all their pollen; the nearness of the stigmas to the dehiscing anthers favours self-pollination

In the ripe fruit the carpels separate into five one-seeded portions (*cocci*), which break away from the central column, either rolling elastically outwards and upwards or becoming spirally twisted In most species of *Geranium* the cocci split open on the inside and the seeds are shot out by the elastic uptwisting (fig 1); in *Erodium* and *Pelargonium* each coccus remains closed, and the long twisted upper portion separates from the central column, forming an awn, the distribution of which is favoured by the presence of bristles or hairs The embryo generally fills the seed, and the cotyledons are rolled or folded on each other.

Geranium is the most widely distributed genus; it has 300 species and is spread over all temperate regions with a few species



MEADOW CRANE'S BILL (GERANIUM PRATENSE), AN ENGLISH HERB, WHOSE COMMON NAME IS DERIVED FROM ITS LONG-BEAKED FRUIT THE DOUBLE-FLOWERED VARIETIES ARE FREQUENTLY GROWN IN GARDEN BORDERS

in the tropics Three British species—*G sylvaticum, G pratense* and *G Robertianum* (herb-Robert)—reach the arctic zone, while *G patagonicum* and *G magellanicum* are found in the antarctic *Erodium* contains 65 species (two are British), most of which are confined to the Mediterranean region and west Asia, though others occur in America, in South Africa and West Australia *Geranium* is represented in eastern United States by 11 species, 7 of which are introduced In this region *Erodium* is represented only by two species introduced from Europe In the western United States there are 5 species of *Geranium,* and *Erodium* is represented by one native species which extends throughout the whole region west of the Rocky Mountains, where it is known as "pin-clover" and "pin-grass" *Pelargonium,* with 250 species, has its centre in South Africa, the well-known garden and greenhouse "geraniums" are species of *Pelargonium* (*see* GERANIUM)

GERANIUM, the name of a genus of plants, the type of the family Geraniaceae The name, as a scientific appellation, has a much more restricted application than when taken in its popular sense Formerly the genus *Geranium* was almost conterminous with the order Geraniaceae Then as now the geranium was very popular as a garden plant, and the species included in the original genus became widely known under that name, which has clung to them ever since, in spite of scientific changes which have removed the larger number to the genus *Pelargonium*

The species of *Geranium* consist mostly of annual or perennial

herbs, dispersed throughout the temperate regions of the world. They number about 300 and bear a considerable family resemblance The leaves are for the most part palmately-lobed, and the flowers are regular, consisting of five sepals, five imbricating petals, alternating with five glandules at their base, ten stamens and a beaked ovary. Fourteen species are natives of the British Isles and are popularly known as crane's-bill *G Robertianum* is herb-Robert, a common plant in hedgebanks *G sanguineum,* with flowers a deep rose colour, is often grown in borders, as are also the double-flowered varieties of *G pratense* Many others of exotic origin form handsome border plants in our gardens of hardy perennials

In North America about 25 species of *Geranium* are found, inclusive of several naturalized from the Old World Of the native species well-known representatives are the spotted crane's-bill or wild geranium (*G maculatum*), common in woods from Newfoundland to Manitoba and southward to Georgia and Nebraska, with handsome rose-purple flowers, 1 in to 1½ in broad, the Carolina crane's-bill (*G carolinianum*), found in barren soil across the continent from Nova Scotia to British Columbia and southward to Florida and Mexico, with pale pink or white flowers about ½ in broad, and the herb-Robert mentioned above, which is native to rocky woods from Nova Scotia to Manitoba and southward to New Jersey and Missouri

Pelargonium, though agreeing with *Geranium* in certain points of structure, differs in that the flowers are irregular, the two petals which stand uppermost being different—larger, smaller or differently marked—from the other three, which latter are occasionally wanting This irregularity the modern florist has done much to annul, for the increased size given to the flowers by high breeding has usually been accompanied by the enlargement of the smaller petals, so that a near approach to regularity has been in some cases attained Another well-marked difference, however, remains. the back or dorsal sepal in *Pelargonium* has a hollow spur, which is adnate, *i e,* joined for its whole length with the flower-stalk, while in *Geranium* there is no spur This peculiarity is best seen by cutting through the flower-stalk just behind the flower, when in *Pelargonium* there will be seen the hollow tube of the spur

The various races of pelargoniums have sprung from the intermixture of some of the species obtained from the Cape of Good Hope The older show-flowered varieties have been gradually acquired through a long series of years The fancy varieties, as well as the French spotted varieties and the market type, have been evolved from them The zonal or bedding race, on the other hand, has been more recently perfected, they are supposed to have arisen from hybrids between *Pelargonium inquinans* and *P zonale* In all the sections the varieties are of a highly ornamental character, but for general cultivation the market type is preferable for indoor purposes, while the zonals are effective either in the greenhouse or flower garden Some of the Cape species are still in cultivation—the leaves of many being beautifully subdivided, almost fern-like in character, and some of them are deliciously scented, *P quercifolium* is the oak-leaf geranium The ivy-leaf geranium, derived from *P peltatum,* has given rise to an important class of both double- and single-flowered forms adapted especially for pot culture, hanging baskets, window boxes and the greenhouse

The best soil for pelargoniums is a mellow fibrous loam with good well-rotted stable manure or leaf-mould in about the proportion of one-fifth, when used it should not be sifted, but pulled to pieces by the hand, and as much sand should be added as will allow the water to pass freely through it All are readily increased by cuttings made from the shoots when the plants are headed down after flowering, or in the spring, when they will root freely in a temperature of 65° to 70° F They must not be kept too close, and must be very moderately watered

GERARD (d 1108), archbishop of York under Henry I, began his career as a chancery clerk in the service of William Rufus He was one of the two royal envoys who, in 1095, persuaded Urban II to send a legate and Anselm's pallium to England Gerard was rewarded for his services with the see of Hereford (1096) On the death of Rufus he at once declared for Henry I, by whom he was nominated to the see of York. He made difficulties when required to give Anselm the usual profession of obedience, and took the king's side on the question of investitures He pleaded Henry's cause at Rome with great ability, and claimed that he had obtained a promise, on the pope's part, to condone the existing practice of lay investiture But this statement was contradicted by Paschal, and Gerard incurred the suspicion of perjury About 1103 he wrote or inspired a series of tracts which defended the king's prerogative and freely attacked the oecumenical pretensions of the papacy In 1105, he became a stanch friend and supporter of Anselm Gerard was a man of considerable learning and ability, but the chroniclers accuse him of being lax in his morals, an astrologer and a devil worshipper

See the *Tractatus Eboracenses* edited by H Bochmer in *Libelli de lite Sacerdotii et Imperii,* vol iii (in the *Monumenta hist Germaniae,* quarto series), and the same author's *Kirche und Staat in England und in der Normandie* (Leipzig, 1899) (H W C D)

GERARD (*c* 1040–1120), variously surnamed TUM, TUNC, TENQUE or THOM, founder of the order of the Knights of St John of Jerusalem (*q v*), found his way in some capacity to Jerusalem, where a hospice existed for visitors to the holy places Of this institution Gerard became guardian about 1100, and he organized that religious order of St John which received papal recognition from Paschal II in 1113, by a bull which was confirmed by Calixtus II shortly before the death of Gerard in 1120

GÉRARD, ÉTIENNE MAURICE, COUNT (1773–1852), French general, was born at Damvilliers (Meuse), on April 4, 1773 He joined a battalion of volunteers in 1791, and served in the campaigns of 1792–1793 under Generals Dumouriez and Jourdan In 1795 he accompanied Bernadotte as aide-de-camp In 1799 he was promoted *chef d'escadron,* and in 1800 colonel He distinguished himself at the battles of Austerlitz and Jena, and was made general of brigade in November 1806, and for his conduct in the battle of Wagram he was created a baron He won distinction in the Spanish campaign (1810–11), the expedition to Russia, and the campaign of 1813 In the campaign of 1813, he commanded a division, and after the battle of Bautzen he was created by Napoleon a count of the empire After the first restoration he was named by Louis XVIII grand cross of the Legion of Honour and chevalier of St Louis In the Hundred Days Napoleon made Gérard a peer of France and placed him in command of the IV corps of the Army of the North with which he took a brilliant part in the battle of Ligny (*see* WATERLOO CAMPAIGN) He retired to Brussels after the fall of Napoleon, and did not return to France till 1817 He sat as a member of the chamber of deputies in 1822–1824, and again in 1827 He took part in the revolution of 1830, after which he was appointed minister of war and a marshal of France He resigned the office of war minister in October, but in 1831 he took the command of the northern army, and drove the army of Holland out of Belgium In 1832 he commanded the besieging army in the famous scientific siege of Antwerp He was again chosen war minister in July 1834, but resigned in October From 1838 to 1842 he was commander of the National Guards of the Seine He became a senator under the empire in 1852, and died in the same year

GÉRARD, FRANÇOIS, BARON (1770–1837), French painter, was born on May 4, 1770, at Rome, where his father occupied a post in the house of the French ambassador His mother was Italian At the age of twelve Gérard obtained admission into the Pension du Roi at Paris From there he passed to the studio of Pajou (sculptor), he left at the end of two years for that of the painter Brenet, whom he left almost immediately to place himself under David In 1789 he competed for the Prix de Rome, which was carried off by his comrade Girodet In the following year (1790) he again presented himself, but the death of his father prevented the completion of his work, and obliged him to accompany his mother to Rome In 1791 he returned to Paris David at once availed himself of his help, and one of that master's most celebrated pictures—Le Pelletier de St Fargeau—may owe much to the hand of Gerard This painting was executed early in 1793, the year in which Gérard, at the request of David, was named a member of the revolu-

tionary tribunal, from the fatal decisions of which he, however, invariably absented himself In 1794 he obtained the first prize in a competition, the subject of which was "The Tenth of August," and, further stimulated by the successes of his rival and friend Girodet in the Salons of 1793 and 1794, Gérard produced in 1795 his famous "Bélisaire" In 1796 a portrait of his generous friend, Isabey the miniaturist (in the Louvre) obtained undisputed success, and in 1797 he executed his "Psyché et l'Amour" In 1799, his portrait of Madame Bonaparte established his position as one of the first portrait-painters of the day All the leading figures of the empire and of the restoration, all the most celebrated men and women of Europe, sat to Gérard This extraordinary vogue was due partly to the charm of his manner and conversation, for his *salon* was as much frequented as his studio, Madame de Stael, Canning, Talleyrand, the duke of Wellington, have all borne witness to the attraction of his society Loaded with honours—baron of the empire, member of the institute, officer of the legion of honour, first painter to the king, he died on Jan 11, 1837

See C Lenormant, *Essai de biographie et de critique sur François Gérard* (1846), Delécluze, *Louis David, son école et son temps* (1855).

GERARD, JAMES WATSON (1867–), American lawyer and diplomat, was born at Geneseo, N Y, on Aug 25, 1867 Educated at Columbia university and at the New York law school, he was admitted to the bar in 1892 and began to practise in New York city In 1908 he became associate justice of the supreme court of New York, resigning in 1913, on being appointed ambassador to Germany At the outbreak of the World War in 1914 he assumed the care of British, Japanese, Rumanian and Serbian interests in Germany On Feb 3, 1917, diplomatic relations were broken off by America and he was recalled On his return to America he resumed the practice of law in New York city In 1917 he published *My Four Years in Germany* and in 1918 *Face to Face with Kaiserism*

GÉRARD, JEAN IGNACE ISIDORE (1803–1847), French caricaturist, generally known by the pseudonym of Grandville—was born at Nancy on Sept 13, 1803 He received his first instruction in drawing from his father, a miniature painter, and at the age of 21 came to Paris, where he soon afterwards published a collection of lithographs entitled *Les Tribulations de la petite propriété* He followed this by *Les Plaisirs de toutâge* and *La Sibylle des salons*, his success was made with *Métamorphoses du jour* (1828), a series of 70 scenes in which individuals with the bodies of men and faces of animals play the human comedy Gérard contributed drawings to many periodicals, illustrated several classic works, and issued from time to time series of lithographs He died on March 17, 1847

A short notice of Gérard, under the name of Grandville, is contained in Theophile Gautier's *Portraits contemporains* *See* also Charles Blanc, *Grandville* (1855)

GERARD, JOHN (1545–1612), English herbalist and surgeon, was born at Nantwich, Cheshire He was educated at Wisterson or Willaston and, setting up in London, acted as superintendent of the gardens of Lord Burghley In 1597 appeared his well-known *Herball* which was really an adaptation of the *Stirpium historiae pemptades* (1583) of Rembert Dodoens Its illustrations are mostly impressions from the wood blocks employed by Jacob Theodorus Tabernaemontanus in his *Icones stirpium*, published at Frankfurt in 1590 He died in London in Feb 1612

See preface to the 1633 edition of the *Herball* by T Johnson, *A Catalogue of Plants cultivated in the Garden of John Gerard in the years 1596–1599, with a Life of the Author, by B Daydon Jackson, F L S* (1876), and *Gerard's Herball, the essence thereof distilled by Marcus Woodward* (1927)

GÉRARDMER, a town of north-eastern France, in the department of Vosges, 33 m E S E of Epinal by rail Pop (1926), 3,962, of the commune, 10,041 Gérardmer is situated at a height of 2,200 ft at the eastern end of the small Lake of Gérardmer It is the chief summer resort of the French Vosges and is a centre for excursions The town itself carries on cloth-weaving, bleaching, wood-sawing and the manufacture of wooden goods, felt hats and paper, there is trade in the cheeses (*géromés*) manufactured in the neighbourhood Gérardmer is said to owe its name to Gerard of Alsace, 1st duke of Lorraine, who in the 11th century built a tower on the bank of the lake near which in 1285 a new town was founded

GERARD OF CREMONA (*c* 1114–1187), the famous mediaeval translator, was born at Cremona He spent most of his life at Toledo in the college of translators established by Archbishop Raymond (d 1151)

At an uncertain date he returned to Cremona, where he died in 1187 The most important of his Latin translations from the Arabic are the *Post Anal.* (with the commentary of Themistius), the *Physics*, the *De Caelo*, the *De Gen et Corr* and the *Meteorologica* (bks 1–3) of Aristotle, the famous *Liber de Causis*, the *Almagest* of Ptolemy, the *De Somno et visione*, the *De Intellectu* and the *De quinque essentiis* of Alkindi, the *De Syllogismo* of Alfarabi, the *De Crepusculis* of Alhazen, the *De Motu Accessionis et recessionis* of Thabit, the *Canon* of Avicenna, the *Algebra* of Al-Khowarizimi, the *De Sphaeris* of Theodosius, the *De Diffinitionibus* and the *De Elementis* of Isaac Israeli, the *Elements* and the *Data* of Euclid, and works by Galen and Hippocrates

See A Jourdain, *Recherches sur l'origine des traductions latines d'Aristote* (1843), Boncompagni, *Della vita e delle opere di Gherardo Cremonese e di Gherardo da Sabbionetta* (1851), L Thorndike, *Hist. of Magic, etc* (2 vols, 1923)

GERASA, an ancient city of Palestine in the highlands of Gilead, 20 m N of 'Ammān (Philadelphia) and 20 m E of the Jordan (mod Jerāsh) The city, now ruined, is pleasantly situated in a valley through which runs a perennial stream, the Chrysorrhoas of the Greeks, to fall into the Zerka (Jabbok) 6 m to the south The site is undulating and strewn with knolls offering excellent positions for public buildings, a circumstance of which the Roman architects took full advantage, as their structures, magnificent even in ruin, testify Since 1878 a colony of Circassians has occupied the site, or rather a small portion of it The building materials for their village on the eastern bank of the stream have been extracted from the ruins, the bulk of which lie on the western bank The delightful orchard gardens of Jerāsh make it one of the pleasantest towns in all Palestine

History.—Nothing, up to the present at any rate, is known of the history of the city in Old Testament times or earlier, although the site was very probably occupied, unless, indeed, it represents Ramoth Gilead, as has been suggested Iamblichus asserts that it was originally colonized by veterans of Alexander the Great Josephus tells us that it was captured by Alexander Jannaeus (*c* 83 B C), rebuilt by the Romans (*c* A D 65), burned by the Jews, and subsequently desolated and burned by Vespasian's captain, Annius From the time of Trajan it belonged to the Roman province of Syria, but about A D 160 it was allotted to the province of Arabia, and during the peaceful reign of the Antonines (130–180), it was adorned with magnificent buildings and rose rapidly in importance and prosperity It was the second city of the Decapolis and early in Christian times became the see of a bishop To the Talmud and Jerome Gerdsa and Gilead were synonymous, and similarly Mukkadsī calls Jebel 'Ajlūn, Jebel Jerāsh, Tughtakin, the atabeg of Damascus, had here a castle which was taken and destroyed by Baldwin II (1121) The Arabic geographer, Yākūt, on the evidence of an eye-witness, reports it in ruins at the beginning of the 13th century The "Gerasenes" of Matthew viii 28 were not natives of Gerasa, as might be thought, but must be sought elsewhere (Khersa?)

Archaeology.—Of the many beautiful architectural monuments beyond Jordan, the fruit of Roman administration, the ruined grandeur of Gerasa supplies the finest Laid out on a definite scheme with colonnaded main and cross streets, we find in it an early example of enlightened town planning The city was surrounded by walls, 8 ft thick, with a total circuit of 3,000 yd, and had six gates, the principal ones being north and south The stream, near to which and roughly parallel to it ran the main street, divided the city in two, but the main public buildings were on the western bank and on the western side of the road The approach to Jerāsh from the south passes a triumphal arch 300 yd from the south gate Between this and the gate on the left hand side are the ruins of a *naumachia* or tank for naval displays (170 yd by 60 yd) and contiguous to it a

stadium (100 yd. by 60 yd) Within the walls the main objects of interest are a fine peripteral temple, a theatre (south) in a good state of preservation, a colonnaded loop in the road, generally, but doubtfully, regarded as the forum, a basilica or senate house, the great sun temple, a tetrapylon at the cross-roads, and a theatre (north) But the outstanding feature of the site is undoubtedly the profusion of columns, of which over 200 still stand "A catalogue of the visible monuments alone can convey little impression of their supreme beauty from the point of view of classical art, and not only are the buildings in themselves triumphs of architecture, but they are strikingly placed so that each one meets the eye as a distinct feature, while from the distance they compose themselves readily into a single harmonious picture" The decay of the city is partly due to changed climatic conditions bringing lack of water, partly to political vicissitudes and partly and especially to seismic disturbances

The Trans-Jordan Government in 1926 cleared the main street and retrieved and consolidated dangerous parts of the ruins Excavation has begun on the temple area, and tourists are given facilities to visit Jerāsh by the Government

See Sir C Warren, in Hastings' *Dictionary of the Bible;* and F Bull, in *Encyclopaedia of Islam* (bibl), E Huntington, *Palestine and its Transformation* (1911), H Guthe, *Das Land der Bibel,* II 1, 2 (1919), J Garstang, in Cook's *Handbook for Syria and Palestine* 478 *seq* (1924) (E Ro)

GERBA: *see* JERBA

GERBIL or GERBILLE, the name of a group of small, elegant, large-eyed, jumping rodents typified by the North African *Gerbillus aegyptiacus* and forming a special sub-family, *Gerbillinae,* of the rat tribe or *Muridae* They are found over the desert districts of Asia and Africa They have elongated hind-limbs and long hairy tails and progress by leaps, in the same manner as jerboas, from which they differ in having five hind-toes Gerbils dwell in burrows furnished with numerous exits, and containing large grass-lined chambers The Indian *Tatera indica* produces at least a dozen young at a birth All are nocturnal

GERENUK, a long-necked aberrant gazelle, commonly known as Waller's gazelle (*Lithocranius walleri*), and ranging from Somaliland to Kilimanjaro The gerenuk is a large species with long neck and limbs The horns of the bucks are heavy, and have a peculiar forward curvature at the tips, the coat is red-fawn, with a broad brown band down the back Gerenuk, in Somaliland, are found in family parties, and feed by browsing on the branches and leaves of trees and shrubs (*See* ANTELOPE)

GERGOVIA (mod *Gergovie*), in ancient geography, the chief settlement of the Arverni, situated in the Auvergne, 8 m from the Puy de Dôme, France Julius Caesar attacked it in 52 B C , but was beaten off, some walls and earthworks, probably of this period, survive Later, when Gaul had been subdued, the place was dismantled and its Gaulish inhabitants resettled 4 m away in the plain at the new Roman city of Augustonemĕtum (mod Clermont-Ferrand)

GERHARD, JOHANN (1582–1637), Lutheran divine, was born in Quedlinburg on the 17th of October 1582, and studied at Wittenberg, Jena and Marburg He was general superintendent of the duchy of Coburg until 1616, when he became theological professor at Jena, where the remainder of his life was spent Here, with Johann Major and Johann Himmel, he formed the "Trias Johannea" Gerhard had already come to be regarded as the greatest living theologian of Protestant Germany, in the numerous "disputations" of the period he was always protagonist, and his advice was sought on many public and domestic questions touching on religion or morals He died in Jena on the 20th of August 1637

Of his many works the most important is the *Loci communes theologici* (1610–22), in which Lutheranism is expounded with a fulness of learning, a force of logic and a minuteness of detail that had never before been approached His devotional work, *Meditationes sacrae* (1606), has been frequently reprinted and has been translated into most of the European languages, including Greek The English translation by R Winterton (1631) passed through at least nineteen editions There is also an edition by W Papillon in English blank verse (1801) His life, *Vita Joh Gerhardi,* was published by E R Fischer in 1723, and by C J. Bottcher, *Das Leben Dr. Johann Gerhards,* in 1858 *See* also W. Gass, *Geschichte der protestantischen Dogmatik* (1854–67).

GERHARDT, CHARLES FRÉDÉRIC (1816–1856), French chemist, was born at Strasbourg on Aug 21, 1816 After attending the gymnasium at Strasbourg and the polytechnic at Karlsruhe, he was sent to the school of commerce at Leipzig, where he studied chemistry under Otto Erdmann Later he worked for some time with Liebig at Giessen and became professor of chemistry at Montpellier in 1844, and in 1855 at Strasbourg, where he died on Aug 19, 1856 Although Gerhardt did some noteworthy experimental work—for instance, his preparation of acid anhydrides in 1852—his contributions to chemistry consist not so much in the discovery of new facts as in the introduction of new ideas that vitalized and organized an inert accumulation of old facts In 1839 he revived the old radicle theory of organic compounds under the title of the "theory of residues" He first suggested that many organic substances were "conjugated" or "copulated" compounds formed by the union of two residues In 1842 he attempted the first definite classification of organic compounds, but owing to the obscurity of some of his concepts, little progress was made until he co-operated with Laurent (*q v*) Eventually Gerhardt introduced the idea that all substances were based on four main types, viz , hydrogen, hydrochloric acid, water and ammonia Although these ideas were later abandoned they play an important part in the development of structural organic chemistry (*see* CHEMISTRY *Organic*)

His chief works were *Précis de chimie organique* (1844–45), and *Traité de chimie organique* (1853–56)

See *Charles Gerhardt, sa vie, son oeuvre, sa correspondance,* by his son, Charles Gerhardt, and E Grimaux (Paris, 1900)

GERHARDT, ELENA (1883–), German singer, was born at Leipzig on Nov 11, 1883 She studied music at the Leipzig conservatorium, where her voice was trained by Madame Hedmondt, and afterwards received invaluable help in interpretation from Nikisch, who frequently accompanied her at concerts As a Lieder singer, and especially as an interpreter of Schubert, she has set a standard of purity and simplicity which is not likely to be surpassed

GERHARDT, PAUL (1607–1676), German hymn-writer, was born at Grafenhainichen on March 12, 1607 After tutoring in Berlin, in 1657 he became "diaconus" to the Nicolaikirche there Owing to his uncompromising Lutheranism he refused to accept the Elector Frederick William's "syncretistic" edict of 1664, and was deprived of his office in 1666 In spite of a public petition in 1667, he refused to resume an office which, he thought, implied at least a tacit repudiation of the Formula Concordiae In 1668 he was appointed archdeacon of Lubben, Saxe-Mersburg, where he died on June 7, 1676 Gerhardt is the greatest German hymn-writer of the 17th century Many of his best-known hymns first appeared in church hymnbooks, as for example in the Brandenburg hymnal in 1658, others in Johann Cruger's *Geistliche Kirchenmelodien* (1649), and *Praxis pietatis melica* (1656) The first complete set is the *Geistliche Andachten* (1666–67), edited by Ebeling, music director in Berlin

The life of Gerhardt has been written by Roth (1829), by Langbecker (1841), by Schultz (1842), by Wildenhahn (1845), by Bachmann (1863), and by H Petrich (1914), also by Kraft in Ersch u Gruber's *Allg Encycl* (1855) The best modern edition of the hymns, published by Wackernagel in 1843, has often been reprinted (Eng trs by Kelly, *Paul Gerhardt's Spiritual Songs,* 1867) *See* also T B Hewitt, *Paul Gerhardt as a hymn-writer and his influence on English Hymnody* (New Haven, U S 1918).

GÉRICAULT, JEAN LOUIS ANDRÉ THÉODORE (1791–1824), French painter, the leader of the French realistic school, was born at Rouen on Sept 26, 1791 In 1808 he entered the studio of Carle Vernet, from which, in 1810, he passed to that of Guérin, whom he drove to despair by his passion for Rubens, and by the unorthodox manner in which he persisted in interpreting nature At the Salon of 1812 Géricault attracted attention by his "Officier de Chasseurs à Cheval" (Louvre), a work in which he personified the cavalry in its hour of triumph Two years later (1814) he exhibited the "Cuirassier blessé" (Louvre), in both subjects he called attention to the interest of contem-

porary aspects of life, and exhibited that mastery of and delight in the horse which was a feature of his character In 1815 Géricault gave way to his enthusiasm for horses and soldiers, and enrolled himself in the *mousquetaires* During the Hundred Days he followed the king to Bethune, but, on his regiment being disbanded, left France for Italy in 1816, and at Rome illustrated his favourite animal by his great painting, "Course des Chevaux Libres" Returning to Paris, Géricault exhibited at the Salon of 1819 the "Radeau de la Méduse" (Louvre), illustrating a shipwreck, a subject which not only enabled him to prove his zealous and scientific study of the human form, but contained those elements of the heroic and pathetic, as existing in situations of modern life, to which he had appealed in his earliest productions The appearance of this work marks the beginning of the struggle between the classicist and Romantic movements Easily depressed or elated, Géricault took to heart the hostility which this work excited, and passed nearly two years in London, where the "Radeau" was exhibited with success, and where he executed many series of admirable lithographs now rare, and painted the three versions of the Derby now in the Louvre At the close of 1822 he was again in Paris, and produced a great quantity of projects for vast compositions, models in wax, and a horse *écorché*, as preliminary to the production of an equestrian statue He died from the consequences of a fall from his horse on Jan 26, 1824

See Charles Clément, *Th Géricault, Etude biographique et critique, avec le catalogue raisonné* (1879 second edition)

GERIN-LAJOIE, ANTOINE (1824–1882), Canadian writer, was born at Yamachiche in 1824, and died at Ottawa on Aug 4, 1882 He was educated at the Collège de Nicolet In 1844 he was employed as proof-reader on *La Minerve*, and soon rose to be its editor At the same time he pursued legal studies, and was called to the bar, afterwards entering the civil service In 1856 he was made librarian to the parliament At Quebec, where the parliament was held after 1859, he was one of the founders of *Soirées Canadiennes* (*see* CRÉMAZIE, OCTAVE), and of the *Foyer Canadien;* in these magazines he published his *Jean Rivard* (1862–64), a novel of pioneer life He also wrote *Dix ans d'Histoire du Canada* (1888) But he is best known for the almost national poem, *Un Canadien*, written at a time when many Canadians were being forced, by the upheavals of 1837, to emigrate to the United States

GERIZIM, a mountain in Samaria (mod Jebel et-Tūr), 2,849ft. above sea-level With its companion mountain, Ebal, it flanks the valley in which lies Nāblus (Neapolis), the ancient Shechem.

History.—It was on Ebal and Gerizim that the tribes assembled under Joshua to hear the curses and the blessings connected with the violation and observance of the law (Deut. xi). The distance from Ai and the position of Ebal and Gerizim in the midst of a hostile country have constituted difficulties which Eusebius, Epiphanius and others met by associating Ebal and Gerizim with hillocks in the lower Jordan valley—a solution that has never found favour From Gerizim—a prominent rock is still pointed out as his pulpit—Jotham addressed his parable to the treacherous elders of Shechem (Judges ix) This mountain is the holy place of the Samaritan community. About 432 BC, following on the refusal of the Jews returned from the Exile to recognize the Samaritans, the latter erected on the mount a temple as rival to that at Jerusalem This was probably destroyed by John Hyrcanus (*c* 110 BC) The Samaritans were expelled from Gerizim by the emperor Zeno, who built a church (484) In the course of his struggle with the Samaritans, Justinian surrounded this church with a fortress

Archaeology.—A small level plateau near the summit marks the site of the schismatic temple and an important link with the past is the celebration near this spot of the Passover by the Samaritans, now a small body of about 150 souls "As the sun sets on Passover eve the seven lambs are slain, ceremonially examined and roasted in the oven pit At midnight the covering is removed and the flesh is eaten by the standing elders with their families in the improvised tents Anything left over is scrupulously collected and consumed, so that the letter of the commandment may be kept" Recently (1928) excavations carried out by the German Archaeological Institute have uncovered Zeno's basilica. This building (121ft. by 98ft), which was built over the ruins of the Samaritan temple, exhibits a well-preserved octagonal ground plan. Two side chapels with handsome mosaics have also been disclosed The abundance of fragments suggests that it will be possible to determine accurately the details of architectural design. (E Ro)

GERLE, CHRISTOPHE ANTOINE (1736–*c* 1801), French revolutionary and mystic, was born at Riom in Auvergne, and became prior of a Carthusian monastery He was elected deputy to the states-general in 1789 He encouraged the insane fancies of Catherine Théot, a convent servant who proclaimed herself the Virgin, and in the person of Robespierre he recognized the Messiah Shortly after the festival of the Supreme Being Vadier obtained the imprisonment of Catherine, Gerle and others as fanatics and conspirators Catherine died in prison, but Gerle, released by the Directory, became one of the editors of the *Messager du soir*, and later entered the ministry of the interior

GERMAN BAPTIST BRETHREN or **GERMAN BRETHREN,** a sect of American Baptists which originated in Germany, and whose members are popularly known in the United States as "Dunkers," "Dunkards," or "Tunkers," corruptions of the German verb *tunken*, "to dip," in recognition of the sect's continued adherence to the practice of triple immersion

Origin.—The sect was the outcome of one of the many Pietistic movements of the 17th century, and was founded in 1708 by Andrew Mack of Swartzenau, Germany, and seven of his followers, upon the general issue that both the Lutheran and Reformed Churches were taking liberties with the literal teachings of the Scriptures The new sect was scarcely organized in Germany when its members were compelled by persecution to take refuge in Holland, whence they emigrated to Pennsylvania, in small companies, between 1719 and 1729 The first congregation in America was organized on Christmas Day 1723 by Peter Becker at Germantown, Pa, and here in 1743 Christopher Sauer, one of the sect's first pastors, and a printer by trade, printed the first Bible (a few copies of which are still in existence) published in a European language in America From Pennsylvania the sect spread chiefly westward, and, after various vicissitudes, caused by defections and divisions due to doctrinal differences, in 1908 were most numerous in Pennsylvania, Maryland, Virginia, Ohio, Indiana, Illinois, Iowa, Missouri, Nebraska and Kansas

Tenets and Observances.—In their celebration of the communion service they aim to imitate exactly the forms observed by Christ It is celebrated in the evening, and is accompanied by the ancient love feast (partaken by all communicants seated at a common table), by the ceremony of the washing of feet and by the salutation of the holy kiss, the three last-named ceremonies being observed by the sexes separately They pray over their sick and, when so requested, anoint them with oil They are rigid non-resistants, and will not bear arms or study the art of war; they refuse to take oaths, and discountenance going to law over issues that can possibly be settled out of the courts The taking of interest was at first forbidden, but that prohibition is not now insisted upon They "testify" against the use of intoxicating liquor and tobacco, and advocate simplicity in dress In its earlier history the sect opposed voting or taking any active part in political affairs, but these restrictions have quite generally disappeared Similarly the earlier prejudice against higher education, and the maintenance of institutions for that purpose, has given place to greater liberality along those lines In 1782 the sect forbade slave-holding by its members

The church officers (generally unpaid) comprise bishops (or ministers), elders, teachers, deacons (or visiting brethren) and deaconesses. The Government of the church is chiefly according to the congregational principle, and the women have an equal voice with the men

Secessions.—An early secession from the general body of Dunkers was that of the Seventh Day Dunkers, whose distinctive principle was that the seventh day was the true Sabbath The

sect was founded by Johann Conrad Beissel (1690–1768), a native of Eberbach and one of the first emigrants in 1725. In 1814 the society was incorporated as the Seventh Day Baptists More important in the history of the modern church was the secession, in the decade between 1880 and 1890, of the Old Order Brethren, who opposed Sunday schools and the missionary work of the Brethren, in Asia Minor and India, and in several European countries; and also in 1882 of the radicals, or Progressives who objected to a distinctive dress and to the absolute supremacy of the yearly conferences Higher education was long forbidden and is consistently opposed by the Old Order

Statistics and Activities.—According to Howard Miller's census of 1880 (Record of the Faithful) the number of Dunkers was 59,749 in that year; by the U S census of 1890 it was then 73,795 The figures for 1927 are. Conservatives, or German Baptist Brethren, 120,103; Old Order, 3,260, Progressives or Brethren, 25,797; Church of God, 1,000; total, 150,160. The main body or Conservatives, support schools at Huntingdon, Pa ; Mt. Morris, Ill.; Lordsburg, Calif ; McPherson, Kan ; Bridgewater, Va ; Canton, O.; Chicago, Ill , North Manchester, Ind , Plattsburg, Mo , Elizabethtown, Pa ; Union Bridge, Md ; and Fruitdale, Ala They have a publishing house at Elgin, Ill , and maintain missions in Denmark, Sweden, France, Italy, India and China. The Progressives have a college, a theological seminary and a publishing house at Ashland, O ; and they carry on missionary work in Canada, South America and Persia

Bibliography.—Lamech and Agrippa, *Chronicon Ephratense,* in German (Ephrata, Penn , 1786) and in English (Lancaster, 1889), G. N. Falkenstein, "The German Baptist Brethren, or Dunkers," part 8 of "Pennsylvania The German Influence in its Settlement and Development," in vol x of the *Pennsylvania German Society, Proceedings and Addresses* (1900); J. F. Sachse, *The German Sectarians of Pennsylvania, 1742–1800 A Critical and Legendary History of the Ephrata Cloister and the Dunkers* (1900), and John Lewis Gillin, *The Dunkers A Sociological Interpretation* (1906), a doctor's dissertation with full bibliography (S M)

GERMAN CATHOLICS (*Deutschkatholiken*), the name assumed in Germany towards the close of 1844 by certain dissentients from the Church of Rome The most prominent leader of the German Catholic movement was Johann Ronge, a priest who in the *Sachsische Vaterlandsblätter* for the 15th of October, 1844, made a vigorous attack upon Wilhelm Arnoldi, bishop of Trier since 1842, for having ordered (for the first time since 1810) the exposition of the "holy coat of Trier," alleged to be the seamless robe of Christ, an event which drew countless pilgrims to the cathedral It was intended to demonstrate that the Roman Catholic population would render unconditional obedience to the leadership of their clergy, and the intention was fully realised But this celebration had also the effect of a challenge on circles which in spirit had outgrown the tutelage of the clergy Ronge, who had formerly been chaplain at Grottkau, was then a schoolmaster at Laurahutte near the Polish border The article made a great sensation, and led to Ronge's excommunication by the chapter of Breslau in December 1844 The ex-priest received a large amount of public sympathy, and a dissenting congregation was almost immediately formed at Breslau with a very simple creed, in which the chief articles were belief in God the Father, creator and ruler of the universe; in Jesus Christ the Saviour, who delivers from the bondage of sin by his life, doctrine and death; in the operation of the Holy Ghost, in a holy, universal, Christian church; in forgiveness of sins and the life everlasting The Bible was made the sole rule, and all external authority was barred Within a few weeks similar communities were formed at Leipzig, Dresden, Berlin, Offenbach, Worms, Wiesbaden and elsewhere; and at a "council" convened at Leipzig at Easter 1845, twenty-seven congregations were represented by delegates, of whom only two or at most three were in clerical orders

Even before the beginning of the agitation led by Ronge, another movement fundamentally distinct, though in some respects similar, had been originated at Schneidemühl, Posen, under the guidance of Johann Czerski (1813–1893), also a priest, who had come into collision with the church authorities on the then much discussed question of mixed marriages, and also on that of the celibacy of the clergy The result had been his suspension from office in March 1844; his public withdrawal, along with twenty-four adherents, from the Roman communion in August; his excommunication; and the formation, in October, of a "Christian Catholic" congregation which, while rejecting clerical celibacy, the use of Latin in public worship, and the doctrines of purgatory and transubstantiation, retained the Nicene theology and the doctrine of the seven sacraments Czerski had been at some of the sittings of the "German Catholic" council of Leipzig; but when a formula somewhat similar to that of Breslau had been adopted, he refused his signature because the deity of Christ had been ignored, and he and his congregation continued to retain by preference the name of "Christian Catholics," which they had originally assumed Of the German Catholic congregations which had been represented at Leipzig some manifested a preference for the fuller and more positive creed of Schneidemuhl, but a great majority continued to accept the comparatively rationalistic position of the Breslau school The number of these rapidly increased, and the congregations scattered over Germany numbered nearly 200 External and internal checks, however, soon limited this advance In Austria, and ultimately also in Bavaria, the use of the name German Catholics was officially prohibited, that of "Dissidents" being substituted, while in Prussia, Baden and Saxony the adherents of the new creed were laid under various disabilities, being suspected both of undermining religion and of encouraging the revolutionary tendencies of the age Ronge himself was a foremost figure in the troubles of 1848, after the dissolution of the Frankfort parliament he lived for some time in London, returning in 1861 to Germany He died at Vienna on the 26th of October 1887 In 1859 some of the German Catholics entered into corporate union with the "Free Congregations," an association of free-thinking communities that had since 1844 been gradually withdrawing from the orthodox Protestant Church, when the united body took the title of "The Religious Society of Free Congregations" (*Religionsgesellschaft freier Gemeinden*) Before that time many of the congregations which were formed in 1844 and the years immediately following had been dissolved, including that of Schneidemuhl itself, which ceased to exist in 1857 Both movements were deficient in the power to proceed from negative criticism of the faults of the Roman Church to the formation of a purer Catholic Church

See Mirbt, article "Deutschkatholicismus" in Herzog-Hauck, *Realencyklopadie,* vol iv., G. G Gervinus, *Die Mission des Deutschkatholicismus* (1846), F. Kampe, *Das Wesen des Deutschkatholicismus* (1860), Findel, *Der Deutschkatholicismus in Sachsen* (1895), Tschirn, *Zur 60-jahrigen Geschichte der Freireligiosen Bewegung* (1904).

GERMANDER, the name given to plants of the genus *Teucrium* (family Labiatae), comprising some 100 species distributed all over the world Both common British species (*T Scorodonia*) and the common North American forms (*T canadense* and *T. occidentale*) are frequently known as wood sage The European species were formerly used medicinally, *T marum,* the cat thyme of southern Europe, is still so used The plants are small, with small flowers remarkable for the slight development of the upper lip *T Chamaedrys* is wall-germander

GERMAN EAST AFRICA. By agreements with Great Britain, in 1886 and 1890, and by other agreements with Portugal and the Congo Free State the east central part of Africa was recognized as a German possession At that time the coast lands of what became German East Africa were held by Seyyid Bargash, the Sultan of Zanzibar, who also made vague claims to the interior as far as Lake Tanganyika At Zanzibar British influence was then predominant and Bargash had in 1877 made an offer to a British merchant, William MacKinnon, to lease to him all his mainland territory In consequence of the opposition of the British Government the offer was declined, but when in 1884 the German Colonization Society sought to secure for its country territory on the east coast it deemed it prudent to act secretly, so that both Great Britain and Zanzibar might be confronted with accomplished facts Making their way inland, three young Germans, Karl Peters, Joachim Count Pfeil and Dr Juhlke, concluded a "treaty" in Nov 1884 with a chieftain in Usambara who was declared to be independent of Zanzibar Other treaties followed, and on Feb 17, 1885, the German emperor granted a char-

ter of protection to the Colonization Society. The German acquisitions were resented by Zanzibar, but were acquiesced in by the British Government The sultan was forced to acknowledge their validity, and to grant a German company a lease of his mainland territories south of the mouth of the Umba river. On Oct. 28, 1890, the sultan ceded to Germany the mainland territories, receiving as compensation £200,000

Meanwhile, on Aug 16, 1888, the German East African Company, the lessee of the mainland strip, took over the administration from the Arabs This was followed, five days later, by a revolt of all the coast Arabs against German rule—the Germans, raw hands at the task of managing Orientals, having aroused intense hostility by their brusque treatment of the dispossessed rulers. It was not until the end of 1899 that the revolt was crushed, through the efforts of Maj Hermann von Wissmann, who was sent out by the German Government Wissmann remained in the country until 1891 as commissioner, and later (1895–96) was for 18 months governor of the colony—as the German sphere had been constituted by proclamation (Jan. 1, 1897). Towards the native population Wissmann's attitude was conciliatory, and under his rule the resources of the country were developed Equal success did not attend the efforts of other administrators; in 1891–92 Karl Peters had great trouble with the tribes in the Kilimanjaro district and resorted to very harsh methods, such as the execution of women, to maintain his authority In 1896 Peters was condemned by a disciplinary court, for a misuse of official power, and lost his commission

The extension of German authority in the interior met with much opposition, several revolts occurred and a rebellion of the Wangoni in 1905–6 entailed the loss of 120,000 lives. Material development was slow, partly because the Reichstag was niggardly in supplying funds, partly because of the inexperience of the Germans in dealing with Africans A change came about after 1907, when Herr B. Dernburg, then colonial secretary, visited the colony and boldly advocated the adoption of British colonial methods in administration From that time better conditions prevailed and much good work was done in the scientific study of the resources of the country Flourishing German settlements grew up in the Usambara highlands, which were linked to Tanga by railway. From Dar es Salaam a trunk railway was built to Ujiji-Kigoma on Lake Tanganyika Partly owing to the energy of Dr Albert Schnee, the last German governor, this line was completed, two years before scheduled time, in Feb 1914 The World War followed, ending in the conquest of German East Africa by British and Belgian troops By the Treaty of Versailles Germany renounced her sovereignty over the colony, which came for the most part under British mandate (*see* TANGANYIKA TERRITORY). Part came under Belgian mandate (*see* RUANDA AND URUNDI)

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GERMANIC LANGUAGES: *see* TEUTONIC LANGUAGES

GERMANIC LAWS, EARLY. After the foundation of the great kingdoms of the Teutonic tribes on the soil of Roman civilization, the necessity for a written codification of the inherited tribal laws arose This necessity evidently arose out of permanent intercourse with a native population which had been living under different laws Thus the Visigoths, Burgundians and Salic Franks had already, at the turn of the fifth and sixth centuries, codified their law One and a half centuries later the Lombards did the same The Teutonic tribes, living in the interior, owe their codification to the influence of the Frankish suzerainty; the Ripuarians, Alemans and Bavarians to the Merovingians; the Chamavic Franks, Saxonians, Thuringians and Frisians to Charlemagne For the edict of Theodoric I *see* ROMAN LAW

The leges germanorum are codifications of the valid criminal law and the law of procedure, but do not offer an exhaustive regulation of these and are not, on the other hand, solely confined to them. In substance they consist partly of already existing customary law and also partly of new statutory laws Whether it is possible to distinguish among such varied forms, contained within a lex, the different strata of text is a question not definitely settled. It was thought, but has not as yet been proved, from the tradition of the Salic Law that it was originally composed of primitive tariffs of composition, to which, later, constitutions were added with the intention of creating a new law Moreover such constitutions (capitularia) are preserved to us partly as amendments (novellae) to older leges and partly as special laws The capitularies of Charlemagne and of his son Louis were of particular importance in the development of the law All *leges* and *capitularia* are in Latin, but in most cases there is also an admixture of Germanic legal terminology We possess fragments of the Lex Salica and of the Carolingian capitulary in an old High-German translation

For the whole body of the Germanic laws *see* P Canciani, *Barbarorum leges antiquae* (Venice, 1781–1789); F Walter, *Corpus juris germanici antiqui* (Berlin, 1824); *Monumenta Germaniae historica, Leges* For further information on the codes in general *see* J E O Stobbe, *Geschichte der deutschen Rechtsquellen* (Brunswick, 1860–1864); Paul Viollet, *Histoire du droit civil français* (2nd ed, Paris, 1893); H Brunner, *Deutsche Rechtsgeschichte* (2nd ed Leipzig, 1906), Brunner-Heymann, *Grundzuge der deutschen Rechtsgeschichte* (7th ed, Leipzig, 1925)

Leges Visigothorum.—It is now certain that the earliest written code of the Visigoths dates back to King Euric (466–485). Of this code, fragments of chapters cclxxvi to cccxxxvi have been discovered in a palimpsest ms in the Bibliothèque Nationale at Paris (Latin coll, No 12161) The *lacunae* in these fragments have been filled in by aid of the law of the Bavarians, where the chief provisions are reproduced Euric's code was used for all cases between Goths, and between them and Romans; in cases between Romans, Roman law was used

Euric's code remained in force among the Visigoths of Spain until the reign of Leovigild (568–586), who made a new one, improving upon that of his predecessor This work is lost, and we have no direct knowledge of any fragment of it In the 3rd codification, however, many provisions have been taken from the 2nd, and these are designated by the word "antiqua", by means of these "antiqua" we can reconstruct the work of Leovigild

After the reign of Leovigild the legislation of the Visigoths underwent a transformation The new laws made by the kings were declared to be applicable to all the subjects in the kingdom, of whatever race—in other words, they became territorial, and this principle of territoriality was gradually extended to the ancient code. Moreover, the conversion of Reccared I. (586–601) to orthodoxy effaced the religious differences among his subjects, and all subjects, *qua* Christians, had to submit to the canons of the councils, which were made obligatory by the kings After this change had been accepted, Recessvind (649–672) made a new code, which was applicable to Visigoths and Romans alike This code, known as the *Liber judiciorum,* comprises 324 constitutions taken from Leovigild's collection, a few of the laws of Reccared and Sisebut, 99 laws of Chindasvind (642–653), and 87 of Recessvind A recension of this code of Recessvind was made in 681 by King Ervig (680–687) and is known as the *Lex Visigothorum renovata;* and finally some additamenta were made by Egica (687–702) The texts of the *Leges Visigothorum* have been published by K Zeumer in the 40 series of the *Mon Germ hist Cf.* Zeumer's articles in the *Neues Archiv.,* vols xxiii, xxiv and xxvi, H Brunner, *Deutsche Rechtsgeschichte* (2nd ed, Leipzig, 1906); Ureña y Smenjaud, *La Legislacion Gotico-hispana* (Madrid, 1905), E de Hinojosa, *Das germanische Element im spanischen Rechte* (*Zeitschrift der Savigny-Stiftung,* vol 31).

Lex Burgundionum.—This code was compiled by King Gundobad (474–516), very probably after his defeat by Clovis in 500 Some additamenta were subsequently introduced either by Gundobad himself or by his son Sigismund This law bears the title of *Liber Constitutionum,* which shows that it emanated from the king; it is also known as the *Lex Gundobada* or *Lex Gombata.* It was used for cases between Burgundians, but was also applic-

able to cases between Burgundians and Romans. The law of the Burgundians shows strong traces of Roman influence. It recognizes the will and attaches great importance to written deeds, but, on the other hand, sanctions the judicial duel and the *conjuratores* (sworn witnesses). The vehement protest made in the 9th century by Agobard, Bishop of Lyons, against the *Lex Gundobada* shows that it was still in use at that period So late as the 10th and even the 11th centuries we find the law of the Burgundians invoked as personal law in Cluny charters, but doubtless these passages refer to accretions of local customs rather than to actual paragraphs of the ancient code

The text of the *Lex Burgundionum* has been published by F Bluhme in the *Mon Germ hist, Leges,* iii, 525; by Karl Binding in the *Fontes rerum Bernensium* (vol i, 1880), by J E Valentin Smith (Paris, 1889 *seq*), and by von Salis (1892) in the 4to series of the *Mon Germ hist*, cf R Dareste, "La Loi Gombette," in the *Journal des Savants* (July 1891), K Zeumer in the *Neues Archiv*, vol xxv; Petot, "Un nouveau manuscr de la loi Gombette, *Nouv Rev hist de Droit*, 1913

Leges Langobardorum.—We possess a fair amount of information on the origin of the laws of the Lombards The first part, consisting of 388 chapters, is known as the *Edictus Langobardorum,* and was promulgated by King Rothari at a diet held at Pavia on the 22nd of November, 643 This work, composed at one time and arranged on a systematic plan, is very remarkable The compilers knew Roman law, but drew upon it only for their method of presentation and for their terminology, and the document presents Germanic law in its purity Rothari's edict was augmented by his successors Grimoald (668) added nine chapters, Liutprand (713–735), fifteen volumes, containing a great number of ecclesiastical enactments, Ratchis (746), eight chapters, and Aistulf (755), thirteen chapters After the union of the Lombards to the Frankish kingdom, the capitularies made for the entire kingdom were applied to Italy There were also special capitularies for Italy, called *Capitula Italica,* some of which were appended to the edict of Rothari

At an early date compilations were formed in Italy for the use of legal practitioners and jurists Eberhard, Duke and Margrave of Rhaetia and Friuli, arranged the contents of the edict with its successive additamenta into a *Concordia de singulis causis* (829–832) In the 10th century a collection was made of the capitularies in use in Italy, and this was known as the *Capitulare Langobardorum* Then appeared, under the influence of the school of law at Pavia, the *Liber legis Langobardorum* also called *Liber Papiensis* (beginning of 11th century) and the *Lombarda* (end of 11th century) in two forms—that given in a Monte Cassino ms and known as the *Lombarda Casinensis,* and the *Lombarda Vulgata*

There are editions of the *Edictus,* the *Concordia,* and the *Liber Papiensis* by F Bluhme and A Boretius in the *Mon Germ hist, Leges,* iv Bluhme also gives the rubrics of the *Lombarda,* which were published by F Lindenberg in his *Codex legum antiquarum* in 1613 For further information on the laws of the Lombards *see* J Merkel, *Geschichte des Langobardenrechts* (1850), A. Boretius, *Die Kapitularien im Langobardenreich* (1864), Schupfer, *Manuale di storia del diritto italiano* (2nd ed 1895), Solmi, *Diritto longobardo e diritto nordico* (1898), C Kjer, *Edictus Rotari* (Copenhagen, 1898), C Kjer, *Dansk og langbardisk Arveret* (1901), J Ficker, *Das langobardische und die skandinavischen Rechte* (Mitteilungen des Instituts fur oesterreichische Geschichtsforschung, vol xxii), Cf R Dareste, in the *Nouvelle Revue historique de droit français et étranger* (1900, p. 143)

Pactus Alamannorum and Lex Alamannorum.—Of the laws of the Alamanni we possess two different texts The earlier text, of which five short fragments have come down to us, is known as the *Pactus Alamannorum,* and from the persistent recurrence of the expression "et sic convenit" was most probably drawn up by an official commission. The reference to affranchisement *in ecclesia* shows that it was composed at a period subsequent to the conversion of the Alamanni to Christianity There is no doubt that the text dates back to the 7th century The later text, known as the *Lex Alamannorum,* dates from a period when Alamannia recognized the theoretical suzerainty of the Frankish kings but was ruled by national dukes and may be placed between the years 717 and 719

The two texts have been published by J Merkel in the *Mon Germ hist.,* Leges, iii, and by Karl Lehmann in the 4to series of the same collection Cf Heinrich Brunner, "Über das Alter der Lex Alamannorum" (*Berliner Sitzungsberichte,* 1885); Karl Lehmann, in the *Neues Archiv*, vol x, Bruno Krusch, *Die Lex Bajuvariorum,* mit zwei Anhangen *Lex Alamannorum* und *Lex Ribuaria* (1924), Franz Beyerle, in the *Savigny-Zeitschrift fur Rechtsgeschichte,* vol xxxv; Bruno Krusch, Neue Forschungen uber die drei oberdeutschen Leges *Bajuvariorum, Alamannorum* und *Ribuariorum* (1927)

Lex Baiuvariorum.—The law of the Bavarians has, in some parts, been taken directly from the Visigothic law of Euric and from the *Lex Alamannorum* and the *Lex Salica* The Bavarian law, therefore, is later than that of the Alamanni It dates, probably, from a period when the Frankish authority was very strong in Bavaria when the dukes were vassals of the Frankish kings The date of compilation may be placed between 740 and 748

The text of the *Lex Baiuvariorum* has been published by J Merkel in the *Mon Germ hist, Leges,* iii 183, by E von Schwind (1927) in the 4to series of the same collection, and by Konrad Beyerle (Munchen, 1926) Cf von Schwind's articles in the *Neues Archiv* vol xxxi, xxxiii and xxxvii, H Brunner, Über ein verschollenes merowingisches Konigsgesetz des 7 Jahrhunderts (*Berliner Sitzungsberichte,* 1901), V Kralik, Die deutschen Bestandteile der *Lex Baiuwariorum* (*Neues Archiv* vol xxxvii), Bruno Krusch, *Die Lex Bajuvariorum,* Textgeschichte, Handschriftenkritik und Entstehung (1924), Franz Beyerle, in the *Savigny-Zeitschrift fur Rechtsgeschichte,* vol. xlv, Ernst Heymann, Zur Textkritik der *Lex Bajuwariorum* (*Kehr-Festschrift,* 1925), Bruno Krusch, Neue Forschungen uber die drei oberdeutschen Leges (1927), Karl August Eckhardt, *Die Lex Baiuvariorum,* eine textkritische Studie (1927)

Lex Saxonum.—The *Lex Saxonum* has come down to us in two mss and two old editions (those of B J Herold and du Tillet) The law contains ancient customary enactments of Saxony, and, in the form in which it has reached us, is later than the conquest of Saxony by Charlemagne It is preceded by two capitularies of Charlemagne for Saxony—the *Capitulatio de partibus Saxoniae,* which dates undoubtedly from 782, and is characterized by great severity, death being the penalty for every offence against the Christian religion, and the *Capitulare Saxonicum,* of the 28th of October 797, in which Charlemagne shows less brutality and pronounces simple compositions for misdeeds which formerly entailed death The *Lex Saxonicum* apparently dates from 802, since it contains provisions which are in the *Capitulare legi Ribuariae additum* of that year The law established the ancient customs, at the same time eliminating anything that was contrary to the spirit of Christianity, it proclaimed the peace of the churches, whose possessions it guaranteed and whose right of asylum it recognized There is an edition of the *leges Saxonum* by Karl v Richthofen in the *Mon Germ hist, Leges,* and another by Cl von Schwerin in the 8vo series of the same collection (1918) Cf von Schwerin, in the *Savigny-Zeitschrift fur Rechtsgeschichte,* vol xxxiii, Martin Lintzel, in the *Savigny-Zeitschrift fur Rechtsgeschichte,* vol xlvii

Lex Thuringorum.—A collection of laws has come down to us, in one ms and one old edition, bearing, in the ms, the name *Lex Thuringorum* and in the edition the name *Lex Angliorum et Werinorum, hoc est Thuringorum* In early times there dwelt, south of the river Unstrut, the Angli, who gave their name to the *pagus Englin* or *Englide*, and to the east, between the Saale and the Elster, the *Warni* (*Werini* or *Varini*) whose name is seen in *Wernofeld* Cf Hoops, *Reallexikon,* i, 86, iv, 483 This text is a collection of local customs arranged in the same order as the law of the Ripuarians Parts of it are based on the *Capitulare legi Ribuariae additum* of 803, and it seems to have been drawn up in the same conditions and circumstances as the law of the Saxons

There is an edition of this code by Karl von Richthofen in the *Mon Germ. hist, Leges,* v 103, and another by Cl v Schwerin in the 8vo series of the same collection (1918)

Lex Frisionum.—This consists of a medley of documents of the most heterogeneous character Some of its enactments are apparently pagan Thus one paragraph allows the mother to kill her new-born child, and another prescribes the immolation to the gods of the defiler of their temple, others are purely Christian such as those which prohibit incestuous marriages and working on Sunday The law abounds in contradictions and repetitions and the compositions are calculated in different moneys From this it would appear that the documents were merely materials collected from various sources and possibly with a view to the compilation of a homogeneous law These materials were apparently brought together at the beginning of the 9th century, at a time of intense legislative activity at the court of Charlemagne.

There are no mss of the document extant, our knowledge of it is based upon B J Herold's edition (*Originum ac Germanicarum antiquitatum libri*, Basel, 1557), which has been reproduced by Karl von Richthoffen in the *Mon Germ hist*, *Leges*, iii 631 and by de Geer (1866) Cf Patteta, *La Lex Frisionum* (1892), Hugo Jaekel, in the *Neues Archiv*, vol xxxii ; Siegfried Rietschel, *Das Volksrecht der Friesen* (Gierke-Festschrift, 1911), Philipp Heck, *Die Entstehung der Lex Frisionum* (1927)

(C Pf , K A Eck)

GERMANICUS CAESAR (15 B C–A D. 19), a Roman general and provincial governor in the reign of Tiberius The name Germanicus, the only one by which he is known in history, he inherited from his father, Nero Claudius Drusus, the famous general, brother of Tiberius and stepson of Augustus His mother was the younger Antonia, daughter of Marcus Antonius and niece of Augustus, and he married Agrippina, the granddaughter of the same emperor It was natural, therefore, that he should be regarded as a candidate for the purple Augustus, it would seem, long hesitated whether he should name him as his successor, and as a compromise required his uncle Tiberius to adopt him, though Tiberius had a son of his own Of his early years and education little is known Suetonius and Ovid allow him a reputation as an orator

At the age of 20 he served under Tiberius, and received the triumphal insignia for crushing the revolt in Dalmatia and Pannonia In A D 11 he accompanied Tiberius in his campaign on the Rhine. In 12 he was made consul, and increased his popularity by appearing as an advocate in the courts of justice, and by the celebration of brilliant games Soon afterwards he was appointed by Augustus to the command of the eight legions on the Rhine. The news of the emperor's death (14) found Germanicus at Lugdunum (Lyons), where he was superintending the census of Gaul Close upon this came the report that a mutiny had broken out among his legions on the lower Rhine Germanicus hurried back to the camp, which was now in open insurrection The tumult was with difficulty quelled, partly by concessions, for which the authority of the emperor was forged, but chiefly owing to his personal popularity Some of the soldiers suggested that he should claim the empire for himself, but he refused In order to calm the excitement Germanicus determined at once on an active campaign Crossing the Rhine, he attacked and routed the Marsi, and laid waste the valley of the Ems In the following year he marched against Arminius, the conqueror of Varus, and performed the last rites over the remains of the Roman soldiers that still lay there unburied, erecting a barrow to mark the spot Arminius, however, favoured by the marshy ground, was able to hold his own, and it required another campaign before he was finally defeated A masterly combined movement by land and water enabled Germanicus to concentrate his forces against the main body of the Germans encamped on the Weser, and to crush them in two obstinately contested battles

The success of Germanicus had already stirred the jealousy and fears of Tiberius, and he was reluctantly compelled to return to Rome On May 26, 17 he celebrated a triumph. The enthusiasm with which he was welcomed, not only by the populace, but by the emperor's own praetorians, was so great that the earliest pretext was seized to remove him from Rome He was sent to the East with extraordinary powers to settle a disputed succession in Parthia and Armenia At the same time Gnaeus Calpurnius Piso, one of the most violent and ambitious of the old nobility, was sent as governor of Syria to watch his movements Germanicus proceeded by easy stages to his province, halting on his way in Dalmatia, and visiting the battle-field of Actium, Athens, Ilium and other places of historic interest When he reached his destination, he found little difficulty in effecting the settlement of the disturbed provinces, notwithstanding Piso's violent and persistent opposition At Artaxata Zeno, the popular candidate for the throne, was crowned king of Armenia To the provinces of Cappadocia and Commagene Roman governors were assigned, Parthia was conciliated by the banishment of the dethroned king Vonones

After wintering in Syria Germanicus started for a tour in Egypt, but he was warned by Tiberius that he was thereby transgressing an unwritten law which forbade any Roman of rank to set foot in Egypt without express permission. On his return to Syria he found that all his arrangements had been upset by Piso At Epidaphne near Antioch he was attacked by a fatal illness which he himself and his friends attributed to poison administered by Plancina, the wife of Piso, at the instigation of Tiberius His ashes were brought to Rome in the following year (20) by his wife Agrippina, and deposited in the grave of Augustus He had nine children, six of whom, three sons and three daughters, survived him, amongst them the future emperor Gaius and the notorious Agrippina, the mother of Nero The news of his death cast a gloom over the whole empire

He possessed considerable literary abilities, his speeches and Greek comedies were highly spoken of by his contemporaries

In addition to monographs by A Zingerle (Trent, 1867) and A Breysig (Erfurt, 1892), there are treatises on the German campaigns by E von Wietersheim (1850), P Hofer (1884), F Knoke (1887, 1889), W Fricke (1889), A Taramelli (1891), Dahm (1902) *See* Tacitus, *Annals*, i–iv (ed. Furneaux), Suetonius, *Augustus*, *Tiberius;* J C Tarver, *Tiberius* (1902), Merivale, *Hist of the Romans under the Empire*, chs 42, 43, H Schiller, *Geschichte der romischen Kaiserzeit*, i 1 (1883), pp 227, 258, 261–266, 270–276, M Schanz, *Geschichte der romischen Literatur*, pt ii (2nd ed , 1901), and Teuffel-Schwabe, *Hist of Roman Literature* (Eng. tr , 1900), 275

GERMANIUM, a chemical element included in the same natural family as tin and lead (*see* Periodic Law), was discovered in 1886 by C Winkler in the argyrodite (a silver thiogermanate) of Freiburg in Saxony (Symbol Ge, atomic number 32, atomic weight 72 6) The properties of this element and its compounds indicated that it was identical with the hypothetical element, ekasilicon, the properties of which had been predicted by D Mendeléeff in 1871 It is still a very rare metal, although a promising source has been found in the concentrate from certain residues obtained in the smelting of American zinc ores, G H Buchanan having reported that such residues contain 0 25% of germanium dioxide This source has been exploited by L M Dennis and his collaborators in Cornell university, U S A , who have thereby increased very considerably our knowledge of germanium and its compounds The following data are largely collected from these researches

Germanium is separated from other metals by fractional distillation of its volatile tetrachloride and is isolated in the metallic state by reduction of its dioxide with aluminium, carbon or hydrogen.

Germanium is a greyish-white metal of crystalline structure and so brittle that it cannot be drilled; it has the specific gravity 5·35/20° C, melts at 958 5° C, and is not volatile at 1,250° C When heated in oxygen at 730° C it is partially oxidized to dioxide, GeO_2, a dense white powder (specific gravity 4 70 at 18°) When acted on by the halogens, germanium yields the corresponding tetrahalides, GeX_4 The tetrachloride is a colourless liquid boiling at 83° C (melting point −49 5° C) The tetrabromide is a colourless crystalline solid (octahedra) melting at 26 1° C and boiling at 186 5° C The tetraiodide is an orange powder or coral-red solid, it melts at 144° C and has specific gravity 4 3215 at 20° C. A germanium-magnesium alloy when decomposed by dilute hydrochloric acid yielded a mixture of germanium hydrides from which the following were isolated:—monogermane or germanomethane, GeH_4, a gas with nauseating odour, melting point, −165° C, boiling point −90° C; digermane or germanoethane,

Ge_2H_6, a colourless volatile liquid boiling at 29° C and melting at −109° C; and trigermane or germanopropane, Ge_3H_8, a colourless liquid boiling at 110·5° C with melting point −105·6° C.

Germanium resembles silicon and tin in forming organic derivatives.—germanium tetramethyl, $Ge(CH_3)_4$, and tetraethyl, $Ge(C_2H_5)_4$, are colourless liquids boiling respectively at 43·4 and 163·5° C Tetraphenylgermane, $Ge(C_6H_5)_4$, and hexaphenyldigermane, $Ge_2(C_6H_5)_6$, are crystalline solids melting at 235° C and 340° C respectively (G T Morgan and H D. K Drew, 1925; C A Kraus and L S Foster, 1927), and homologous alkyl and aryl derivatives of germanium have been prepared in the Cornell laboratories Just as carbon and silicon give respectively chloroform, $CHCl_3$, and silicochloroform, $SiHCl_3$, so germanium furnishes germanochloroform, $GeHCl_3$, a liquid boiling at 75° (melting point −71° C) Germano-bromoform and -iodoform are also known The three compounds $GeHX_3$ are prepared by adding the halogen hydride to the corresponding germanium dihalide $GeX_2+HX=GeHX_3$ The three germanium dihalides are solids the fusibility of which diminishes with increase in the atomic weight of the halogen, they possess strong reducing power similar to that of the stannous halides (F M Brewer, 1927) Germanium compounds when fused with alkaline carbonates and sulphur form thiogermanates which on decomposition with acid give white germanium disulphide This substance, which is useful in the analytical separation of germanium, is also formed by passing hydrogen sulphide into acid solutions of germanium dioxide In its general chemical reactions, germanium disulphide resembles stannic sulphide

When silica is replaced by germanium dioxide in flint and crown glasses, an increase in refractive index is observed Germanium compounds have been suggested in treating anaemia

A further analogy between germanium and tin is seen in the interactions of their tetrachlorides or tetrabromides with acetylacetone The products, germanium bisacetylacetone dichloride, $[GeA\bar{c}_2Cl_2]$, and dibromide, $[GeA\bar{c}_2Br_2]$, are non-ionized metallic complexes corresponding closely with the similar tin bisacetylacetone dihalides When, however, germanium tetrahalides are condensed with copper acetylacetone, the final products are germanium trisacetylacetone cuprohalides, $[GeA\bar{c}_3]Cu^{I}X_2$ In this respect germanium shows its relationship to silicon which gives rise to similar complex salts (Morgan and Drew, 1924)

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GERMAN LANGUAGE. Together with English and Frisian, the German language forms part of the West Germanic group of languages, to which belongs also Langobardian, a dialect which died out in the 9th or 10th century.

Leaving English and Frisian aside, we understand by *Deutsche Sprache* the language of those remaining West Germanic tribes who, at their earliest appearance in history, spoke a Germanic tongue, and still speak it. The chief of these tribes are the Saxons, the Franks, the Chatti (Hessians), Thuringians, Alemannians and Bavarians This definition naturally includes the languages spoken in the Low Countries, Flemish and Dutch, the offspring of the Low Franconian dialect, mixed with Frisian and Saxon elements, but the Netherlands have built up an independent literary language of their own, excluded from the present survey.

MODERN STANDARD "DEUTSCH"

Phonetics.—An important feature is the "glottal stop" preceding every initial vowel in simple words *Eiche* (*'aiçə*) and though not always in compounds *Erinnerung* (ĕr'ĭnarŭn) Further characteristics are. the very full lip-articulation (rounding) in the pronunciation of *u, o; ü, ö;* lingual and guttural *r;* the *p, t, k* are slightly aspirated and the *b, d, g* become voiceless in the offsound; the *ich* sound (ç) and the *ach* (x) are sharply distinguished The German *w* is a bi-labial spirant. Quantity determines the quality of the vowels, so that long vowels which are never diphthongized are tense, short vowels lax, and their articulation is always dorsal (upper surface of the tongue).

There are no nasalized vowels except in words borrowed from French (*Entrée, Parfum,* etc) The diphthongs (*Teil, Main, Hauser, Teufel; Haus, laufen*) are falling, rising diphthongs occur only in words borrowed from Romance languages (*Familie, Union, adieu,* etc)

The difference between strong and weak stress (Silbendruck) is marked, the voice in general is loud, at least when compared with English

Accidence.—Standard German retains four cases out of the six in Old High German, but the weakening of the final vowels has often levelled out the different forms (*cf* declension of *Leben* and *Mensch*), so that it is now the article—not the noun itself—which shows the difference in the cases Other Germanic languages (English, Dutch) as well as the German dialects have lessened the number of specific case-forms, with the latter the loss of the genitive is especially noticeable (*cf* [1] *dem Vater sein Haus,* [2] *das Haus von dem Vater*)

The distinction of *grammatical gender* as masc, fem and neuter—a heritage from the Indo-European—is still retained The declensions, when compared with older stages of the language, are much simplified and represent three types. strong (vocalic), weak (consonantal) and mixed declension Many changes in gender as well as in declension have taken place and the *-er* plurals masc. (*Manner, Geister*) in addition to neuters have greatly increased in number The qualifying adjectives (but not the predicative) all follow the strong and weak declension, but the strong shows pronominal forms (*guter, -em, -en*)

The verb—strong, weak (only one class as compared with three in Old High German) and some irregular (*gehen, stehen, tun, sein, wollen*)—has two tenses as in Germanic; viz, *Present* and *Preterite* (corresponding to the Indo-European Perfect), other tenses being formed, as in English, by combination of the auxiliary verbs *haben, sein, werden* with the past part, or, for the formation of the future, of *werden* with the inf (the latter only since the late Middle High German period from an original *werden* plus pres part with future or present meaning)

The old vocalic distinction between sing. and plur in the preterite of the strong verb (*cf ward, wurden*) has been levelled out Sometimes the sing prevails (*schwamm, schwammen*), sometimes the plur (*griff, griffen*) Some forms have been influenced by the past participle (*erlosch*), others have arisen through the accordance of homophones due to phonetic processes, *e g*, Middle High German *rize, reiz, rizzen, gerizzen,* which should normally give *ich reisse, reiss, rissen, gerissen,* but has substituted the preterite *riss* to avoid confusion of present and preterite (in English *write* <*wrītan, wrote*< *wrāt* there is no interference).

Word Formation.—Compounds of two or more independent words (*Kĭrchtürmspitze, Fĕlddŭ́bstàhl, Altwĕ̈ibersömmer*) and derivations by means of *affixes* (*prefixes* and *suffixes*), some of which originally were independent words such as *-lich* (Engl *-ly*), *-tum* (*-dom*), *-heit* (*-hood*), *-schaft* (*-scape, -ship*), *-haft,* have played an important part in enriching the vocabulary from the oldest period The great modification in the original meaning of a word by these affixes which are mostly of Germanic but for a part also of Classical or Romance origin, may be shown by such examples as *sitzen: ersitzen; Wetter· Gewitter; Eigenschaft: -tum. -heit; eigentlich; Weib· weibisch weiblich; England: Engländer: Engländerei* As an important feature for the growth of the vocabulary loan-translations (*calques, Übersetzungslehnworter*) deserve mention They occur throughout the whole period, *cf* Old High German *bigiht* (*confessio, Beichte*), *arm herzi* (*misericors, barmherzig*), *gifatero* (*compater, Gevatter*) and *Wasserflugzeug* (*hydroplane*), *Volkerbund* (*Société des Nations, League of Nations*), the last examples showing very strikingly the inherent power of forming compounds

Vocabulary.—Besides loan-translations the German vocabulary contains a very large number of foreign words (*Fremd-* and *Lehnworter*) Latin contributes from the time of Rome's contact with the Teutons, through the mediaeval church, humanism and the Renaissance, the rise of the grammar-schools and the study of medicine and science French influence was strong in the period of knighthood, in the baroque period and the Thirty

Years' War, then again under Frederick the Great and the Revolution Italian, Spanish and Eastern languages are also contributors and English supplies many loans, especially sporting terms In the 17th century German academies (*Sprachgesellschaften*) fought against this invasion, in the 19th century. J H Campe, H Stephan and since 1885 the "Allgemeine Deutsche Sprachverein" That the battle still rages is shown by an article of H Bojunga, "Werden und Wesen der deutschen Sprache in alter Zeit" in *Germanische Wiedererstehung*, ed by H Nollan (Heidelberg, 1926)

Syntax.—In German the order of words in the sentence presents some difficulty Its rigidity has gradually become more pronounced owing chiefly to the influence of the grammarians and schoolmasters Examples taken from the great preacher Berthold von Regensburg (about 1250) and from Martin Luther will prove this with regard to the rule of the final position of the verb in dependent clauses when introduced by a rel pronoun or a conjunction

B v R . . *daz ir immer erlost muget werden, daz sie ir muoter ie getruoc an diese werlt*

Luther *den Got selbst hat erkoren, . dass wir uns yhe fursehen mit grossem ernst*

Examples of this kind, however, may easily be paralleled from the writings of Goethe and Schiller and many others *Sprachgefuhl* and other psychological factors must decide where and how far the rigid rule can be relaxed, but it would not be advisable to accept as a pattern K Sternheim's sovereign disregard of the acknowledged rules of word-order General usage puts an infinitive with *zu* behind the verb (*der mich bittet, ihm zu schreiben*) and the same holds good with comparisons. *den ich hoher halte als meine anderen Freunde*

An inflexible rule, on the other hand, is the inversion of subject and predicate when an adverbial clause or dependent sentence precedes *dann kam er*, then he came, *als er kam, sagte ich*, when he came I said English alone among the Germanic languages lacks this feature The inversion frequently met with, especially in business letters where principal clauses are joined by the conjunction *and* (ex *ich danke Ihnen und werde ich*) is unnecessary and should be avoided

Style.—German style has often been accused of intolerably long and intertwined periods, of excessive use of mere expletives and of overburdened adjectival (participial) clauses placed between the article and noun; *e g*, *"der in dem von der Sonne gedorrten Grase liegende Knabe"* There are, indeed, many learned publications, books and treatises on scientific, philosophical, historical or philological subjects which cause the reader to despair

The long domination of Latin in the humanistic schools had certainly its influence on such execrable "Schachtel" sentences, but the predilection for periodic style corresponds to certain features of the national character The successful use, therefore, depends on the author's personality Few will complain of the harmonious, lucid and rhythmical periods in the writings of Goethe, Nietzsche and Thomas Mann However, a preference for clear terse sentences under the influence of French and English style had repeatedly shown itself, *e g*, in the writings of the great literary historian, W Scherer, based on Macaulay and in the historical writings of F Ranke In lyrics, novel and drama this is now the ruling tendency and is often carried to extremes in the works of the expressionists

THE DEVELOPMENT OF THE GERMAN LANGUAGE

The history of the German language falls into three great sections (1) Old High German (*Althochdeutsch*) and Old Low German (Old Saxon, *Altniederdeutsch, Altsachsisch*), (2) Middle High German (*Mittelhochdeutsch*) and Middle Low German (*Mittelniederdeutsch*); and (3) Modern High German and Modern Low German (*Neuhochdeutsch* and *Neuniederdeutsch*)

Old High German Period.—The first or Old High German period is commonly regarded as extending to about the year 1050 The principal characteristic of the change from Old High German to Middle High German is the weakening of the unaccented vowels in final syllables (*cf* O H G *tagā, gesti, geban, gābum* and M H G *tage, geste, geben, gāben*) This process began tentatively as early as the 10th century in Low German, whilst long, unaccented vowels are preserved in the Alemannic dialect as late as the 14th century and even later With regard to the division between the second and third periods, some date Modern High German from the time of Luther, from about 1500. But certain characteristics attributed to the Modern German vowel system, such as lengthening of Middle High German short vowels, the change from Middle High German *ī, ū, iu* to Modern High German *ei, au, eu* (*ou*), of Middle High German *ie, uo, üe* to Modern High German *ī, ū, ü*, made their appearance long before 1500 Others, therefore, distinguish a period of classical Middle High German extending to about 1250, and a period of transition (sometimes called *Fruhneuhochdeutsch*, or Early Modern High German) from 1250 to 1650 The principal characteristics of Modern High German are then the greater stability of the grammatical and syntactical structure, due to the efforts of earlier grammarians, such as Schottelius, Gottsched and others, and the levelling out of the vowels of the singular and plural of the preterite of strong verbs (*cf* above) which was carried through consistently

The middle ages did not produce a Schriftsprache or literary language in the modern sense, so that the history of the language in its earlier stages is the history of different dialects With the scientific study of the German language there arose a keen interest—not only on the part of scholars—in the dialects which were long held in contempt [1]

A movement during the last three decades has bestowed great care on many of the existing dialects Phonological questions have received most attention, but problems of syntax have also not been neglected Monumental works like Wenker's *Sprachatlas des deutschen Reiches* and dialect dictionaries are either in course of publication or preparation[2] and many monographs[3] have appeared

In the Old High German period the East Middle German, spoken mostly on territory colonized later, is therefore not represented in literature In that period are found Old Low German and Old High German dialects, the latter divided into Upper High German and Franconian dialects [4]

Low German.—The chief characteristic of Low German is the absence of the High German sound-shift, *i e*, the phonological process starting about A D 500 in the South by which the voiced and unvoiced stops *b, d, g, p, t, k* were affected *b>p, d>t, g>k*, according to position *p>pf or ff, t>z* (=affricate *tz*) or *zz* (double spirant, now written *ss*), *k>ch* (*i e*, *kh* or χ) or *hh* Low German therefore agrees in this respect with Frisian and English Independently of this sound-shift another consonantal shift starts from Upper Germany in the 8th century, *i e*, the change of the spirant *th*(þ)*>d werthan· werdan, theob· deob* (*Dieb*), it soon spread to Middle German dialects and finally in the 11th and 12th centuries to Low German, so that *th* (þ) is only preserved in English On the other hand the *i* -Mutation (Umlaut) found in Anglo-Saxon in the 6th century, had a firmer grip on Old Saxon in the 8th century than on Franconian and

[1] Of writers who have made extensive use of dialects, it must suffice to mention here the names of J H Voss, Hebel, Klaus Groth, Fritz Reuter, Usteri, G D Arnold, Holtei, Castelli, J G Seidl, Anzengruber, John Brinckmann, in our own days G Hauptmann, and a Low German group as J H. Fehrs, A Wibbelt, F. Stavenhagen, K. Wagenfeld

[2] *Cf* J A Schmeller, *Bayrisches Worterbuch* (2nd ed, Munich, 1872–77), F Staub and L Tobler, *Schweizerisches Idiotikon* (1881 *et seq*), E Martin and F Lienhart, *Worterbuch der elsassischen Mundarten* (Strassburg, 1899 *et seq*), H Fischer, *Schwabisches Worterbuch* (Tubingen, 1901 *et seq*), The "Deutsche Kommission" of the Prussian Academy is preparing a *Rheinisches*, a *Hessen-Nassauisches* and a *Preussisches Worterbuch*

[3] *Cf* F. Mentz, *Bibliographie der deutschen Mundartforschung* (Leipzig, 1892) Of periodicals may be mentioned *Deutsche Mundarten*, by J W Nagl (Vienna, 1896 *et seq*); *Zeitschrift fur hochdeutsche Mundarten*, by O Heilig and Ph Lenz (Heidelberg, 1900 *et seq*), continued as *Zeitschrift fur deutsche Mundarten*, Verlag des Allgemeinen Deutschen Sprachvereins.

[4] For a map of the German dialects *cf* Bremer and Brockhaus, *Conversationslexikon* sub Deutsche Mundarten, or O Behaghel, *Geschichte der deutschen Sprache* (4th ed 1914)

GERMAN DIALECTS IN THE MIDDLE HIGH GERMAN AND MODERN GERMAN PERIODS

Low German	Low Franconian	Flemish Dutch	
	Low Saxon (Plattdeutsch)	Westphalian Eastphalian East Low German	
High German	Upper German	Alemannic	Swabian Low Alemannic (Alsatian) High Alemannic (Swiss)
		Bavarian-Austrian	
		High or Upper Franconian	East Franconian South Franconian
	West Middle German	Rhenish Franconian Middle Franconian	Ripuarian Moselle Franconian
	East Middle German	Thuringian Upper Saxon Silesian	

especially on Upper German dialects of the same period In Low Saxon—not in Low Franconian and East Low German (colonial territory)—the plural present of all three persons ends in *-et* (originally the ending of the 2nd pers , Old Saxon *-ath*): *wi, ir, sie sturwet, b, d, g* and *s* (medially) are always voiced, short *i* and *u* are rather open sounds tending towards *e* and *o*

Upper German.—The Upper German dialects have carried the sound-shift farthest, especially the Old Bavarian, *cf Kāpamēs* (*wir gaben*), in the Tyrol we still find *k*=>*kch* (the affricate sound). *kchind* and in High Alemannic (Swiss) *kh* (χ spirant) *chilche* In the Bavarian-Austrian dialect—in the second half of the 12th century—the first traces of that diphthongization of *ī, ū, iū* (*ü*) to *ei, au, eu* can be seen which, even at the present day, is foreign to the greater part of the Alemannic, to the Ripuarian, (Low) Hessian, West-Thuringian and Low German dialects *frīlī* (Swiss), *is* (*Eis,* Cologne), etc Bavarian-Austrian forms the diminutives in *-el, -erl* (*Madel, Hunderl*), High Franconian, Alemannic in *-la, -le* (*Madla*) as opposed to *-chen* and *-ken* in Middle and Low German dialects Bavaria has preserved the old dual form of the personal pronoun as *es* and *enk* Characteristic of Alemannic is the pronunciation of *-st-* and *-sp-* as *scht* and *schp* (*Lascht, Haschpel*).

West Middle German.—The principal characteristic of the West Middle German dialects is unshifted initial *p,* not *pf* as in the Upper German dialect Middle Franconian shows *-f,* for *-b* (*wif=Weib*), *y-* for *g-* (*yolden—Gulden*), has preserved the old *t* in the pronominal forms *dat, wat, dit, it, allet; -rp* for *rf* (*dorp*), *rd* for *rt,* at least in the north, in *Ripuarian* (centre Cologne), where *up=auf* has also escaped the sound-shift

East Middle German.—The East Middle German group shows initial *f*<*p-* first in *Thuringian,* which dialect marks the transition between West and East Middle German This change then spread eastwards, *e g , Ferd, Fund, Feife, Fennig flucken,* etc A feature of the Thuringian dialect is the loss of the final *-n* in the infinitive, *e g , (ge)lerne,* in Southern Thuringia even *(ge)lern* This is not shared by the other East Middle German dialects They pronounce the old *hs* in *wachsen,* etc , *ks* as in the literary language, whilst Thuringia and the West Middle German dialects speak *s(s).*

FROM THE DIALECTS TO STANDARD MODERN GERMAN

The language spoken during the Old High German period is remarkable for the fullness and richness of its vowel sounds in word-stems as well as in inflexions Cf *elilenti, Elend, luginari, Lugner, karkari, Kerker, menniskono slahta, Menschengeschlecht; herzono, Herzen* (gen. pl); *furisto, vorderste; hartost, (am) hartesten; stbunzug, siebzig; ziohemes, (wir) ziehen; salbota, (er) salbte, gaworahtos, (du) wirktest,* etc

Literary Use.—Of the dialects enumerated above, Bavarian and Alemannic, High and Rhenish Franconian as well as Old Saxon are more or less represented in the literature of this peroid *Cf* the *"Hildebrandslied"* (mixture of High and Low German), the Old High German *"Isidor"* (Rhenish Franconian), *"Tatian"* (East Franconian), Otfrid's *"Evangelienbuch"* (South Rhenish Franconian), *"Muspilli"* (Bavarian), *"Heliand"* (Old Saxon), Notker's prose (Alemannic) There was no recognized literary language (*Schriftsprache*) during this period; though the schools in the large monasteries, such as Reichenau, St Gall, Murbach and Fulda, contributed to the spread and acceptance of certain orthographical rules Nor did the next period—that of classical Middle High German—give birth to a *Schriftsprache* At this period the German language made great advance as a vehicle of literary expression; it acquired a lucidity, flexibility and beauty of style hitherto unknown, although the language lost in richness of sounds owing to the weakening of unstressed vowels to neutral *-e* or their complete disappearance (*cf* O H G *aro ar[e] Aar; zala zal Zahl, salida saelde*) This was the period of the *Minnesang* (Walther von der Vogelweide) and the great heroic and court epics (*Nibelungenlied,* Hartmann von Aue, Wolfram von Eschenbach and Gotfrid von Strassburg), when literature enjoyed the fostering care of the courts and the nobility (court of Vienna and of Eisenach in Thuringia) At the same time German prose celebrated its first triumphs in the sermons of Berthold von Regensburg, and later in the 14th century in the mystic writings and sermons of Meister Eckhart, Tauler and others History (Eike von Repkow's *Weltchronik*) and law (*Sachsenspiegel, Schwabenspiegel*) used the vernacular, and from about the middle of the 13th century German became the language of deeds and charters

How far did this period aspire after a *Schriftsprache?*[1] About the year 1200 there was undoubtedly a marked tendency towards a unification of the literary language by poets like Walther von der Vogelweide, Hartmann von Aue and Gotfrid von Strassburg, who avoid dialectic peculiarities more particularly in their rhymes, and do not make use of archaic words or forms There was thus, if not a Middle High German literary language in the widest sense of the word, at least a Middle High German *Dichtersprache* or poetic language, on an Alemannic-Franconian basis Whether or how this affected the ordinary speech of the nobility or courts is a matter of conjecture, but it had an undeniable influence on Low German poets, who endeavoured at least to use High German forms in their rhymes But the efforts of the High German poets to form a uniform language were short-lived By the end of the 13th century the *Dichtersprache* disappeared, and the dialects again reigned supreme. yet the desire for a certain degree of uniformity was never again entirely lost At the close of the 13th century literature had passed from the nobility to the middle classes of the towns, the number of writers who used the German tongue rapidly increased, later the invention of printing, the increase of the schools, the progress of commerce and travel, and above all the religious movement of the Reformation, awakened a desire to be understood by a wider community A certain amount of uni-

[1] *Cf* H Paul, *Gab es eine mhd Schriftsprache?* (Halle, 1873), A Socin, *Schriftsprache und Dialekte* (Heilbronn, 1888), O Behaghel, *Schriftsprache und Mundart* (Giessen, 1896), S Singer, *Die mhd Schriftsprache* (1900); C Kraus, *Heinrich von Veldecke und die mhd Dichtersprache* (Halle, 1899), G Roethe, *Die Reimvorreden des Sachsenspiegels* (1899); H. Tumpel, *Niederdeutsche Studien* (1898).

formity could be found in the language used officially by the great chanceries (*Kanzleien*), the imperial chancery (first under Charles IV [1347–78] at Prague, then from Frederick III [1440–93] at Vienna) and that of the Saxon electorate About the year 1500 there was no essential difference between the languages of the two chanceries and others soon followed suit

Luther.—In the midst of this development arose the imposing figure of Luther, who, although by no means the originator of a common High German speech, helped very materially to establish it He deliberately chose (*cf* the often quoted passage in his *Tischreden*, c 69) the language of the Saxon chancery as the vehicle of his Bible translation and subsequently of his own writings The differences between Luther's usage and that of the chancery, in phonology and inflection, are small, still in his writings after 1524 he shows more pronounced tendency towards East Middle German The adoption of the language of the chancery gave rise to the mixed character of sounds and formas which is still a feature of the literary language of Germany Thus the use of the monophthongs, *ī*, *ū* and *u* instead of the old diphthongs *ie*, *uo* and *ue*, comes from Middle Germany; the forms of the words and the gender of the nouns follow Middle rather than Upper German usage, whereas, on the other hand, the consonantal system (*p*, to *pf*; *d* to *t*) betrays in its main features Upper German (Bavarian-Austrian) origin

The language of Luther no doubt shows greater originality in its style and vocabulary (*cf* its influence on Goethe and the writers of the *Sturm und Drang*), for in this respect the chancery could obviously afford him but scanty help His vocabulary is drawn to a great extent from his own native East Middle German dialect However, it would be a mistake to infer that his language in the orthography given to it by the correctors of the Wittenberg printing presses made any rapid conquest of Germany It was immediately acceptable to the eastern part of the Middle German district (Thuringia and Silesia), and it found no great difficulty in penetrating into Low Germany, at least into the towns and districts lying to the east of the Sale and Elbe (Magdeburg, Hamburg), thus crushing the aspirations of Low Germany to have a literary language of its own Protestant Switzerland, on the other hand, resisted the "uncommon new German" until well into the 17th century The Catholic Lower Rhine (Cologne) and Catholic South Germany held out against it, for to adopt the language of the reformers would have helped their ideas At the same time, geographical and political conditions, as well as the pronounced character of the Upper German dialects, formed an important obstacle to any speedy unification, in spite of the ever-increasing number of printing presses in all parts of Germany

Thus in the 16th century Germany was still far from real unity in its language During the 17th century men like M Opitz (*Buch von der deutschen Poeterey*) and J G Schottelius (*Teutsche Sprachkunst*, 1641, and *Von der teutschen Sprachkunst*, 1663), insisted on the claims of the vernacular to a place beside and even above Latin (in 1687 Christian Thomasius held for the first time lectures in the German language at the University of Leipzig), and established a firm grammatical basis for Luther's common language which, especially in the hymnals, had become modernized and more uniform About the middle of the 17th century the disparity between the vowels of the singular and plural of the preterite of the strong verbs practically ceases, under East Middle German influence the final *e* is restored to words like *Knabe, Jude, Pfaffe*, which in South German had been *Knab*, etc , the mixed declension (*Ehre, Ehren, Schmerz, Schmerzen*) was established, and the plural in *-er* was extended to some masculine nouns (*Wald, Walder*), the use of the mutated sound has now become the rule as a plural sign (*Vater, Baume*) Thus the unification of word-forms and the agreement in the vocabulary made great strides, but the exclamation of the Swiss A von Haller (1708–77) "I am a Swiss, the German language is strange to me," or the language used by the great preacher Abraham a Sancta Clara (1709) are characteristic of the backwardness of the South

Eighteenth Century Developments.—In the 18th century the Leipzig Professor J. C Gottsched (*Deutsche Sprachkunst*, 1748) insisted on the claims of the spoken language (*Umgangssprache*) of the educated classes of Upper Saxony (*Meissen*); *i e* , the East Middle German dialect which since the Reformation had much esteem throughout the greater part of Germany, and J C Adelung published his *Grammatisch-kritisches Worterbuch der hochdeutschen Mundart* (1774–86) Later came Bodmer and Breitinger, the Swiss writers, and Klopstock (*Messias*, 1748), who, partly under the influence of Milton, opposed Gottsched's pedantic conception of the standard language in favour of a more poetical and flexible diction The "*Sturmer* and *Dranger*" like the Romanticists later, enriched the vocabulary by many an archaic or vigorous word, and then came the classics Wieland, Herder, Schiller, Goethe, when the movement towards a standard literary language reaches its culmination. But this unification did not imply the creation of an unalterable standard, for, just as the language of Opitz and Schottelius differed from that of Luther, so—although naturally in a lesser degree—the literary language of our day differs from that of the classic writers of the 18th century Local peculiarities are still to be met with, as in modern German literature from Switzerland or Austria

But this imperfect unity is limited to the literary language The differences are much more sharply accentuated in the *Umgangssprache*, the language spoken by educated people throughout Germany with regard both to pronunciation, where it is naturally most noticeable, and to the choice of words and the construction of sentences Compared with the times of Goethe and Schiller a certain advance undoubtedly has been made, but the differences between north and south are still great The question as to whether a unified pronunciation (*Einheitsaussprache*) is possible or even desirable has occupied the attention of academies, scholars and the educated public during recent years, and in 1898 a commission of scholars and theatre directors drew up a scheme of pronunciation for use in the royal theatres of Prussia,[1] which has been recommended to all German theatres by the German Buhnenverein

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GERMAN LAW. (I) *General*—In Germany those questions, the settlement of which primarily concerns the interests of the public, are dealt with under public law, whose chief components are constitutional law and administrative law The latter, however, does not embrace all the legal principles governing administrative procedure, indeed, private law also partially governs the actions of the Administration To administrative law appertain only such rules as lay down special regulations for public administration "Administrative law is therefore that law adapted to the requirements of public administration" (*Cf* Fleiner, *Institutionen des deutschen Verwaltungsrechts*, p 61) It is thus essentially a question of this distinction in content between private and public law, and it is not correct to state that administrative law is that law "which is administered by administrative courts" although administrative courts do exist (*See* Lassar, *Administrative Jurisdiction in Germany*) But there are also important rules of administrative law, of which the courts have no

[1] *Cf* Th Siebs, *Deutsche Buhnenaussprache* (14th ed, Köln, 1927).

cognizance, and their application in the event of disputes is determined by the ordinary courts. While the competence of the administrative courts to decide questions of law extends properly only to questions involving administrative disputes, such questions constitute only a fraction of those matters with which administrative law has to deal

(II) The fields of activity in which public administration is carried out preferably under the rules of administrative law, are numerous Historically the oldest, and formerly the most important, department is that of the police In principle the police is competent to act when the public is endangered There are numerous legal provisions dealing with the prevention of such dangers They deal, among other things, with the regulation of traffic, combating of dangerous diseases, rules affecting associations, public meetings and the press, also certain industrial activities and the structure of buildings

A special importance attaches to social insurance (sickness, accident, old age, disablement and unemployment insurance) Closely associated therewith are the provisions for the care of combatants in the World War and of those in need of assistance The laws for the protection of workmen also come within this province Moreover, since 1919, legislation relating to taxation has increased enormously as a result of the considerable increase in public expenditure Furthermore, administrative law regulates public roads, rivers and lakes and the military, while a considerable proportion of rail traffic regulations also fall within its province, also a part of agricultural and forest law (*e g*, game, hunting and settlement regulations), as well as the whole field of education including the universities Moreover, public officials are subject in the whole of their relations to administrative law

(III) *Federal Law and State Law*—Germany is a federal State with the result that German administrative law is partly Federal law and partly State law (Landesrecht) Historical development has determined the boundary between the two To-day the organization of State departments and the regulations regarding State officials belong to the sphere of the law of the several States, and so do considerable portions of police, agricultural, mining, game and education law, together with the law of water rights, as also the whole sphere of State taxation On the other hand the Federal Government (the "Reich") has dealt with the law regarding Federal taxation, industrial and labour law, also with matters affecting Federal officials, the army, the railways and waterways, and the postal service The line dividing them is, however, by no means uniform since, in the course of development, the empire has frequently encroached on State law or, *e g*, in dealing with education, has laid down general rules only, their detailed application being left to the States The extent and importance of Federal law has steadily increased as against the law of the States, a process which, in view of the tendency to greater uniformity in all the relationships of life, is likely to continue in the future

(IV) *The General Problems of Administrative Law*—In Germany common (*gemeines*) administrative law exists only as Federal law All other administrative law is general (*allgemeines*) law There is no general section corresponding to the general section of the civil code Only with regard to certain special domains, which have been dealt with within recent years, has codification of general rules of law been effected (*See* GERMAN CODES) However, general principles and rules of law also exist, and these recur in the individual fields of administration The *nucleus is the authority of the "rule of law,"* the principle of which is recognized, but its application to individual cases is still the subject of controversy It is an inherent characteristic of the bureaucracy that they strive as far as possible to extend the range of their operations to the utmost possible limits left undefined by law; such, at any rate, has been the experience of all modern States, and in the case of Germany there are special historical reasons tending to such a development In Germany it was not until the period of 1818–50 that the absolutist system was superseded by a constitutional system Since in the absolutist State no separation of powers exists, the bureaucracy was, at that time, not bound in practice by principles of law; and it only gradually became accustomed to such subordination The question of the rule of law accordingly plays an important part in the interrelations of the executive and the legislative

As in England and the United States, so in Germany the legislature has, to an increasing degree, empowered administrative departments to make regulations The problems connected with the scope and investiture of such authority, and the question as to whether any particular regulation is or is not *ultra vires* are of great importance In their consideration special interest attaches to the determination of the powers of the administration with regard to persons and property In this connection, particularly in recent years, the fundamental rights embodied in the Federal Constitution of 1919 have gained in importance Amongst these may be mentioned liberty of the person, inviolability of property, equality before the law, freedom of societies, meetings and religion It is unnecessary to observe that the law cannot prescribe rigid rules to the administrative departments but must necessarily allow them a certain freedom of action The department would be powerless to act unless they had a certain discretion (*pouvoir discrétionnaire*) It occasionally happens, however, that departmental action is *ultra vires* and, in practice, particularly with regard to the administrative courts, it is part of the daily work to determine the limits of their conduct The determining of compensation, due in respect of administrative acts, is also an important branch of administrative law In recognizing Government responsibility in tort the German law differs notably from that of England If, in the exercise of official activity, a public servant exceeds his official duty, the private citizen has a claim for compensation against the State These provisions are interpreted very liberally by the courts and therefore afford satisfactory protection to the citizen

An important section is devoted to administrative organization In Germany, too, public administration is either departmental or self-governing As a result of the federal articulation of Germany the former is either Federal administration or State administration Self-government is, to a very great extent, on a communal basis To such belongs the administration of the communes, communal unions and other organizations which may be compared with that of the counties (Grafschaft) Furthermore, the legislature has, to an increasing degree, transferred to newly formed self-governing bodies the carrying out of public services, *e g*, in the domain of insurance, public health and settlement schemes The main questions appertaining to organization are concerned with the competence of the administrative departments to deal with the individual problems of public administration, the relations of the departments one to another and the State control of self-governing bodies

German law does not provide a legal remedy for all administrative disputes The system is a complicated one The ordinary courts are competent to deal with some few disputes, defined by the law, but apart from the categories so defined they have no competence to deal with disputes involving public law Moreover, the administrative courts are competent to act only in such cases as are explicitly defined If a case does not fall within the definition the only remedy is to lodge a complaint with the department concerned The administrative courts are, however, always competent to act in matters of practical importance, *e g*, in matters affecting the police and taxes, as provided by the so-called general clause A new movement is in progress in consequence of the example of individual German States to introduce this general clause generally The administrative courts may not give opinions, their functions are limited to deciding questions of law

GERMAN CODES

By codification we understand the exhaustive arrangement of a particular subject matter (*e g*, commercial or criminal law) according to a uniform plan in a book of law

The Nature and History of Codification.—Modern codifications have only been carried out in Germany since the 18th century As a result of the adoption of Roman law the *Corpus Juris Civilis* came to be applied in Germany as a whole, subject to the glosses which had been incorporated by the Bologna school of law It was a code regulating all legal relationships except in

so far as particular rights were otherwise provided for Moreover the *Corpus Juris Canonici* had a wide application There were thus two great code systems in existence Their validity was profoundly shaken at the beginning of the modern era for the following reasons: The Reformation had very much limited the extent to which the ecclesiastical law could be applied, while the mental attitude towards the question of social relationships had been profoundly modified as a result of a philosophy of enlightenment and the idea of natural law Moreover the changes in political, social and economic conditions required new principles of law, since the Roman text books had become archaic and unmanageable, while in the matter of social jurisprudence they were not sufficiently adapted to the conditions of the modern world Finally the general conception of law at the time was that all valid law was exclusively State-made law, and by codification it was possible to give effect to this point of view In the 18th century the German empire broke up into a series of independent States When the legal constitutional connection between the individual States disappeared, they began to feel the want of a new and independent settlement of their systems of law Codification was often a means of confirming a State's entity, and the individual German States set about the task of introducing systems of law that would answer to their national and practical requirements The most extensive codification of the end of the 18th century, which embraces every department of law is the *Allgemeine Landrecht fur die preussischen Staaten* of Feb 5, 1794 The other individual States all codified the law separately, they dealt specially with private law, with criminal law, and with procedure These collections of laws incorporated much from the general law of the land, and also many special German laws, so that in spite of a certain modernization the general tradition was observed Moreover, on passing from an absolutist to a constitutional system in Germany, the form of a written constitution was adopted, so that State law itself was codified The political circumstances of the time, however, were such that this was only done for the individual German States except in the case of the law incorporating the German Federation It was not until the North German Federation and the German empire came into being (in 1866 and 1870 respectively) that the constitutional conditions for the general codification of law obtained The need for a uniform system of law, especially in the field of commerce, was so strong that a common form had already been arrived at by the individual States in their system of commercial law Under its constitution the North German Federation was already competent to frame laws which should be commonly valid In the individual territories As this competence increased in scope a number of codifications were effected over a considerable period of years The scheme which they followed was determined both by the keen need that was felt for rationalizing a constantly growing and therefore increasingly unmanageable legal material, and by the simplification of all political and commercial relationships, and the closely related evolution of the federal constitution of Germany into that of a single individual state

In order to understand the German codes, it is essential to realize that they apply not to an ordinary State entity, but to a Federal State Even in the case of those parts of the law which had been codified, the empire was not wholly successful in assuming full control of further legislation (*e g*, in questions of police and the law of real property) There are therefore in many codes provisions allowing for the reservation of certain matters to the legislatures of the individual States Such are especially matters which had been previously dealt with by the States individually. On the other hand such exceptions are of small scope or non-existent in those codes which deal with matters which had from the start fallen within the province of the imperial legislature, such as the law relating to national insurance The importance of reservations in favour of territorial jurisdiction has been greatly diminished in those cases where they still exist

Apart from this limitation of codes in favour of provincial law, their scope is limited in another direction When, upon a subject being codified, new legal regulations are required, these are often promulgated as *novellae* to the codes But frequently independent laws are passed, especially where the code is antiquated Thus there are about 300 subsidiary laws to the penal code. The purpose of the original code is largely frustrated by such developments.

THE CIVIL CODE

The German civil code is set out in five books It has been largely influenced in its scheme by the general law and by the Prussian general law of real property The general regulations and the provisions dealing with relationships between debtors have been largely derived from Roman law, while the law of property and of inheritance is Germanic in origin Its technique does not derive from casuistic theory, indeed the provisions are of a very general nature and often conceived in a highly abstract manner It bears the mark of the individualistic, and in economics of the capitalistic, outlook of the end of the 19th century Collectivist ideas have had but little influence upon it Even when it first came into force it was partly inadequate, since it does not deal with the special conditions under which the modern proletariat live, although the proletariat already constituted a substantial portion of the population In theory the code was intended to cover all laws affecting the rights of private individuals excepting commercial law Moreover, since it came into force, important fields have been regulated by separate imperial laws, as for instance motor insurance, contracts for service, the laws relating to young persons In matters appertaining to the law of things the old territorial law has been largely retained and the competence of territorial jurisdictions for further dealing with matters in this province has been maintained

As for the separate portions of this code, the general section includes the rules of law laying down what subjects fall within the scope of the legislature, and deals with the manner of conducting the business of the courts It includes regulations regarding interpretation, the expiry of laws, contempt of court, etc.

The law of debt relationships which is contained in the second book is based upon the principle of freedom of contract In the first and general section, this book contains the maxims regarding the nature, origin and extinction of the debt relationship Its guiding principle is that all obligations are to be carried out in a manner consonant with a true and loyal observation of the generally accepted rules of human intercourse The special portion of the book deals with individual cases of obligation, such as purchase, hire, barter, unjustifiable increment, unconscionable actions This code contains only a few provisions affecting contracts of service and such provisions are of little practical significance The legal position of workmen and servants is in fact dealt with to a much greater extent by subsidiary laws, especially the wages agreements regulations These provisions are generally no longer included in the law of persons, together with allied regulations they have been amalgamated into a labour law, the codification of which is being planned

The law of things of the civil code deals with the law as it affects movable and immovable things, especially ownership, possession and assignable rights The recent advance of the social idea has profoundly modified the contents of this book The ownership and user of the land is dealt with in a series of supplementary laws of the post-War period, dealing with usufruct, occupation and life estates

The law of the family regulates marriage, relationship and guardianship Reforms affecting divorce and the position of illegitimate children are under consideration Public interest in child-welfare has invalidated the original provisions of the code in several directions (the Juvenile Welfare Law of July 9, 1922, the Juvenile Courts Law of Feb 16, 1923) Finally the fifth book deals with the law of inheritance

The Commercial Code.—This was of special importance as being the first codification of private law, it was the predecessor of the civil code, into which a large number of the general provisions were subsequently incorporated It was revised on the promulgation of the civil code and is now valid as the commercial code for the German empire (May 10, 1897) Since that date numerous *novellae* have been passed and in addition a series of subsidiary laws of various dates are operative, as for instance

the laws governing limited liability companies and unfair competition. On the other hand any isolated reservations by provincial legislatures are without practical significance The private special law of merchants, in so far as it is applicable, is therefore of higher validity than the civil code It deals more particularly with the problem of assuring liberty of contract and of form, there being also numerous provisions to ensure the revelation of essential facts and to secure good faith (*e g*, those dealing with the trade register and *bonâ fide* acquisition) as well as for the accurate estimation of time and money (suggestions as to the value of commercial services) It is divided into four books The first contains the legal definitions affecting commerce and such activities as can be practised commercially The book dealing with commercial associations treats of the legal position of partnerships, public corporations, limited liability companies, etc The law regarding the latter is shortly to be revised in the light of the change in the commercial objects which they serve. The commercial code does not contain any special provisions affecting trusts and cartells, these being dealt with separately The third book on commercial transactions contains general regulations dealing with them as well as provisions dealing with a series of individual trades, as for instance the purchase of businesses, warehousing and agency matters The fourth book deals with the law of shipping

The Criminal Code.—The reforming movement of the 18th century left its mark in the field of criminal law The individual German States codified their criminal law, Bavaria being the first to do so, in 1751 The criminal code was not issued until after the unification of Germany (the imperial criminal code of April 16, 1871) This falls into a general and a particular section The first section contains the general legal definitions regarding the essential nature of crime, its various forms and degrees, explaining what constitutes attempt, complicity and perpetration as well as the system and measure of punishment, preventive arrangements and some further general matters The special section deals with individual crimes and penalties The code is however far from dealing with every individual penal matter; it is therefore only the general section that is of importance as a code A revised code will shortly be completed and with regard to certain highly important matters has been already carried into effect The principal of fines has been adopted as a substitute for short terms of imprisonment, while youthful offenders are dealt with educationally rather than penally, the reformatory principle having been adopted from the French model New principles are applied for carrying punishment into effect These reforms, which have been introduced by means of *novellae*, are indicative of the general trend The distinguishing features will be greater detail in specifying crime, as well as special preventive measures and a considerable widening of judicial discretion, both in the matter of imposing penalties and applying preventive measures, and in the matter of probational liberty The military code (draft of April 30, 1926) is valid concurrently with the criminal code It provides for a number of special military crimes and misdemeanours

Constitution of the Courts and Procedure.—The law relating to the constitution of the ordinary courts is codified in the courts organization code This deals with the office of judge and the organization of the courts, as well as laying down certain general rules for the conduct of their business There are besides two codifications of the procedure to be adopted in ordinary courts, viz, the rules of civil procedure (Jan 30, 1879) and the rules of criminal procedure The law of criminal procedure has been codified in the individual States since the middle of the 19th century. On Feb 1, 1877, the rules of criminal procedure for the German empire were promulgated Moreover since the World War, the taxing authority in almost all cases has passed from the provincial to the Federal Government Here too codification had been effected through the tax regulations of Dec 23, 1919.

The importance of the codes is variously estimated in Germany. They have served to crystallize the ideas of law current at the time of their promulgation The danger is that the law of the State and the law as applied tend to be identified Codifications in Germany had therefore in the earlier period after their promulgation often tended to make the law rigid and to encourage a cult of the legal system for its own sake When, however, society and an economic system have outgrown a code, new propositions of law arise in a liberal administration of the law, so that codes suffer the fate of all written legal propositions Moreover, as has been already indicated, individual codifications do not represent an exhaustive treatment of the subject, owing to subsidiary laws that are passed from time to time In the further course of their development the emphasis of codes tends more and more to be restricted to the general portion Nevertheless they have played a highly important part in the development of German law Every code has tended to make the law more uniform and, in spite of their traditional content, to modernize it Moreover the codifications embody to so large a degree those nationalistic elements which are inherent in German legal thought that it is certain they will continue in the future to be an essential part of the German legal system

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GERMAN LITERATURE. The literary history of the German-speaking peoples of the continent of Europe may conveniently be divided into six main sections

I The Old High German Period, from the earliest records to the middle of the 11th century

II The Middle High German Period, from the middle of the 11th to the end of the 14th century

III The Transition Period, covering the 15th and 16th centuries

IV The Period of Renaissance and Baroque, from the end of the 16th century to the middle of the 18th

V The Classical and Romantic Period of Modern German literature, from the middle of the 18th century to Goethe's death in 1832

VI The Period from Goethe's death to the present day

I. THE OLD HIGH GERMAN PERIOD (c. 750–1050)

There are no records which can justify us in inferring that the continental Germanic tribes possessed a written literature before the age of Charlemagne But the sagas out of which the German national epics of a later date were welded originated in the great upheaval of the 5th century known as the *Volkerwanderung* or "Migration" Thus one might speak of an earlier period of unwritten poetry When the vernacular literature began to emerge in the 9th century, it was merely a faint reflection of the activity of the monasteries, and this, with very few exceptions, Old High German literature remained Translations of the liturgy, of Tatian's *Gospel Harmony* (*c* 835), of fragments of sermons, form a large proportion of it Rarely, as in the so-called *Monsee Fragments*, and at the end of the period, in the prose of Notker Labeo (d 1022), does this ecclesiastical prose attain any kind of literary style But it had no vitality of its own, it virtually sprang into existence at the command of Charlemagne, whose policy with regard to the use of the vernacular in place of Latin was liberal and far-seeing, and it docilely obeyed the tastes of the rulers that followed, becoming severely orthodox under Louis the Pious, and consenting to extinction when the Saxon emperors withdrew their favour from it Of the poetic fragments the most interesting are the *Merseburg Charms* (*Zauberspruche*), the *Wessobrunn Prayer* (*c* 780), the *Muspilli*, an imaginative description of the Day of Judgment, and the *Ludwigslied* (881), the first German historical ballad The *Gospel Book* (*Liber evangeliorum*) of Otfrid of Weissenburg (*c* 800–870) is the earliest attempt to supersede alliteration in German poetry by rhyme, but for the only genuine poetry of this epoch we have to look to the Low German races To Saxon tradition we owe the earliest extant fragment of a national saga, the *Lay of Hildebrand* (*Hildebrandslied*, *c* 800),

and a Saxon poet was the author of a vigorous alliterative version of the Gospel story, the *Heliand* (*c.* 830), which is worthy of being described as an epic. Of the existence of a lyric poetry we only know by hearsay; and the drama had nowhere in Europe yet advanced beyond an ecclesiastical function Such as it was, the vernacular literature of the Old High German period enjoyed but a brief life, and the literature of the 10th and 11th centuries again reverted to Latin The *Lay of Walter* (*Waltharilied, c* 930), by Ekkehard of St Gall, the moralizing dramas of the nun, Hrosvitha of Gandersheim, the *Ecbasis captivi* (*c* 940), earliest of all the beast epics, and the romantic adventures of *Ruodlieb* (*c* 1030), although not in German, foreshadow the future developments of German poetry

II. THE MIDDLE HIGH GERMAN PERIOD (1050–1350)

The beginnings of Middle High German literature were slow and tentative after the set-back of the 11th century The Church had no helping hand to offer, as in the more liberal epoch of the great Charles; for, at the middle of the 11th century, when the linguistic change from Old to Middle High German was taking place, a religious asceticism, originating in the Burgundian monastery of Cluny, cast a blight over secular poetry Lugubrious in their asceticism are poems like *Memento mori* (*c* 1050), *Vom Glauben*, a verse commentary on the creed by a monk Hartmann (*c* 1120), and verses on "the remembrance of death" (*Von des tôdes gehugede*) by Heinrich von Melk (*c* 1160) But in the *Ezzolied* (1063), a spirited lay by a monk of Bamberg on the life, miracles and death of Christ, and in the *Annolied* (*c* 1080), a poem in praise of the archbishop Anno of Cologne, the tone is less monotonous

A freer poetic spirit is to be seen, too, in the lyric poetry inspired by the Virgin, in the legends of the saints which bulk so largely in the poetry of the 12th century, and in the *Kaiserchronik* (*c* 1130–50), a long, confused chronicle of world history The national sagas begin to emerge in the popular literature To the wandering *Spielleute* we owe the romance of *König Rother* (*c* 1160), and the kindred stories of *Orendel, Oswald* and *Salomon und Markolf* These poems bear witness to the influence of the crusades, as do also the *Alexanderlied* (*c* 1130), and *Herzog Ernst* (*c* 1180), which point the way to the court epic The *Chanson de Roland* (*Rolandslied*) was, about 1135, reproduced in German by Konrad of Regensburg.

The court epic begins in Germany with the *Tristrant* (*c* 1180) of Eilhart von Oberge, and a knightly romance of *Floris und Blancheflur* In these years, too, the beast epic, already represented by the Latin *Ecbasis captivi,* was reintroduced into Germany by an Alsatian monk, Heinrich der Glîchezâre, who based his *Reinhart Fuchs* (*c.* 1180) on the French *Roman de Renart.* Lastly, the *Minnesang,* or lyric, burst out with extraordinary vigour in the last decades of the 12th century Its origins are obscure, and it is debatable how much in it is indigenous and national, how much due to French and Provençal influence, but the freshness and originality of the early South German singers, such as Kurenberg, Dietmar von Eist, Friedrich von Hausen and Heinrich von Morungen, are not to be questioned. The satirical *Spruchdichtung* is represented by two poets who call themselves Herger and "Der Spervogel," and was less dependent on foreign models

Mediaeval Poetry.—Such was the preparation for the extraordinarily brilliant although brief epoch of German mediaeval poetry which was contemporary with the reigns of the Hohenstaufen emperors, Frederick I Barbarossa, Henry VI and Frederick II. National epic, court epic and *Minnesang*—these three types of mediaeval German literature, to which may be added as a smaller group, didactic poetry, comprise virtually all that has come down to us in Middle High German A Middle High German prose hardly existed, and the drama, such as it was, was still essentially Latin.

The first place among the National epics belongs to the *Nibelungenlied,* which received its present form in Austria about the end of the 12th century Combining, as it does, elements from various cycles of sagas—the lower Rhenish legend of Siegfried, the Burgundian saga of Gunther and Hagen, the Gothic saga of Dietrich and Etzel—it is the representative epic of German mediaeval life. And in dramatic intensity and singleness of purpose it is the greatest of them all. Whoever the welder of the sagas may have been, he was clearly a poet of lofty imagination and high epic gifts (*see* NIBELUNGENLIED) Less imposing is the second of the German national epics, *Gudrun,* which, as it has come down to us, is the work of an Austrian; but the home of the saga is on the shores of the North sea Dietrich von Bern (*i e*, of Verona), or Theodoric the Great, who had been looked upon for hundreds of years by the German people as their national hero, has been celebrated in no epic comparable to the *Nibelungenlied,* but he appears in the background of a number of romances—*Die Rabenschlacht, Dietrichs Flucht, Alpharts Tod, Biterolf und Dietlieb, Laurin,* etc —which make up what is usually called the *Heldenbuch*

The court epic, or romance of chivalry, the influence of which is apparent on all these popular epics, forms the second great group of German mediaeval poetry The poet who established the court epic in Germany was Heinrich von Veldeke, a native of the lower Rhineland, his *Eneit,* written between 1175 and 1186, is based on a French original Other poets of the time, such as Herbort von Fritzlar, the author of a *Liet von Troye,* followed Heinrich's example, and selected French models for German poems on antique themes With the three masters of the court epic, Hartmann von Aue, Wolfram von Eschenbach and Gottfried von Strassburg—all of them contemporaries—the Arthurian cycle became the established theme of this type of romance, and the embodiment of the ideals of the knightly classes Hartmann was a Swabian, Wolfram a Bavarian, Gottfried presumably a native of Strasbourg Hartmann, in his *Erec* and *Iwein, Gregorius* and *Der arme Heinrich,* provided the Court epic of the age with its best models, he had, of all the mediaeval court poets, the most delicate sense of style Wolfram and Gottfried, on the other hand, represent two extremes of poetic temperament Wolfram's *Parzival* is filled with mysticism and obscure spiritual significance, while Gottfried's *Tristan* is as lucid in its style as Hartmann's *Iwein*

Parzival and *Tristan* are the greatest of the German court epics, and the subsequent development of that literary form stands under the influence of the three poets, Hartmann, Wolfram and Gottfried To the followers and imitators of Hartmann belong Ulrich von Zatzikhoven (*Lanzelet, c* 1195), Wirnt von Gravenberg, a Bavarian (*Wigalois, c* 1205), the versatile Spielmann, known as "Der Stricker", and Heinrich von dem Turlin, author of an unwieldy epic, *Die Krone* ("the crown of all adventures," *c* 1220) Wolfram's mysticism is to be seen in *Der jüngere Titurel* of a Bavarian poet, Albrecht von Scharfenberg (*c* 1270), and in the later *Lohengrin* of an unknown poet, whereas Gottfried von Strassburg dominates the *Flore und Blanscheflur* of Konrad Fleck (*c* 1220) and two chief poets of the later 13th century, Rudolf von Ems, who died in 1254, and Konrad von Wurzburg, who lived till 1287 Of these, Konrad alone carried on worthily the traditions of the great age, he excels in short romances like *Die Herzemaere* and *Engelhard,* but becomes diffuse and wearisome in his enormously long *Trojanerkrieg* and *Partonopier und Meliur.*

The most conspicuous changes which came over the narrative poetry of the 13th century were, on the one hand, a steady encroachment of realism on the matter and treatment of the epic, and, on the other, a tendency to didacticism Substituting the "fact" of the chronicle for the freer imaginings of the earlier poets is to be seen in the work of Rudolf von Ems, while the growth of realism appears in the *Pfaffe Amis,* a collection of comic anecdotes, the admirable peasant romance *Meier Helmbrecht,* written about 1250 in Bavaria, and in the adventures of Ulrich von Lichtenstein (*Frauendienst,* 1255, *Frauenbuch,* 1257)

In a higher degree than any of these epic poets, Walther von der Vogelweide summed up in himself all that was best in the group of poetic literature with which he was associated—the *Minnesang* or lyric; in love song high and low, in religious poetry, in patriotic and political *Sprüche*—in all he was a master He was born about 1170 and died about 1228, his art he learned in Austria—he calls the elegiac poet Reinmar von Hagenau his master—whereupon he wandered through South Germany, a wel-

come guest wherever he went although his championship of what he regarded as the national cause in the political struggles of the day won him foes as well as friends Of all Germany's lyric poets, he exerted the deepest influence, and in the originality and purity of his inspiration he is one of her greatest (*see* WALTHER VON DER VOGELWEIDE).

Amongst Walther's immediate contemporaries, highborn poets, whose lives were passed at courts, naturally cultivated the conventional lyric, but the more gifted and original singers of the time availed themselves of the freedom of Walther's poetry of uncourtly love. This was Walther's most valuable legacy to his successors, the greatest of whom was Neidhart von Reuental (*c.* 1180–*c.* 1250). Neidhart sought the themes of his *Hofische Dorfpoesie* in the village, and, as the mood happened to dictate, depicted the peasant with humorous banter or biting satire The lyric poets of the later 13th century were either echoes of Walther and Neidhart, or their originality was confined to some particular form of lyric poetry in which they excelled. On the whole, the *Spruchdichter* came best out of the ordeal of changing fashions; and the increasing interest in the moral and didactic applications of literature favoured the development of a new form of verse The *Spruchdichtung,* was in fact, the connecting link between the *Minnesang* of the 13th and the lyric and satiric poetry of the 15th and 16th centuries.

A utilitarian and didactic spirit was gradually taking the place of the idealism of chivalry In the early decades of the 13th century, *Der Winsbeke,* by a Bavarian, and *Der welsche Gast,* written in 1215–16 by Thomasin von Zirclaere, a native of Friuli, still inculcate the duties and virtues of the knightly life But in the *Bescheidenheit* (*c.* 1215–30) of a wandering singer, who called himself Freidank, we find for the first time an antagonism to the unworldly code of chivalry and a sign of the changing social order, brought about by the rise of what we now call the middle class Freidank is their spokesman In *Der Renner* by Hugo von Trimberg, written at the very end of the century, the terseness and wit of Freidank have given place to diffuse moralizing and allegory There is practically no Middle High German literature in prose

III. THE TRANSITION PERIOD (1350–1600)

To the End of the 15th Century.—By the middle of the 14th century, knighthood was rapidly declining, and the conditions under which mediaeval poetry had flourished were passing But the stories of chivalry still appealed as stories to the people, although the old way of telling them was no longer appreciated; the feeling for beauty of form and expression was lost Signs of the decadence are to be seen in a continuation of *Parzival* by two Alsatians, Claus Wisse and Philipp Colin (*c* 1335), and in an *Apollonius von Tyrus* by Heinrich von Neuenstadt (*c* 1315) The story of Siegfried was retold in a rough ballad, *Das Lied vom hurnen Seyfried,* the *Heldenbuch* was recast in *Knittelvers* or doggerel (1472), and even the Arthurian epic was parodied A no less marked symptom of decadence is to be seen in a large body of allegorical poetry analogous to the *Roman de la Rose* in France. As time went on, prose versions of the old stories became more general, and out of these developed the *Volksbucher,* which were the favourite reading of the German people for centuries As the last monuments of the decadent narrative literature of the middle ages, we may regard the *Buch der Abenteuer* of Ulrich Fuetrer, written at the end of the 15th century, and *Der Weisskonig* and *Teuerdank* by the emperor Maximilian I (1459–1519), printed in the early years of the 16th At the beginning of the new epoch the *Minnesang* could still point to two poets of distinction, Hugo von Montfort (1357–1423) and Oswald von Wolkenstein (1367–1445), but as the lyric passed into the hands of the middle-class poets of the German towns, its emotional sensitiveness gave place to moral and religious dogmatism; and the simple forms of the older lyric were superseded by ingenious metrical distortions. Under the influence of writers like Heinrich von Meissen ("Frauenlob," *c* 1250–1318), Heinrich von Mugeln and Michael Beheim (1416–*c.* 1480), the Minnesang passed over into the *Meistergesang.* In the later 15th and in the 16th centuries all the south German towns possessed flourishing Meistersinger schools in which the art of writing verse was taught and practised according to complicated rules

The great lyric poetry of these transition centuries was not the *Meistergesang,* but the *Volkslied* Never before or since has Germany been able to point to such a rich harvest of popular poetry as now Every form of popular poetry is to be found in the old collections—songs of love and war, hymns and drinking-songs, songs of spring and winter and historical ballads In prose the most popular form was the *Schwank* or comic anecdote Collections of such *Schwanke* range from the practical jokes of *Till Eulenspiegel* (1515), and the coarse witticisms of the *Pfaffe vom Kalenberg* (end of 14th century) and *Peter Leu* (1550), to the religious and didactic anecdotes of J. Pauli's *Schimpf und Ernst* (1522) and the more literary *Rollwagenbuchlein* (1555) of Jorg Wickram and the *Wendunmut* (1563 *seq*) of H W Kirchhoff Of the first importance is the *Narrenschiff* of Sebastian Brant (1457–1521), where the humorous anecdote became a vehicle of the bitterest satire It appeared in 1494, and is a landmark on the way that led to the Reformation. The beast fable and beast epic appealed with peculiar force to the new generation At the very close of the Middle High German period, Ulrich Boner revived the Aesopic fable in his *Edelstein* (1349), translations of Aesop in the following century added to the popularity of the fable (*q v*), and in the century of the Reformation it became, in the hands of Burkard Waldis (*Esopus,* 1548) and Erasmus Alberus (*Buch von der Tugend und Weisheit,* 1550), a favourite vehicle of satire and polemic A still more popular form of the beast fable was the epic of *Reinke de Vos,* which had been cultivated by Flemish poets in the 13th and 14th centuries and has come down to us in a Low Saxon translation, published at Lubeck in 1498

The drama, as we have seen, had practically no existence in Middle High German times As in all European literatures, it emerged slowly and with difficulty from the Church liturgy As time went on, the vernacular was substituted for the original Latin, and with increasing demands for pageantry, the scene of the play was removed to the churchyard or the market-place; the next step was an enlargement of the scope of the religious play to include legends of the saints, and finally we find a complete separation of the drama from ecclesiastical ceremony The most interesting example of this encroachment of the secular spirit is the *Spiel von Frau Jutten* by an Alsatian, Dietrich Schernberg, in 1480 Meanwhile, in the 15th century, a beginning was made to a drama entirely independent of the Church The mimic representations—originally allegorical in character—with which the people amused themselves at the great festivals of the year, were interspersed with dialogue, and performed on an improvised stage This was the beginning of the *Fastnachtsspiel* or Shrovetide-play. Amongst the earliest cultivators of this type of play were Hans Rosenplut (*fl. c.* 1460) and Hans Folz (*fl c* 1510), both of Nuremberg

The Age of the Reformation.—The coming of the Protestant Reformation was prepared by mysticism and humanism With Meister Eckhart (*c* 1260–1327), the most original of all the German mystics, with Heinrich Seuse or Suso (*c* 1300–66), and Johannes Tauler (*c* 1300–61), mysticism was an essentially personal interpretation of Christianity, and, as such, naturally conducive to the individual freedom of Protestantism To the mystics we owe the early translations of the Bible into German, one was printed at Strasbourg in 1466 Johann Geiler von Kaisersberg (1445–1510), a pupil of the humanists and a friend of Sebastian Brant, links up mysticism with humanism The latter was transplanted to German soil with the foundation of the University of Prague in 1348 but its immediate influence was restricted by the fact that the pre-Reformation humanists despised the vernacular and wrote only in Latin Thus although neither Johann Reuchlin of Pforzheim (1455–1522), nor the patriotic Alsatian, Jakob Wimpfeling (or Wimpheling) (1450–1528)—not to forget the great Dutch humanist Erasmus of Rotterdam (1466–1536)—has, strictly speaking, a place in the history of German literature, the battle of the humanists for liberalism in thought and scholarship cleared the way for a healthy national literature Moreover, to

humanistic stimulus we also owe many translations from the Latin and Italian, prominent among the translators being Niklas von Wyl (died *c* 1478), chancellor of Wurttemberg, and Albrecht von Eyb (1420–75)

Martin Luther (1483–1546), Germany's greatest man in this age of intellectual new-birth, demands a large share of attention in a survey of its literature; for Luther's translation of the Bible (1522–34) is, like the English Bible, a great literary monument. Well aware that this Bible must be the keystone to his work, he gave himself endless pains to produce a work German both in language and in spirit He chose, in respect of vocabulary and forms, his language so that it might be read without difficulty in wide circles of the population; and thus the Lutheran Bible became a factor of the first importance in unifying the speech of the nation As a hymn-writer (*Geistliche Lieder,* 1564), Luther was equally mindful of the importance of adapting himself to popular needs, and his hymns form the starting-point for a vast development of German religious poetry which was to culminate in the following century

The most virile literature of this age was inspired by religious strife Amongst Luther's henchmen, Philipp Melanchthon (1497–1560), the "praeceptor Germaniae," and Ulrich von Hutten (1488–1523) were powerful allies in his cause, although their intellectual sympathies inclined to the humanists The satirical dramas of Niklas Manuel (1484–1530), a Swiss Protestant, and the polemical fables of Erasmus Alberus (*c* 1500–53) were, however, insignificant compared with the fierce assault on Protestantism by the Alsatian monk, Thomas Murner (1475–1537), the most ruthless of all German satirists It was not until the following generation that the Protestant party could point to a writer who, in genius and power, was at all comparable to Murner, namely, Johann Fischart (*c* 1550–*c.* 1591) His chief work, the *Affentheuerliche Naupengeheurliche Geschichtklitterung* (1575), a Germanization of the first book of Rabelais' satire, is a witty and ingenious monstrosity, a satirical comment on the life of the 16th century. Other satirists were Bartholomaeus Ringwaldt (1530–1599) and Georg Rollenhagen (1542–1609), author of the *Froschmeuseler* (1595).

On the whole, the form of literature which succeeded best in extricating itself from religious polemics in the 16th century was the drama Protestantism proved favourable to its development, and the humanists, who had always prided themselves on their imitations of Latin comedy, introduced into it form and proportion The Latin school comedy in Germany was founded by Wimpfeling with his *Stylpho* (1470) and by J Reuchlin with his witty adaptation of *Maitre Pathelin* in his *Henno* (1498). In the 16th century the chief writers of Latin dramas were Thomas Kirchmair or Naogeorgus (1511–63), Caspar Brulow (1585–1627), and Nikodemus Frischlin (1547–90). In Basle, Pamphilus Gengenbach produced moralizing *Fastnachtsspiele* in 1515–16; and in Berne Niklas Manuel employed the same type of play for anti-Catholic propaganda The *Parabell vam vorlorn Szohn* by Burkard Waldis (1527), the many dramas on the subject of *Susanna*—notably those of Sixt Birck (1532) and Paul Rebhun (1535)—and Frischlin's German plays are attempts to treat Biblical themes on humanistic lines In another important literary centre of the 16th century, in Nuremberg, the drama developed on more indigenous lines Hans Sachs (1494–1576), the Nuremberg cobbler and Meistersinger, has left behind him a vast literary legacy, embracing every form of popular literature from *Spruch* and *Schwank* to complicated *Meistergesang* and lengthy drama But in the progressive movement of the German drama he played an even smaller rôle than his Swiss and Saxon contemporaries; for his tragedies and comedies are little more than stories in dialogue In the *Fastnachtsspiele,* where dramatic form is less essential than anecdotal point and brevity, he is at his best. At the close of the century the influence of the English drama—brought to Germany by English actors—introduced the dramatic and theatrical element which had hitherto been lacking in the German drama. This is to be seen in the work of Jakob Ayrer (d 1605) and Duke Heinrich Julius of Brunswick (1564–1613). But unfortunately these beginnings had hardly made themselves felt when the full current of the Renaissance swept across Germany, bringing in its train the Senecan tragedy. Then came the devastation of the Thirty Years' War, which made the creation of a popular and national theatre impossible.

The novel was less successful than the drama in emancipating itself from satire and religious controversy, Fischart was too dependent on foreign models and too erratic to create a national form of German fiction. The most important novelist was a much less talented writer, the Alsatian Meistersinger and dramatist Jorg Wickram (d *c* 1560), who has been already mentioned as the author of a popular collection of anecdotes, the *Rollwagenbuchlein.* His *Der Knabenspiegel* (1554) and *Der Goldfaden* (1557), are in form, and especially in the importance they attach to psychological developments, the forerunners of the modern German novel But Wickram stands alone The old *Volksbucher* were the real novels of the Reformation age; and none of these affords clearer insight into its temper and spirit than the famous story of the magician *Doctor Johann Faust,* published at Frankfurt in 1587.

IV. THE RENAISSANCE (1600–1740)

The 17th century in Germany presents a complete contrast to its predecessor; the fact that it was the century of the Thirty Years' War, which devastated the country, crippled the prosperity of the towns, and threw back by many generations the social development of the people, explains much, but it can hardly be held entirely responsible for their intellectual apathy and slavery to foreign customs and foreign ideas

There were, however, some branches of German poetry which escaped this foreign influence The Church hymn, continuing the great Lutheran traditions, shows extraordinary richness both in quality and quantity Paul Gerhardt (1607–76), the greatest German hymn-writer, was only one of many Lutheran pastors who in this age contributed to the German hymnal On the Catholic side, Angelus Silesius (Johann Scheffler, 1624–77) showed what a wealth of poetry lay in the mystic speculations of Jakob Boehme, the gifted shoemaker of Gorlitz (1575–1624), while Friedrich von Spee (1591–1635), another leading Catholic poet of the century, cultivated the pastoral allegory of the Renaissance The revival of mysticism associated with Boehme gradually spread through the whole religious life of the 17th century Besides the hymn, the *Volkslied,* which amidst the struggles and confusion of the great war bore witness to a steadily growing sense of patriotism, developed in its own way But all else—if we except certain forms of fiction—stood completely under the influence of the Baroque

The first focus of the Renaissance literature was Heidelberg, where, under the leadership of J. W Zincgref (1591–1635), a number of scholars carried into practice that interest in the vernacular which had been shown a little earlier by the German translator of Marot, Paul Schede or Melissus (1539–1602) G R Weckherlin (1584–1653), a native of Wurttemberg who had spent the best part of his life in England, wrote *Oden und Gesänge* (1618–19) of great promise But the greatest, or at least the most influential writer of this group was Martin Opitz (1597–1639) He was a native of Silesia and, as a student in Heidelberg, came into touch with Zincgref's circle; subsequently, in the course of a visit to Holland, a more definite trend was given to his ideas by the example of the Dutch poet and scholar, Daniel Heinsius As a poet, Opitz experimented with every form of Renaissance poetry, and with his *Buch von der deutschen Poeterey* (1624) he gave the German Renaissance its theoretical textbook In this tract, in which Opitz reproduced in German the doctrines of Scaliger and Ronsard, he not merely justified his own mechanical verse-making, but also gave Germany a law-book which regulated her literature for 100 years.

The work of Opitz as a reformer was furthered by another institution of foreign origin, namely, literary societies modelled on the *Accademia della Crusca* in Florence These societies, of which the chief were the *Fruchtbringende Gesellschaft* or *Palmenorden* (founded 1617), the *Elbschwanenorden* in Hamburg and the *Gekronter Blumenorden an der Pegnitz* or *Gesellschaft*

der Pegnitzschafer in Nuremberg, were the centres of literary activity during the unsettled years of the war. Although they produced much that was trivial, these societies also did German letters an invaluable service by their attention to the language, one of their chief objects being to purify it from foreign and un-German ingredients J G Schottelius (1612–76) wrote his important grammatical works to further the objects of the *Fruchtbringende Gesellschaft.* Meanwhile the poetic centre of gravity in Germany had shifted from Heidelberg to Konigsberg, where a group of academic poets gave practical expression to the Opitzian theory. Chief among them were Simon Dach (1605–59), a gentle, elegiac writer on whom the laws of the *Buch von der deutschen Poeterey* did not lie too heavily, and the more manly and vigorous Paul Fleming (1609–40)

Satire was cultivated by two Low German poets, J. Lauremberg (1590–1658) and J Rachel (1618–69), of whom at least the latter was accepted by the Opitzian school, but there is satire, too, in the powerful and scathing sermons of J B Schupp (1610–61), an outspoken Hamburg preacher, and in the scurrilous wit of the Viennese monk Abraham a Sancta Clara (1644–1709), who had inherited something of his predecessor Murner's gift Most gifted of all the Silesian group of writers is Friedrich von Logau (1604–55), Germany's greatest epigrammatist Logau's 3,000 epigrams (*Deutsche Sinngedichte,* 1654) reflect admirably the intellectual temper of their age

The chief dramatist of the Renaissance movement is Andreas Gryphius (1616–64) Like Opitz, Gryphius was a Silesian, and a poet of no mean ability, as is to be seen from his lyric poetry, but his tragedies, modelled on the stiff Senecan pattern, suffered from his ignorance of the more highly developed drama of France, not to speak of England, his models were Dutch. In the field of comedy, he was less hampered, and his *Horribilicribrifax* and *Herr Peter Squentz*—the latter an adaptation, probably through a Dutch intermediary, of the comic scenes of the *Midsummer Night's Dream*—are the best German plays of the 17th century

The German novel of the 17th century was largely a product of foreign influence, Spanish and French *Don Quixote* had been partly translated early in the century and the picaresque romance had found its way to Germany still earlier; while H M Moscherosch (1601–69) in his *Gesichte Philanders von Sittewald* (1642–43) made the *Sueños* of Quevedo the basis for vivid pictures of the life of the time, interspersed with satire The best German novel of the 17th century, *Der abenteurliche Simplicissimus* (1669) by H J Christoffel von Grimmelshausen (*c* 1625–76), is picaresque, but it owed little more than its form to the Spaniards It is in great measure the autobiography of its author, and describes with uncompromising realism the social disintegration and the horrors of the Thirty Years' War But this remarkable book stands alone Christian Weise (1642–1708), rector of the Zittau gymnasium, wrote a few satirical novels, but his realism and satire are too obviously didactic He is seen to better advantage in his dramas, of which he wrote more than 50 for performance by his scholars

The real successor of *Simplicissimus* in Germany was the English *Robinson Crusoe,* a novel which, on its appearance, was immediately translated into German (1721), it called forth hundreds of imitations, the vogue of which is even still kept alive by *Der schweizerische Robinson* of J R Wyss (1812 *seq*) With the exception of J G Schnabel's *Insel Felsenburg* (1731–43), the literary value of these imitations is slight; but they represented a healthier and more natural development than the "gallant" novels of French provenance, written by writers like Philipp von Zesen (1619–89), Duke Anton Ulrich of Brunswick (1633–1714), A H Buchholtz (1607–71), H A von Ziegler (1653–97)—author of the famous *Asiatische Banise* (1688)—and D C von Lohenstein (1635–83). The last mentioned and Christian Hofmann von Hofmannswaldau (1617–79) are regarded as the leaders of a "second Silesian school," opposed to the first school of Opitz They cultivated the bombastic and Euphuistic style of the Italians Guarini and Marini, and of the Spanish writer Góngora

But this aberration of taste was of short duration Although socially the recovery of the German people from the desolation of the war was slow and laborious, the intellectual life of Germany was rapidly recuperating Samuel Pufendorf (1632–94), Christian Thomasius (1655–1728), Christian von Wolff (1679–1754) and, above all, Gottfried Wilhelm Leibnitz (1646–1716), the first of the great German philosophers, laid the foundations of rationalism; while German religious life was strengthened and enriched by a revival of pietism, under mystic thinkers like Philipp Jakob Spener (1635–1705), a revival which left its traces on religious poetry The so-called "court poets"—Rudolf von Canitz (1654–99), Johann von Besser (1654–1729) and Benjamin Neukirch (1665–1729)—substituted the "good taste" of Boileau for the extravagance of Marini, and from their midst sprang one lyric poet, Johann Christian Gunther (1695–1723), of high gifts In Hamburg, where the Italian opera kept the decadent Renaissance poetry alive, the incisive epigrams of Christian Wernigke (1661–1725) provided an effective antidote; and Barthold Heinrich Brockes (1680–1747), who had been deeply impressed by English nature-poetry, gave the artificiality of the Silesians its death-blow Translations and imitations of the English *Spectator, Tatler* and *Guardian*—the so-called *Moralische Wochenschriften*—helped to regenerate literary taste, and implant healthy moral ideas in the German middle classes Between 1724 and 1740 Johann Christoph Gottsched (1700–66) succeeded in establishing in Leipzig, then the metropolis of German taste, literary reforms in accord with French 17th-century classicism He purified the stage by abolishing irrelevant buffoonery, and provided it with a repertory largely of French origin, and in his *Kritische Dichtkunst* (1730) he laid down the principles according to which good literature was to be produced and judged With Gottsched the period of German Renaissance literature reaches its culmination and at the same time its close

V. THE CLASSICAL AND ROMANTIC PERIOD (1740–1832)

From the Swiss Controversy to the "Sturm und Drang." —As in France, the next advance in German literature was achieved in a battle between the "ancients" and the "moderns," the German "ancients" being represented by Gottsched, the "moderns" by the Swiss literary reformers, J J Bodmer (1698–1783) and J J Breitinger (1701–76) The latter in his *Kritische Dichtkunst* (1739) maintained doctrines which were in opposition to Gottsched's in his treatise of the same name, and Bodmer supported his friend's initiative Basing their arguments on Milton's *Paradise Lost,* which Bodmer had translated into prose (1732), the Swiss demanded room for the play of genius and inspiration; they insisted that the imagination should not be dominated by the reason Their victory was due less to any skill with which they presented their arguments than to the fact that literature itself was in need of greater freedom The effects of the controversy appear in a group of Leipzig writers of Gottsched's own school, the *Bremer Beitrager* as they usually are called after their literary organ These men—C F Gellert (1715–69), author of graceful fables and tales in verse, G W Rabener (1714–71), mild satirist of Saxon provinciality, the dramatist J Elias Schlegel (1719–49), and a number of minor writers—did not set themselves up in active opposition to their master, but they were in sympathy with many of the views which the Swiss had advocated And in the *Bremer Beitrage* there appeared in 1748 the first instalment of an epic by F G Klopstock (1724–1803), *Der Messias* These first cantos of Klopstock's epic, and in a still higher degree, his *Odes,* inaugurate the great age of German literature in the 18th century His rhapsodic dramas have less value, but with Macpherson's *Ossian,* which in the '60s awakened a widespread enthusiasm throughout Germany, they were responsible for the so-called "bardic" movement The leaders of this movement were H W von Gerstenberg (1737–1823), K F Kretschmann (1738–1809) and Michael Denis (1729–1800)

Under Frederick the Great, who, as the docile pupil of French culture, had little sympathy for unregulated displays of feeling, neither Klopstock nor his imitators were in favour in Berlin, but at the University of Halle considerable interest was taken in the new movement Here, before Klopstock's name was known

at all, two young poets, J I. Pyra (1715–44) and S G. Lange (1711–81), wrote *Freundschaftliche Lieder* (1737) in rhymeless metres such as Klopstock advocated The later Prussian poets, J W. L. Gleim (1719–1803), J P. Uz (1720–96) and J N Gotz (1721–81), who were associated with Halle, and K W Ramler (1725–98) in Berlin, cultivated mainly the Anacreontic and the Horatian ode, and Friedrich von Hagedorn (1708–54) in Hamburg showed to what perfection the lighter *vers de société* could be brought. The Swiss physiologist Albrecht von Haller (1708–77) was the first German poet to give expression to the beauty and sublimity of Alpine scenery (*Die Alpen,* 1734), and a Prussian officer, Ewald Christian von Kleist (1715–59), author of *Der Fruhling* (1749), wrote admirable nature-poetry

As Klopstock had been the first of modern Germany's inspired poets, so Gotthold Ephraim Lessing (1729–81) was the first critic who brought credit to the German name throughout Europe Like his predecessor Gottsched, whom he vanquished more effectually than Bodmer, he had unwavering faith in classicism, but "classic" meant for him, as for his contemporary, J J Winckelmann (1717–68), Greek art and literature, not French pseudoclassicism He went, indeed, still further, and asserted in his *Hamburgische Dramaturgie* (1767–68) that Shakespeare, with all his irregularities, was a more faithful observer of the spirit of Aristotle's laws, than were the French dramatists He looked to England and not to France for the regeneration of the German theatre, and his own dramas were pioneer-work in this direction *Miss Sara Sampson* (1755) is a *burgerliches Trauerspiel* on the English model, *Minna von Barnhelm* (1767), a comedy in the spirit of Farquhar; in *Emilia Galotti* (1772), again, he remoulded the "tragedy of common life" in a form acceptable to the *Sturm und Drang;* and finally in *Nathan der Weise* (1779) he won acceptance for iambic blank verse as the medium of the higher drama His two most promising disciples—J F von Cronegk (1731–58) and J W von Brawe (1738–58)—unfortunately died young, but another of his friends, C F. Weisse (1726–1804) was the most successful playwright of his day. Lessing's name is associated with Winckelmann's in *Laokoon* (1766), a treatise which defines the boundaries between plastic art and poetry, and with those of the Jewish philosopher, Moses Mendelssohn (1729–86) and the Berlin bookseller C F Nicolai (1733–1811) in the famous *Literaturbriefe* The last years of Lessing's life were embittered by conflict with Lutheran orthodoxy and intolerance

To the widening of the German imagination C M Wieland (1733–1813) contributed by introducing the Germans to the lighter poetry of the south of Europe With the exception of his verse-romance *Oberon* (1780), his work has fallen into neglect; he did, however, excellent service to the development of German prose fiction with his psychological novel, *Agathon* (1766–67), and with his humorous satire, *Die Abderiten* (1774) Wieland had a considerable following, particularly in Austria, where Aloys Blumauer (1755–89) and J B von Alxinger (1755–97) wrote travesties and epics under his influence In Saxony, M A von Thummel (1738–1817), author of a comic epic in prose, *Wilhelmine* (1764), belonged to Wieland's school It was K A Kortum (1745–1824), however, who wrote the most popular comic epic of the time, the *Jobsiade* (1784) The German novel owed much to the example of *Agathon,* but the groundwork and form were borrowed from English models, Gellert had begun by imitating Richardson in his *Schwedische Grafin* (1747–48), and he was followed by J T Hermes (1738–1821), Sophie von Laroche (1730–1807), A von Knigge (1752–96) and J K A Musaus (1735–87), the last mentioned being, however, better known as the author of a collection of *Volksmarchen* (1782–86) Meanwhile rationalism was spreading rapidly Men like Knigge, Mendelssohn, J G Zimmermann (1728–95), T G von Hippel (1741–96), Christian Garve (1742–98), J J Engel (1741–1802), as well as the educational theorists J B. Basedow (1723–90) and J H. Pestalozzi (1746–1827), wrote books and essays on "popular philosophy" which were as eagerly read as had been the *Moralische Wochenschriften;* and with this group of writers must also be associated the most brilliant of German 18th-century satirists, G C Lichtenberg (1742–99)

Such was the *milieu* from which sprang the most stimulating pioneer of the great epoch of modern German literature, J. G. Herder (1744–1803) The transition from the popular philosophers to Herder is represented by men like Thomas Abbt (1738–66) and J. G. Hamann (1730–88) The revolutionary nature of Herder's thought lay in the fact that he grasped, as no thinker before him, the idea of historical evolution, and awakened an interest—for which, of course, Rousseau had prepared the way—in the primitive conditions of mankind He collected and published the *Volkslieder* of all nations (1778–79), and drew attention to those elements in German life and art which were, in the best and most precious sense, national Herder is thus the real founder of the literary movement known as *Sturm und Drang* New ground was also broken by a group of poets, who, under Klopstock's influence, founded in 1772 the Gottingen "Bund" or "Hain," and published their poetry in the *Gottinger Musenalmanach.* With the exception of the two brothers, Chr zu Stolberg (1748–1821) and F L zu Stolberg (1750–1819), the members of this coterie belonged to the peasant class or the lower *bourgeoisie;* J H Voss (1751–1826), the leader of the "Bund," and author of the famous idyll, *Luise* (1784), was a typical North German peasant L H C Holty (1748–76) and J M Miller (1750–1814), again, excelled in simple lyrics in the tone of the *Volkslied* Closely associated with the Gottingen group were M Claudius (1740–1815), an even more unassuming representative of the German peasant in literature than Voss, and G A Burger (1748–94) who contributed to the *Gottinger Musenalmanach* the famous ballad of *Lenore* (1774)

But the Gottingen "Bund" was only a minor phase of *Sturm und Drang;* the main movement was intimately associated with Johann Wolfgang Goethe (1749–1832) As a student in Leipzig (1765–68), Goethe had written lyrics in the Anacreontic vein and dramas in alexandrines, but in Strasbourg, where he continued his studies in 1770–71, he made the personal acquaintance of Herder, who interested him in Gothic architecture, the *Volkslied* and Shakespeare The pamphlet *Von deutscher Art und Kunst* (1773), to which, besides Goethe and Herder, the historian Justus Moser (1720–94) contributed, was a kind of manifesto of *Sturm und Drang* The new ideas seemed at once to set Goethe's genius free, and from 1772 to 1775 he was extraordinarily fertile in poetic ideas His *Gotz von Berlichingen* (1773), the first important drama of the *Sturm und Drang,* was followed within a year by the first novel of the movement, *Werthers Leiden* (1774), he dashed off *Clavigo* and *Stella* in a few weeks in 1774 and 1775, and wrote a large number of *Singspiele,* dramatic satires and fragments—including *Faust* in its earliest form (the so-called *Urfaust*)—not to mention matchless lyrics which more than fulfilled the promise of Klopstock's *Odes* In all forms of literature he set the fashion to his time, the Shakespearian restlessness of *Gotz von Berlichingen* found imitators in J M R Lenz (1751–92), F. M. von Klinger (1752–1831), J A Leisewitz (1752–1806), H L Wagner (1747–79) and Friedrich Muller, better known as Maler Muller (1749–1825) The dramatic literature of the *Sturm und Drang* was its most characteristic product—indeed, the very name of the movement was borrowed from a play by Klinger, it was inspired by the desire to present upon the stage figures of Shakespearian grandeur impelled by gigantic passions, all considerations of plot, construction and form being subordinated to character The fiction of the *Sturm und Drang,* again, was in its earlier stages dominated by *Werthers Leiden,* as may be seen in the novels of F H Jacobi (1743–1819) and J M Miller, who has been already mentioned Later, it was developed in a broader and less turbulent spirit by J J W. Heinse (1749–1803), author of *Ardinghello* (1787), Klinger and K Ph Moritz (1757–93), whose *Anton Reiser* (1785) foreshadows *Wilhelm Meister*

With the production of *Die Rauber* (1781) by Johann Friedrich Schiller (1759–1805), the drama of the *Sturm und Drang* entered upon a new phase Schiller's tragedy was more skilfully adapted than those of his predecessors to the exigencies of the theatre, it and the succeeding dramas, *Fiesco* and *Kabale und Liebe*—all three in prose—were masterpieces of high promise. In

his fourth drama, *Don Carlos* (1787), he abandoned prose for iambic blank verse Other eminent dramatists of this period were O. von Gemmingen (1755–1836), an imitator of Diderot, F. L Schröder (1744–1816) and A W Iffland (1759–1814), the two latter the greatest actors of their time Germany owes to the *Sturm und Drang* her national theatre; permanent theatres were established in these years at Hamburg, Mannheim, Gotha and at Vienna, the Hofburgtheater was founded in 1776

Classicism.—The *Sturm und Drang* soon exhausted itself. For Goethe this phase in his development came to an end with his departure for Weimar in 1775, while, after *Don Carlos,* Schiller turned aside from poetry to study history and philosophy; not until the very close of the century did he, under the stimulus of Goethe's friendship, return to the drama The first ten years of Goethe's life in Weimar were comparatively unproductive, at the Weimar court, where classic or even pseudoclassic tastes prevailed, he was gradually finding his way to a new poetic form But he did not arrive at clearness in his ideas until after his sojourn in Italy (1786–88), an episode of the first importance for his mental development. Italy was, in the first instance, a revelation to Goethe of the antique, here he conceived that ideal of a classic literature, which for the next 20 years dominated German literature In Italy he gave *Iphigenie auf Tauris* (1787) its final form, he completed *Egmont* (1788)—like the exactly contemporary *Don Carlos* of Schiller, a kind of bridge from *Sturm und Drang* to classicism—and began *Torquato Tasso* (1790) *Wilhelm Meisters Lehrjahre* (1795–96), Goethe's most important novel, which had been originally concerned only with the theatre, becomes now a book on the conduct of life

Before *Wilhelm Meister* appeared, however, German thought and literature had arrived at that stability in form and ideas essential to a great literary period In the year of Lessing's death, 1781, Immanuel Kant (1724–1804), the great philosopher, had published his *Kritik der reinen Vernunft,* and this, together with the two later treatises, *Kritik der praktischen Vernunft* (1788) and *Kritik der Urteilskraft* (1790), placed the Germans in the front rank of thinking nations Under the influence of Kant, Schiller turned to the study of aesthetics, the first fruits of which were his wonderful philosophic lyrics, and his treatises *Anmut und Wurde, Asthetische Erziehung des Menschen* (1795), and *Über naive und sentimentalische Dichtung* (1795) In the same way, German historical writing had in these years, led by men like Justus Möser, Thomas Abbt, I. Iselin, F C Schlosser, Schiller himself and, greatest historian of all, Johannes von Muller (1752–1809), advanced from unsystematic chronicling to scientific method G A Forster (1754–94), who had accompanied Cook round the world, and Alexander von Humboldt (1769–1859), gave Germany models of lucid descriptive writing In practical politics and economics, once the unbalanced doctrines of Rousseauism had fallen into discredit, Germany produced much wise and temperate thinking which provided a basis for the reconstruction of her social and intellectual life Prominent amongst such builders was Wilhelm von Humboldt (1767–1835)

Meanwhile the years 1794–1805, when in Jena and Weimar Goethe and Schiller were united by a close friendship, mark the culmination of literary classicism. Schiller's treatises provided a theoretical basis, his new journal, *Die Horen,* and his *Musenalmanach*—in which the two poets published their magnificent ballad poetry—were its literary organs Goethe, as director of the ducal theatre, influenced the whole dramatic production of Germany. Under his encouragement, Schiller turned from philosophy to poetry and wrote the splendid series of classic dramas, the trilogy of *Wallenstein, Maria Stuart, Die Jungfrau von Orleans, Die Braut von Messina, Wilhelm Tell,* closing with the fragment of *Demetrius;* while to Goethe we owe the idyllic epic of *Hermann und Dorothea;* his severely classical plays *Die naturliche Tochter* and *Pandora* are less important, but it was chiefly owing to Schiller's stimulus that in those years Goethe brought the first part of *Faust* (1808) to a conclusion.

Although acknowledged leaders of German letters, Goethe and Schiller met with considerable opposition, representatives of the once dominant rationalistic movement being particularly obnoxious. But, apart from the two great poets, literature was in no very healthy condition; the stage was dominated by the extraordinarily popular plays of A von Kotzebue (1761–1819), and there is a wide gap between Moritz's *Anton Reiser* or the philosophic novels which Klinger wrote in his later years, and Goethe's *Meister;* nor can the once so warmly admired novels of Jean Paul Friedrich Richter (1763–1825) stand very high In lyric and epic poetry, it is impossible to regard poets like the gentle F von Matthisson (1761–1831), or the less inspired G. L. Kosegarten (1758–1818) and C A. Tiedge (1752–1841), as worthy of an age that produced Goethe and Schiller Thus when we speak of the greatness of Germany's classical period, we think mainly of the work of her two chief poets Moreover, at the very close of the 18th century a new unclassical movement set in, and to this movement, which took definite form in the Romantic school, the sympathies of the younger generation turned

The Romantic Movement.—The first Romantic school was founded in 1798, not so much as a protest against the classicism of Weimar, with which its leaders were in essential sympathy, as against the utilitarian rationalism of Berlin Ludwig Tieck (1773–1853), a leading member of the school, was in reality a belated *Sturmer und Dranger,* who in his early years had chafed under the tastes of the Prussian capital Friedrich Holderlin (1770–1843), one of the most gifted poets of this age, demonstrates no less clearly than Tieck the essential affinity between *Sturm und Drang* and Romanticism The theoretic basis of Romanticism was laid down by the two brothers, August Wilhelm and Friedrich Schlegel (1767–1845 and 1772–1829), who, accepting, in great measure, Schiller's aesthetic conclusions, adapted them to their own needs While the older school had insisted on the critic's right to sit in judgment according to a definite code of principles, these Romantic critics maintained that the first duty of criticism was to understand and appreciate; the right of genius to follow its natural bent was sacred The *Herzensergiessungen eines kunstliebenden Klosterbruders* by Tieck's school-friend W H Wackenroder (1773–98) contained the Romantic art-theory, while the hymns and fragmentary novels of Friedrich von Hardenberg (known as Novalis, 1772–1801), were, with the dramas and fairy tales of Tieck, the representative products of this phase of Romantic literature The universal sympathies of the movement were exemplified by the many admirable translations—greatest of all, Schlegel's *Shakespeare* (1797–1810)—which were produced under its auspices J G Fichte (1762–1814) and to a much greater extent, F W J von Schelling (1775–1854) were the exponents of the Romantic doctrine in philosophy, while the theologian F E D Schleiermacher (1768–1834) demonstrated how vital its individualism was for religious thought

The first Romantic school was of short duration; Wackenroder and Novalis died young, and by the year 1804 the other members were widely separated Two years later, however, another phase of Romanticism was initiated in the town of Heidelberg. The leaders of this second Romantic school were Klemens Brentano (1778–1842), L A von Arnim (1781–1831) and J J von Gorres (1776–1848); their organ, corresponding to the *Athenaum* of the first school, was the *Zeitung fur Einsiedler,* or *Tröst-Einsamkeit,* and their most characteristic production the collection of *Volkslieder,* published under the title *Des Knaben Wunderhorn* in 1805–08 Compared with the earlier school, the Heidelberg writers were more practical, they, too, were interested in the German past, but they put aside the idealizing glasses of their predecessors and kept to historic fact; they wrote historical novels, not stories of an imaginary mediaeval world as Novalis had done, and they collected *Volkslieder* and *Volksbucher* Their immediate influence on German intellectual life was consequently greater; they stimulated the interest of the German people in their history; and we owe to them the foundations of the study of German philology and mediaeval literature, both the brothers Jakob and Wilhelm Grimm (1785–1863 and 1786–1859) having been in touch with this circle in their early days Again, the Heidelberg poets strengthened the national and patriotic spirit of their people; they prepared the way for the rising against

Napoleon in 1813, which produced an outburst of patriotic song, the chief voices being those of E M Arndt (1769–1860), K. Th Körner (1791–1813) and M von Schenkendorf (1783–1817).

The subsequent history of Romanticism stands in close relation to the Heidelberg school, and when, about 1809, the latter broke up, and Arnim and Brentano settled in Berlin, the Romantic movement followed two clearly marked lines of development, one North German, the other associated with Wurttemberg. In the north Heinrich von Kleist (1777–1811), Prussia's greatest dramatic poet, created a Romantic drama of high poetic achievement; while Zacharias Werner (1768–1823), an undisciplined and unbalanced dramatic genius, sounded depths of mysticism and fatalism. But Berlin was no favourable soil for the development of Romantic ideas, and the circle of poets there were not free from elements of decadence. Friedrich de la Motte Fouqué (1777–1843), for instance, shows how easy it was for the mediaeval tastes of the Romanticists to be satisfied with mediocre novels and plays; and E T. A Hoffmann (1776–1822), novelist of indubitable genius though he was, cultivated with preference in his stories a morbid supernaturalism The lyric was less sensitive to this decadence; and the North German Romantic circle could point to one lyric poet of the very first rank, the Silesian, J. von Eichendorff (1788–1857); while A. von Chamisso (1781–1838), French-born although he was, developed into a German poet of the purest water. Others again, like Friedrich Ruckert (1788–1866), sought new inspiration in the poetry of the East, and Wilhelm Muller (1794–1827) following Byron's example, stirred German sympathy for the oppressed Greeks and Poles.

The last phase of Romanticism is represented by the Swabian school. Its chief representative, Ludwig Uhland (1787–1862), himself a disciple of the Heidelberg school, grafted the lyricism of the Romantic school on to the older traditions of German poetry, and as a ballad-poet is second only to Schiller in popular esteem. One might say that the mission of the Swabian circle, the chief members of which were J Kerner (1786–1862), G Schwab (1792–1850), W. Waiblinger (1804–30), W. Hauff (1802–27) and, most gifted of all, E Morike (1804–75) was to preserve the Romantic traditions from the disintegrating influences to which their North German contemporaries were exposed in the next generation

Meanwhile, in the background of these phases of Romantic evolution stands the majestic figure of Goethe Personally he had in the early stages of the movement been opposed to that reversion to subjectivity and lawlessness which the first Romantic school seemed to him to represent; to the end of his life he regarded himself as a "classic," not a "romantic" poet But, on the other hand, he was too liberal-minded a thinker and critic to be oblivious to the fruitful influence of the new movement His own works, above all, the first part of *Faust* (1808), *Die Wahlverwandtschaften* (1809), *Dichtung und Wahrheit* (1811–14, a final volume in 1833), *Westöstlicher Divan* (1819), *Wilhelm Meisters Wanderjahre* (1821–29) and the second part of *Faust* (published in 1832 after his death), stood in no real antagonism to the Romantic ideas of their time One might rather say that Goethe was the link between the two great literary groups; and that his work represented reconciliation between "classic" and "romantic" ideas.

VI. GERMAN LITERATURE SINCE GOETHE (1832–1928)

Young Germany.—With Goethe's death a great age in German poetry came to a close Long before 1832 Romanticism had begun to lose ground, and the French July revolution of 1830 virtually brought the movement to an end In philosophy Schelling had given place to G. W F Hegel (1770–1831), now the dominant force in German philosophy; and the Hegelian metaphysics proved a less fruitful influence on literature than that of Fichte and Schelling The transference of Romantic ideas to religion and politics had led to reaction, Romanticism became the cloak for a kind of Neocatholicism, and Romantic politics, as enunciated by men like F. von Gentz (1764–1832) and Adam Muller (1779–1829) was an apology for the Metternich régime in Austria. Only at the universities—in Göttingen, Heidelberg and Berlin—did the movement continue, in the best sense, to be productive; German philology, German historical science and German jurisprudence benefited by Romantic ideas, long after Romantic poetry had been superseded. The day of Romanticism was over; but a return to the classic and humanitarian spirit of the 18th century was impossible. The social condition of Europe had been profoundly altered by the French Revolution, the rise of industrialism had created new economic problems, the march of science had overturned old prejudices. The leadership in literature passed to the un-romantic school of "Young Germany."

The new school was called into existence by political persecution: in Dec. 1835 the German "Bund" issued a decree suppressing the writings of Heinrich Heine, Karl Gutzkow, Ludolf Wienbarg, Theodor Mundt and Heinrich Laube Of these men, Heine (1797–1856) is by far the most famous He had made his reputation in 1826 and 1827 with *Die Harzreise* and his *Buch der Lieder,* both of which show how deeply he was immersed in the Romantic traditions. The *Buch der Lieder* is, in fact, one of the greatest of German song-books. But Heine felt more acutely than any other man of his time how the ground was slipping away from beneath his feet; he hailed the July revolutions as the first stage in the "liberation of humanity", and sought in France the freedom and intellectual stimulus which Germany withheld from him But these sympathies were always counteracted by doubts whether, after all, life had not been better in that old Romantic Germany of his childhood for which, to the last, he retained so warm an affection. To these doubts were added bitter disappointments and the excruciating tragedy of his "mattress grave", the gifted poet and satirist were often overshadowed by the cynic.

Heine's contemporary and fellow-fighter, Ludwig Borne (1786–1837), was a more whole-hearted representative of the "Young German" point of view, and his brilliant *Briefe aus Paris* (1830–33) form a landmark in the development of German prose style. Karl Gutzkow (1811–78) had become a man of letters under the influence of the July revolution, and in an early novel, *Wally, die Zweiflerin* (1835), then regarded as atheistic and immoral, he fought for the new ideas His best literary work was the comedies with which he enriched the German stage of the '40s, and the long novels *Die Ritter vom Geiste* (1850–51), and *Der Zauberer von Rom* (1858–61) Heinrich Laube (1806–84), also the author of social novels and *Reisenovellen* in the style of Heine's *Reisebilder,* was another of the leaders of the new movement; but he is best remembered as Germany's greatest theatre manager: his directorship (1850–67) of the Burgtheater of Vienna forms one of the most brilliant periods in the history of the modern stage. The scholarship and learning of this period were strongly infused with Hegelianism, the leading spirits being D F Strauss (1808–74), author of the *Leben Jesu* (1835), the historians G G Gervinus (1805–71) and W Menzel (1798–1873), and the philosopher L A. Feuerbach (1804–72).

Outside the circle of "Young Germany," efforts were being made to keep alive the Romantic tradition, or provide a surrogate for it. The historical novel, for instance, which Romanticists like Arnim had cultivated, fell at an early date under the influence of Sir Walter Scott; Wilhelm Hauff, Heinrich Zschokke (1771–1848) and K. Spindler (1796–1855) were the most prominent amidst the many imitators of the Scottish novelist The drama, too, was endeavouring to adapt itself to the new horizons. In Germany its representatives were either unbalanced geniuses such as C D Grabbe (1801–36), or poets with too little theatrical blood in their veins like K L Immermann (1796–1840), or with too much, like E von Raupach (1784–1852), K von Holtei (1798–1880) and Adolf Mullner (1774–1829)—the last named being the chief representative of the so-called "fate-tragedy" But in Austria the developments were more promising For Austria possessed one dramatic poet of the highest rank, Franz Grillparzer (1791–1872) More successfully than any other dramatist of his time, Grillparzer carried out that task which Kleist had first seriously faced, the reconciliation of the classicism of Goethe and Schiller with the Romantic and modern spirit His *Sappho* (1818), *Das goldene Vliess* (1820), *König Ottokars Glück und Ende* (1825), *Der Traum, ein Leben* (1834) and *Des Meeres und der Liebe Wellen* (1831), are works of high rank. E. F. J. von Münch-Bellinghausen (1806–71), Grillparzer's more popular con-



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GERMAN PHILOSOPHERS AND WRITERS

1. Martin Luther (1483–1546)
2. Immanuel Kant (1724–1804)
3. Gottfried Wilhelm von Leibnitz (1646–1716)
4. Gotthold Ephraim Lessing (1729–81)
5. Johann Wolfgang von Goethe (1749–1832)
6. Georg Wilhelm Friedrich Hegel (1770–1831)
7. Heinrich Heine (1797–1856)
8. Johann Christoph Friedrich von Schiller (1759–1805)
9. Arthur Schopenhauer (1788–1860)
10. Friedrich Nietzsche (1844–1900)
11. Gerhart Hauptmann (1862–
12. Hermann Keyserling (1880–

temporary, who wrote under the pseudonym of Friedrich Halm, is now unread Other Austrian dramatists are E. von Bauernfeld (1802–90), who wrote some admirable comedies, and F. Raimund (1790–1836) and J. Nestroy (1801–62), who cultivated the popular Viennese fairy-play and farce

The transitional character of the age is best illustrated by K. L Immermann, already mentioned, and A von Platen-Hallermunde (1796–1835) Immermann's dramas had little success in the theatre, but one at least, *Merlin* (1832), is a dramatic poem of great beauty. In his novels, however, *Die Epigonen* (1836) and *Münchhausen* (1838–39), Immermann reflected the spirit of his time. Platen is a poet who stands peculiarly alone, he was an antagonist both of Romanticism and "Young Germany"; even with Immermann he came into sharp conflict He, the least subjective of all German lyric poets, began as an imitator of oriental poetry, and soon attained an extraordinary mastery of poetic form; his *Sonette aus Venedig* (1825) are the finest sonnets in the German tongue.

Meanwhile the political ideas of the "Young German" movement, gained ground in the unsettled conditions prevailing between the revolutions of 1830 and 1848 The early '40s were in German literature marked by an outburst of political poetry, which may be compared with the national and patriotic lyric of 1813 Initiated by mediocre talents like N Becker (1809–45) and R E Prutz (1816–72), the movement found a vigorous champion in Georg Herwegh (1817–75), who in turn succeeded in winning Ferdinand Freiligrath (1810–76) for the revolutionary cause. Others joined in the revolutionary cry—F Dingelstedt (1814–81), A H Hoffmann von Fallersleben (1798–1874), and a number of Austrians, who had more reason for discontent than the North Germans But the best Austrian political poetry, the *Spaziergange eines Wiener Poeten* (1831), by "Anastasius Grun" (Graf A. A. von Auersperg, 1806–76), belonged to a decade earlier The political lyric came to an end in 1848, the revolutionists of the '40s were, if not appeased, at least silenced by the ineffective risings of that year. If Freiligrath be excepted, the chief lyric poets of this epoch stood aside from the revolutionary movement, E Geibel (1815–84) was only temporarily interested in the political movement, and his best work is purely lyrical M von Strachwitz's (1822–47) promising talent did not feel at home in the political atmosphere, while Annette von Droste-Hulshoff (1797–1848), Germany's greatest poetess, and the Austrian, Nikolaus Lenau (1802–50), are imbued with that pessimistic resignation which is characteristic of the best German literature between 1850 and 1870

Mid-century Literature.—When once the revolution of 1848 was over, a spirit of tranquillity came over German letters, but it was without confidence or hope in the future The literature of the middle of the century was not wanting in achievement, but it lacked enthusiasm and initiative; it was slow to respond to the new ideas of the time The so-called "Hegelian Left" had advanced so far as to have become incompatible with the original Hegelianism; the new social and economic theories did not fit into the scheme of Hegelian collectivism, the interest in natural science—fostered by the popular books of J Moleschott (1822–93), Karl Vogt (1817–95) and Ludwig Buchner (1824–99)—created an effective antidote to the Hegelian metaphysics In literature Hegel's influence gave place to that of the chief exponent of philosophic pessimism, Arthur Schopenhauer (1788–1860) Schopenhauer's chief work, *Die Welt als Wille und Vorstellung*, had appeared, it is true, as far back as 1819, but the century was more than half over before pessimism became a dominant force in German intellectual life.

The 20 years between 1850 and 1870 were pre-eminently an age of prose fiction Friedrich Spielhagen (1829–1911) followed in Gutzkow's footsteps, and in a series of excellent novels from *Problematische Naturen* (1860) to *Sturmflut* (1876), held the mirror up to the social problems which agitated the German mind in these decades. Gustav Freytag (1816–95), although an older man, freed himself more successfully from the "Young German" tradition; his romance of German commercialism, *Soll und Haben* (1855), is the masterpiece of mid-century fiction of this class. Less successful were *Die verlorene Handschrift* (1864) and his series of historical novels, *Die Ahnen* (1872–80) As was, however, only natural in an age of social and political interests, the historical novel occupies a subordinate place The influence of Scott, which in the earlier period had been strong, produced only one writer of distinction, Wilhelm Haring ("Willibald Alexis," 1798–1871) In the series of six novels, from *Der Roland von Berlin* to *Dorothe*, published between 1840 and 1856, Alexis gave Germany, and more particularly Prussia, a historical fiction which has been compared with the *Waverley Novels*. But Alexis had no successor, and the historical novel soon made way for a type of fiction seen in the "antiquarian" novels of ancient Egyptian life by Georg Ebers (1837–98), and the historical romances of Felix Dahn (1834–1912), in which the accurate reproduction of remote conditions was held of more account than poetic inspiration or artistic power. Under Fenimore Cooper's influence American life and adventure came into vogue The chief German writers who made these their theme, were K A Postl, who wrote under the pseudonym of Charles Sealsfield (1793–1864) and Friedrich Gerstacker (1816–72)

Of greater importance was the novel of peasant and provincial life, of which Immermann had given an excellent example in *Der Oberhof*, a short story embedded in his *Munchhausen* A Swiss pastor, A Bitzius, better known by his pseudonym "Jeremias Gotthelf" (1797–1854), was, however, the real founder of the peasant romance, and his simple, unvarnished stories of Swiss life were followed not long afterwards by the more famous *Schwarzwalder Dorfgeschichten* (1843–54) of Berthold Auerbach (1812–82) These village stories seem to us now lacking in naiveté, but they enjoyed a wide popularity in their day, and were the forerunners of a large body of peasant literature dealing with South German village life With this group of writers may also be associated A Stifter (1805–68), who has given us unforgettable pictures and impressions of the life and scenery of Bohemia

Meanwhile, the Low German peoples benefited by this revival of interest in dialect and peasant life, Fritz Reuter (1810–74) brought honour to the Plattdeutsch of the north, with his Mecklenburg novels, especially *Ut de Franzosentid* (1860), *Ut mine Festungstid* (1863) and *Ut mine Stromtid* (1862–64), books which have a place beside the best High German fiction of the period; what Reuter did for Plattdeutsch prose, his contemporary, Klaus Groth (1819–99), the author of *Quickborn* (1852), did for its verse Another north German, Theodor Storm (1817–88), is the author of short stories of delicate, lyric inspiration, steeped in that elegiac Romanticism which harmonized so well with mid-century pessimism In Switzerland Gottfried Keller (1819–90), a native of Zurich, was a modern Romanticist of a robuster type; his magnificent autobiographical novel, *Der grune Heinrich* (1854–55), might be described as the last in the great line of Romantic fiction that had begun with *Wilhelm Meister*, and his volumes of short stories, *Die Leute von Seldwyla* (1856–74) and *Zuricher Novellen* (1878) contain masterpieces of the first rank

In the German theatre of these decades French influence was predominant, and the successful German playwrights, such as R Benedix (1811–73) and Charlotte Birch-Pfeiffer (1800–68), have small literary interest Gustav Freytag's admirable comedy, *Die Journalisten* (1852), was one of the few exceptions But the German drama of this epoch is not to be judged by the theatres. At the middle of the century Germany could point to two writers who, each in his way, contributed to the development of the modern European drama Friedrich Hebbel (1813–63) and Otto Ludwig (1813–65) Hebbel is the most original German dramatist of the 19th century His first tragedy, *Judith*, appeared in 1840, his masterpieces, *Herodes und Mariamne*, *Agnes Bernauer*, *Gyges und sein Ring*, and the trilogy of *Die Nibelungen* between 1850 and 1862 They inaugurate the psychological drama, while Ludwig's *Der Erbforster* (1850) is a forerunner of modern realism.

Between 1852 and 1860 King Maximilian II of Bavaria gathered round him in Munich some of the most distinguished writers of the day A leading spirit of the group was Emanuel Geibel F von Bodenstedt (1819–92), revived the Oriental interest with his *Mirza Schaffy;* and J V. von Scheffel (1826–86),

won wide popularity with his historical novel *Ekkehard* (1857) and his verse-romance, *Der Trompeter von Sackingen* (1854). This kind of light epic, which had been cultivated earlier by O. von Redwitz (1823–91) and G Kinkel (1815–82), was, in fact, one of the favourite forms of poetry at this time, its most successful exponents being J Wolff (1834–1910) and R Baumbach (1840–1905); while others, such as H Lingg (1820–1905) and R Hamerling (1830–89) devoted themselves to the more ambitious epic The pessimism of the age is deeply engrained in the verse of H Lorm (pseudonym for Heinrich Landesmann, 1821–1902) and H. Leuthold (1827–79) The most important prose-writer of the Munich group is Paul Heyse (1830–1914), the best of whose "Novellen" or short stories give him a place beside Storm and Keller He is also the author of two important long novels, *Kinder der Welt* (1873) and *Im Paradiese* (1875)

From 1870 to 1900.—The Franco-German War had little or no immediate effect on literary development The interest of the nation was engrossed, not by literature, but by the *Kulturkampf*, the financial difficulties due to unscrupulous speculation, and the rapid rise of social democracy as a political force The intellectual basis of the latter movement was laid by Ferdinand Lassalle (1825–64) and Karl Marx (1818–83), author of *Das Kapital* (1867–94) The influence of Hegel was still strong, and the "historical" method was generally in vogue at the German universities H Lotze (1817–81) attempted to establish a compromise between science and metaphysics, while in his *Philosophie des Unbewussten* (1869), E von Hartmann (1842–1906) aimed at reconciling pessimism with idealism But in literature and art the dominant force was still the philosophy of Schopenhauer In lyric poetry there was, however, some reaction to the war, and the singers of the revolution of 1848 were among the first to welcome the unification of Germany At the same time, men of the older generation, like Herwegh, Freiligrath and Geibel could ill conceal a certain disappointment with the new régime, the united Germany of 1871 was not what they had dreamed of in their youth, when all hopes were set on the Frankfurt parliament

The novel continued to be what it was before 1870, the most popular form of German literature, but the novelists who enjoyed favour in the early '70s were all older men, while the drama was even less promising The iambic tragedy was cultivated by the Munich school, by A Wilbrandt (1837–1911), A Lindner (1831–88), by the Austrian F Nissel (1831–93), and A Fitger (1840–1909); but it was characteristic of the time that Halm was popular, while Hebbel and Grillparzer were neglected The most gifted German dramatist between 1870 and 1880 was an Austrian, Ludwig Anzengruber (1839–89), who produced a series of powerful plays dealing with the life of the Austrian peasant But the popular playwrights of this epoch were either writers who cultivated the *bourgeoise* comedy—G von Moser (1825–1903), O Blumenthal (1852–1918)—or who, like P Lindau (1839–1918), imitated French models The only encouraging sign in the dramatic history of this period is the marked improvement of the German stage, an improvement due to the artistic reforms introduced by the duke of Meiningen in his Court theatre and to the ideals of a national theatre realized at Bayreuth by Richard Wagner (1813–83) The first performance of Wagner's tetralogy *Der Ring des Nibelungen* at Bayreuth in the summer of 1876 was a significant event in the history of the German drama

In marked contrast to all this, the last 15 years of the 19th century were a period of intense literary activity Among the younger generation, growing up as citizens of the united German empire, a more hopeful spirit prevailed The influence of Schopenhauer was on the wane, and at the universities Kant was taking the place of Hegel L. von Ranke (1795–1886) was still the dominant force in German historical science, and between 1881 and 1888 nine volumes appeared of his last great work, *Weltgeschichte* Other historians of the period were H von Sybel (1817–95) and H. von Treitschke (1834–96), the latter a vigorous and inspiring spokesman of Germany's political aspirations; while J Burckhardt (1818–97), author of the masterly *Kultur der Renaissance in Italien* (1860), exerted an influence on German thought which was not confined to academic circles Literary criticism perhaps benefited most of all by the new outlook. It became more cosmopolitan in spirit, a change which is more particularly noticeable in its attitude to Goethe whose greatness had been hitherto overshadowed by Schiller's.

The thinker who embodies the spirit of this period was Friedrich Nietzsche (1844–1900) Nietzsche had begun as a disciple of Schopenhauer and a friend of Wagner, but his mature thought is militantly individualistic, and in its optimism the sharpest contrast to mid-century pessimism The individual, not the race, the *Herrenmensch*, not the slave, self-assertion, not self-denying renunciation—are the pivotal ideas round which his ethics turn. Nietzsche looked forward to the human race emerging from the effete culture of tradition, and re-establishing itself on a basis in harmony with man's primitive instincts. Like Schopenhauer before him, Nietzsche was a stylist of the first rank, and his literary masterpiece, *Also sprach Zarathustra* (1883–91), is one of the most important works of its epoch

The German lyric reacted most quickly to the individualism of Nietzsche—himself a lyric poet of considerable gifts Detlev von Liliencron (1844–1909) was the first to break, in his *Adjutantenritte* (1883), with the traditions of the past; and an anthology, *Moderne Dichtercharaktere* (1885) by W. Arent (b. 1864), may be regarded as the manifesto of the new movement. Representative lyric poets of this period are G Falke (1853–1916), A Holz (b 1863), K Henckell (b 1864), F Avenarius (b 1856), K Busse (1872–1918) and especially Richard Dehmel (1863–1920) Heinrich Hart (1855–1906), one of the critics of the new school, is also the author of an ambitious *Lied der Menschheit* (vols 1–3, 1888–96), but the master of the epic in this age, and one of its greatest poets, is a Swiss, Karl Spitteler (1845–1924) His *Olympischer Fruhling* appeared in two parts in 1900 and 1906 The lighter side is represented by the poetry of the so-called *Überbrettl* or cabaret, its chief exponent was O J Bierbaum (1865–1910), whose lyrics are collected in *Irrgarten der Liebe* (1901).

Nietzschean individualism was only one of many factors which contributed to the vitality of this new literature The realistic movement, as it had developed in France, Russia and Scandinavia, now became a dominant force in Germany The centre of this movement was Berlin, which, since it had become the imperial capital, was rapidly also becoming the literary metropolis The novel reacted quickly to this new realism, more especially as some of the older and established writers, such as F Spielhagen and A Wilbrandt, regarded it with sympathy. Theodor Fontane (1819–98), wrote between 1880 and 1898 a series of novels in which the finer elements of French realism were grafted on the German tradition. To the older school belong Wilhelm Jensen (1837–1911), and that fine humourist, Wilhelm Raabe (1831–1910), with whom may be associated as other humourists of this period, H Seidel (1842–1906) and W Busch (1832–1908) Two eminent Austrian authors, Marie von Ebner-Eschenbach (1830–1916), and Ferdinand von Saar (1833–1906), both excel as writers of short stories An Austrian, too, is Peter Rosegger (1843–1918), who won popularity with his many novels of peasant life. German prose in Switzerland is represented pre-eminently by Konrad Ferdinand Meyer (1825–98), who turned to literature comparatively late in life Meyer resembles his compatriot Keller in being not merely a master of the short story—for his themes he turns with preference to the period of the Renaissance—but also a writer of virile, original verse

Specifically realistic novels were written by H. Conradi (1862–90), Max Kretzer (b. 1854), M G. Conrad (b. 1846), K Bleibtreu (b 1859), K Alberti (pseudonym for Konrad Sittenfeld, b. 1862) and Hermann Sudermann (b 1857), whose *Frau Sorge* (1887) and *Der Katzensteg* (1889) are among the best novels of this period His later and longer novels *Es War* (1894) and *Das hohe Lied* (1908), are marred by a somewhat crass sensationalism Realistic, too, in its origins was the so-called *Heimatskunst*, the cultivation of the province, which was responsible for many excellent novels. Here may be mentioned as representative of widely different areas of the German-speaking world H. Löns (1866–1916) and Otto Ernst (b 1862) in the north; H Stehr (b. 1864) in Silesia;

F. Lienhart (b. 1865) and E. Zahn (b. 1867) in the south-west. Particularly popular were the novels (*Jörn Uhl*, 1901) of G Frenssen (b 1863). Studies of child life and educational problems proved particularly attractive to the younger writers, such as Hermann Hesse (b. 1877), Emil Strauss (b 1866), Rudolf Huch (b 1862) and Friedrich Huch (b 1873). Mention ought also to be made of W von Polenz (1861–1903), G von Ompteda (b. 1863), W Hegeler (b. 1870) and G. Hermann (b 1871) On the whole, the greatest novel of this epoch is *Buddenbrooks* (1902) by Thomas Mann (b 1875), who is also the author of some masterly short stories Some of the best fiction was the work of women, the most distinguished being Helene Böhlau (1859–1919), Gabriele Reuter (b 1859), Clara Viebig (C. Cohn-Viebig, b 1860) and Ricarda Huch (b 1867)

The theatre, however, was the arena in which the decisive literary battles of the day were fought out. In Oct. 1889 Hauptmann's play, *Vor Sonnenaufgang*, was produced on the then recently founded *Freie Buhne* in Berlin, and a month later, *Die Ehre* by Sudermann met with a more enthusiastic reception in Berlin than had fallen to the lot of any German play for more than a generation Before that date, Ernst von Wildenbruch (1845–1909) had attempted to revive the historical tragedy, and other dramatists, such as Richard Voss (1851–1918), had experimented with realism

Gerhart Hauptmann (b 1862) is the most eminent of contemporary German dramatists His early plays, the most powerful of which is *Die Weber* (1892), were works of uncompromising realism, but in *Hanneles Himmelfahrt* (1893) he combined realism with the poetic mysticism of a child's dream, and in *Florian Geyer* (1895) he adapted the methods of realism to an historical theme In 1896 he, to all appearance, abandoned realism for poetic allegory in *Die versunkene Glocke* Hauptmann's subsequent work is exceedingly varied and ranges from the frank naturalism of *Fuhrmann Henschel* (1898) and *Rose Berndt* (1903), to subtle psychological studies in *Der arme Heinrich* (1902) and *Kaiser Karls Geisel* (1908), and the poetic mysticism of *Und Pippa tanzt!* (1906) Hauptmann has also written some excellent comedies (*Der Biberpelz*, 1893) Hermann Sudermann (b 1857) enjoyed a more immediate popularity with the long series of plays of modern life which opened with *Die Ehre* Of these the best are perhaps *Heimat* (1893) and *Das Gluck im Winkel* (1896) With less success Sudermann attempted in *Johannes* (1898) a tragedy on the lines of Hebbel Sudermann's talent has shown less capacity for development than Hauptmann's, he is a practical playwright rather than a dramatic poet

Besides Hauptmann and Sudermann, the most talented dramatists of this period were Max Halbe (b 1865), O E Hartleben (1864–1905), G Hurschfeld (b 1873), Ludwig Fulda (b 1862), Max Dreyer (b 1862), and especially Frank Wedekind (1864–1918) In Vienna, notwithstanding the preponderant influence of Berlin, the drama retained its Austrian characteristics, with writers like Arthur Schnitzler (b. 1862), Hermann Bahr (b 1863) and Hugo von Hofmannsthal (b 1874), the last-mentioned being one of the greater poetic forces of his time.

The 20th Century.—The movement of realism and impressionism had not progressed very far before it was plain that it was but a passing phase; even before the end of the century it had ceased to be the dominating force in German letters The lyric, at all times the most sensitive expression of the German literary temperament, soon broke away, and under the influence of similar movements in France, it is to be seen feeling its way towards a new form, describable at one time as neo-classic, at another as neo-romantic, but in either case definitely opposed to the previous impressionism The representative poet of this revolt is Stefan George (b 1868), whose finely chiselled verse gradually effected, from the early '90s on, a complete break with the past But even here there was no permanence; a younger generation of poets came to the front who, while profoundly influenced by Stefan George's formal beauty, felt the need of more subjective and emotional expression. But there could be no question of going back; for by this time impressionism had been definitely discredited by new doctrines of "expressionism," in accordance with which the interpretation of the outside world by the poet, or indeed, the superimposition of his ego upon that world, was of the first importance. Prominent among the poets of this new phase are Max Dauthendey (1867–1918), Christian Morgenstern (1871–1914), Alfred Mombert (b 1872), and Theodor Daubler (b 1876), whose most considerable work is an epic, *Nordlicht* (1910); nor must Georg Heym (1887–1912) be forgotten, whose early death deprived the lyric of a talent of great promise. The most gifted poet of this last phase of the German lyric is Rainer Maria Rilke (1875–1926), a native of Prague Rilke's subtle spiritual mysticism and haunting cadences have made the deepest impression of all upon the present generation The World War was, of course, responsible for much political and patriotic poetry of ephemeral value, and indeed, in no form of literature did the war bring about more confusion than just here, but on the other hand, the lyric responded more quickly to the new ideas awakened by the terrible tragedy and devastation which had overwhelmed Europe. The militarism of the war-poets was soon displaced by an intense pity for suffering humanity and a craving for the reconstruction of human society on the basis of a universal brotherhood Among the new poets who have given voice to this aspiration towards spiritual and social regeneration the most significant is Franz Werfel (b 1890)

The drama of the 20th century shows an even more surprising change of front, compared with the activity of the preceding generation. Here the doctrine of expressionism has full sway, and aided by the remarkable technical development of the German theatre, has produced a drama of extraordinary interest, which, whatever its ultimate value may be, represents the most complete repudiation of the old realism Of the older writers only Hauptmann has in some measure kept abreast of the movement, his later dramas show an increasing tendency to dwell on subtle psychological problems of allegorical implication, and thus adapt themselves to the changing spiritual horizon, but the actual leadership has passed to younger hands The drama of expressionism, which obviously owes much to the Swede Strindberg and the Belgian Maeterlinck, was inaugurated in 1912 by *Der Bettler* by Reinhard Sorge (1892–1916), but the new art did not assert itself until two years later, on the eve of the war, when *Die Burger von Calais* by Georg Kaiser (b 1878) and *Der Sohn* by Walter Hasenclever (b 1890) were produced Kaiser's talent is extraordinarily facile and prolific, and much of his work has consequently little abiding value. He began with satiric comedies which show clearly the influence of Wedekind, as do also those of Karl Sternheim (b 1881), but in *Von Morgen bis Mitternacht* (1916), *Die Koralle* (1917), and the trilogy *Gas* (1918–20), he has given German expressionism some of its most characteristic works A vigorous talent of the movement is Ernst Toller (b. 1894), while with Reinhard Goering (b 1887), author of *Seeschlacht* (1917) and *Scapa Flow* (1919), Paul Kornfeld (b 1889), Hanns Johst (b 1890) and Johannes M Becher (b 1891), the expressionist drama seems in danger of dissolving in nebulous mysticism and losing all touch with the practical theatre This, too, is true of the dramas *Ein Geschlecht* (1916) and *Platz* (1920) by Fritz von Unruh (b 1885), a dramatist of real poetic gifts who, before the war, had written two effective dramas of military life, to become, in its course, a convert to anti-militarism

Side by side with this expressionist drama there has been a considerable neo-romantic revival in the theatre; many of the younger poets have gone back to mediaeval and even ancient sagas and history for their themes, discovering in them modern implications and infusing into them a very modern psychology The abiding value of this aspect of the contemporary drama seems, however, open to question The chief poets who come in question here are Herbert Eulenberg (b 1876), Ernst Hardt (b 1876), K G Vollmoller (b 1878), Walter von Scholz (b 1874) and Paul Ernst (b 1886). Here, too, should be mentioned the spacious mystic trilogy *Aeon* (1907–11) by Alfred Mombert, and the fine drama *Spiegelmensch* (1920) by F Werfel Of the more recent dramatists in Austria, Karl Schonherr (b 1869) and Anton Wildgans (b 1881); in Switzerland Max Pulver (b 1889), may be mentioned

Of the German novel in the last period it is less possible to speak in positive terms It has experienced the same difficulty as that of other lands in the post-war era, in reconciling literary quality with the demand for entertaining books that are of an immediate but transient appeal Moreover, the new literary theories of the day have led to much experimenting of a psychological and expressionist kind, which, so far from being favourable to the novel, has accentuated those tendencies to formlessness and verbosity which have always been its weak side Of the older writers Thomas Mann has concentrated his experience of the war years in an amorphous novel, *Der Zauberberg* (1925), which, however, has little of the imaginative strength of *Buddenbrooks* His more prolific brother Heinrich (b 1871), who contributed to the fiction of the decadence before the war, has satirized the old régime in a series of novels, *Das Kaiserreich* (1918–25) One of Hauptmann's several novels, *Emanuel Quint* (1910), has real literary significance, while Sudermann has redeemed the sensationalism of his earlier work with a volume of fine *Litthauische Geschichten* (1917). Of the newer writers of fiction Jakob Wassermann (b 1873) and Bernard Kellermann (b 1879) have produced books of some distinction, while in the field of the historical novel E G. Kolbenheyer (b 1878) and Enrica Hendel-Mazzetti (b 1871) perhaps may retain a place in literary history.

The time has obviously not yet come for a summing-up of the significance of the last phase of German literary history It may well be that the future will attach more importance to the ideas that lie behind it than to the actual production—that revival of mysticism in German thinking which has led alike to a revaluation of the past and to the reconstruction of the present, but it has at least borne out the old tradition of the unexpected which is characteristic of all new developments in the history of Germany's literature

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(J G R)

GERMAN OFFENSIVE, 1918. This great effort to obtain a military decision on the western front in France and Flanders before the intervention of American man-power could turn the scales, comprised four main acts, opening respectively on March 21 (*see* ST QUENTIN, BATTLE OF, 1918), April 9 (*see* LYS, BATTLES OF THE, 1918), May 27 (*see* CHEMIN-DES-DAMES, BATTLE OF THE, 1918), and July 15 (*see* MARNE, SECOND BATTLE OF THE) Important attacks were also attempted, but with less success, on April 24 in front of Amiens, and on June 9 in the direction of Compiégne, the latter to break down the "buttress" between the salients made by the St Quentin and Chemin-des-Dames offensives These and the general course of the whole offensive are described under WORLD WAR

GERMAN SILVER or **NICKEL SILVER,** an alloy of copper, nickel and zinc, prepared either by melting the copper and nickel together in a crucible, and adding piece by piece the previously heated zinc, or by heating the finely divided metals under a layer of charcoal To destroy its crystalline structure and so render it fit for working it is heated to dull redness and then allowed to cool German silver is harder than silver, it resembles that metal in colour, but is of a greyer tinge Exposed to the air it tarnishes slightly yellow, and with vinegar affords a crust of verdigris At a bright red heat it melts, losing its zinc by oxidation unless protected from the atmosphere At a heat above dull redness it becomes exceedingly brittle

German silver in various modifications of composition is much used in the arts Alloys, of which about 50% is copper and the residue zinc and nickel in about equal proportions, take a fine polish and are used as imitation silver for knives and forks With a somewhat higher proportion of copper an alloy is formed suitable for rolling and for wire In Chinese *white silver* or *packfong* (paktong) the amount of copper is smaller, about 40%, with about 32% of nickel, 25 of zinc, and 2 or 3 of iron German silver for casting contains 2 or 3% of lead, which like iron increases the whiteness of the alloy German silver, having a high specific resistance and a low temperature coefficient, has been used for electrical resistance coils, and these qualities are possessed in a still greater degree in *manganin*, which contains manganese in place of zinc, its composition being 84% of copper, 12 of manganese and 4 of nickel The addition of a trace of tungsten to German silver, as in *platinoid*, also largely increases the resistance.

GERMAN SOUTH-WEST AFRICA. A territory north of the lower course of the Orange river, which, owing to its proximity to Cape Colony, came to be regarded as a sort of depend-

ency of the Cape. This territory, bounded on the east by the Kalahari desert, was inhabited by Hottentot tribes who had migrated from the Cape, and was known as Great Namaqualand. A few Dutch and British farmers had settled in it, and from 1805 the London Missionary Society had agents—of German nationality—among the Hottentots, many of whom had a considerable strain of European blood. About 1840 the L.M.S. transferred its stations to the Rhenish mission. A few traders established themselves on the coast at Angra Pequena, in 1867 the small islands off the coast, which had valuable guano deposits, were annexed to Great Britain. The next year (1868), largely as the result of disputes between the Hottentots and their neighbours, the Herero, a tribe living in Damaraland, the Rhenish missionaries, seeking protection, asked Great Britain to annex the country. Although this appeal was supported by Prince Bismarck, on behalf of the Prussian Government, it was refused. In 1876, however, the Cape Government sent W. Coates Palgrave as "special commissioner to the tribes north of the Orange." Palgrave concluded treaties which placed the whole region up to the Portuguese colony of Angola under British control. Sir Bartle Frere, then high commissioner for South Africa, approved Palgrave's action, but the British Government refused to ratify the treaties, and it was with difficulty that Sir Bartle obtained consent (1878) to annex Walvis bay, the only good harbour along the coast, and the adjacent strip of territory.

Such was the position when, in July 1883, an agent of Adolf Luderitz (a Bremen merchant), obtained a cession of land at Angra Pequena, since known as Luderitz bay. Prince Bismarck, a late convert to belief in German colonial expansion, gave ample opportunity to Great Britain to act. The opportunity was neglected, both by the London and the Cape cabinets, and in Aug. 1884 a German protectorate was proclaimed. Treaties with Portugal (1886) and Great Britain (1890), fixed the limits of German territory.

A large part of the country thus obtained was barren. The most fertile and most thickly-inhabited part was the northern tropical region of Ovamboland, but in this remote district the Germans interfered little. Elsewhere, besides deserts, were large stretches of grazing ground, and certain areas where farming was possible. Moreover, South-west Africa was the only oversea possession suitable for white settlement which Germany had acquired. The Germans, almost from the outset, had much trouble with the Hottentots, but in 1894 Hendrik Witboi, the most redoubtable Hottentot leader, concluded peace and became an ally of the Germans. In that year von Leutwein became governor, and under his rule in the next ten years the country made much progress. Swakopmund was chosen as chief port, and from it a railway, 240m. long, was built (1897–1902) to Windhuk, a former Hottentot stronghold in the hill country which the Germans had made their capital. Another line was built going north to the copper mines of Otavi. Land was very freely appropriated by the white settlers from the natives, a cause of great discontent, though von Leutwein endeavoured to treat the natives with consideration.

In 1903 the Bondelzwart Hottentots, living near the Cape border, rose in revolt, and this developed into a long and ruthless struggle with the Herero and the Hottentots generally. Impatience of white rule, and the loss of their grazing grounds by the natives, were the main causes of the war. The Herero began hostilities (Jan. 1904) in the approved fashion of savage tribes—the murder of a number of German farmers and their families. Troops under Gen. von Trotha were sent from Germany. Von Trotha stormed the Herero stronghold in Aug. 1904, but the main body of the enemy escaped and thereafter kept up a harassing guerilla warfare. Von Trotha, exasperated, issued a proclamation in Oct. 1904 saying that every (man) Herero within the German frontier, "with or without a rifle," would be shot, no more women or children would be taken over. "I will either drive them back to your people or have them fired on." Later von Trotha ordered his soldiers to fire, not into, but over the heads of the women and children; while Prince Bulow, the then chancellor, ordered the general to repeal the whole proclamation. At this juncture (Oct. 1904) Hendrik Witboi broke with the Germans and was joined by other Hottentot tribes; the first act of the insurgents being the massacre of some 60 German settlers in the Gibeon district (British and Boer farmers were left in peace). Witboi was incensed because von Leutwein, for whom he had great admiration, had been recalled to Berlin, and by the harsh conduct of von Trotha. The Germans found that in the Hottentots they had to deal with an able, determined and elusive foe, and that in a country largely roadless and waterless. Von Trotha was in turn recalled towards the end of 1905. The new governor, von Lindequist, issued an amnesty to the Herero, who had lost some 30,000 men killed, while thousands, including women and children, had been driven into the Kalahari desert, there to perish. In Nov. 1905 Hendrik Witboi died, but other Hottentot chiefs continued the struggle, and it was not until 1908 that German authority was completely re-established. At the height of the campaign (1906) the Germans had 19,000 men in the field, while the cost of the wars (1904–08) to the Imperial Treasury was £23,000,000.

The native wars had resulted in the loss, in all, of some 100,000 native lives, and from 1908 the problem of getting labour was very difficult. But in that year diamonds were discovered along the coast by Luderitz bay, and a new and profitable industry quickly grew up. Europeans were attracted, and though settlers on the land were few, the white population in 1913 numbered nearly 15,000, of whom over 12,000 were Germans. The railway system was greatly extended, and the Government, though bureaucratic and expensive, did much to encourage farmers and pastoralists, while the settlers were given some voice in the administration. The country had never paid its way, but the grant-in-aid had been brought down to £500,000, and there appeared to be a fair future for this German colony when, in 1914, the World War began. A year later the country had been conquered by Gen. Botha, and it passed under the administration of the Union of South Africa. (*See* SOUTH WEST AFRICA.)

See *South-west Africa*, British Foreign Office handbook (1920), with bibliography. (F. R. C.)

GERMANTOWN, a residential district and former suburb, now a ward of Philadelphia, Pa., U.S.A., on Wissahickon Creek, in the northern part of the city. There are many old colonial houses along Main street (the old Germantown road or avenue). Prominent among the historic houses is Cliveden, or the "Chew House," built about 1761 by Benjamin Chew (1722–1810), who was chief justice of Pennsylvania in 1774–1777 and was imprisoned as a Loyalist in 1777, and whose home during the battle of Germantown was occupied by British troops. The well-preserved Morris House (1772) was the headquarters of General Howe at the close of the battle. Three doors above stood until 1904 the Ashmead House, used for a time by Count Nicholas Lewis Zinzendorf and his daughters for their Moravian school. In the same street is the old Wister Mansion, built as a country-seat in 1744 and occupied by British officers during the battle of the Revolutionary War. In another old house (now Nos. 5275–5277), John Fanning Watson (1779–1860), the annalist of Philadelphia, did most of his literary work. In this vicinity the first paper mill in America was erected in 1690. The King of Prussia inn, built about 1740, and the Mermaid hotel, as old or older, are interesting survivals of the inns and taverns of old Germantown. The Germantown Academy was built in 1760, and after the battle of Germantown was used by the British as a hospital. In Germantown are also a Friends' school, a Friends' free library, and the Germantown branch of the Philadelphia public library. The first school in Germantown was established about 1701. For the first 18 years it was under the mastership of Francis Daniel Pastorius (1651–1719), the leader in founding the town, who lived in a house that stood on the site of the present First Methodist Episcopal church, High street and Main street. He compiled a primer which was the first school book produced in the State. Later the same school passed to Christopher Dock (d. 1771), who in 1770 published an essay on teaching (written in 1750), which is said to have been the first book on pedagogy published in America. The first Bible printed in America in any European language was published in Germantown in 1743 by Christopher

Sauer (d 1758), who in 1739 established Germantown's first newspaper, *The High German Pennsylvania Historian, or Collection of Important News from the Kingdom of Nature and of the Church* The Friends were the first sect to erect a meeting-house of their own (about 1693) The Mennonites built a log meeting-house in 1709, and their present stone church was built in 1770. Germantown manufactures textiles, knit goods and yarns

Germantown was founded in Oct 1683, by 13 families from Crefeld, Germany, under the leadership of Francis Daniel Pastorius. The borough of Germantown was incorporated in 1689 For many years it was a struggling village, but after 1750 its growth was more rapid It was annexed to Philadelphia in 1854

See Samuel W Pennypacker, *The Settlement of Germantown, and the Beginning of German Emigration to North America* (Philadelphia, 1899), S. F Hotchkiss, *Ancient and Modern Germantown, Mount Airy and Chestnut Hill* (Philadelphia, 1889), N H Keyser, "Old Historic Germantown," in the *Proceedings and Addresses of the Pennsylvania-German Society* (Lancaster, 1906); and Herbert Pullinger, *Old Germantown* (Philadelphia, 1926).

The Battle of Germantown.—This famous encounter in the American War of Independence was fought on Oct 4, 1777. Following the battle of Brandywine (*q v*) and occupation of Philadelphia, the British force commanded by Sir W Howe encamped at Germantown, where Washington determined to attack them The Americans advanced by two roads, Gen Sullivan leading the column on the right and Gen Greene that on the left Washington himself accompanied Sullivan, with whom were Stirling and Anthony Wayne The right at first met with success, driving the British advanced troops back on the main body near the Chew House Col Musgrave, of the 40th Foot, threw a portion of his regiment into this house, and Gen Agnew came up with his command The Americans under Stirling attempted to dislodge Musgrave, thus losing time Gen Greene on the left was even less fortunate. Meeting with unexpected opposition at the first point of attack his troops were thrown into confusion and compelled to retreat One of his brigades extended itself to the right wing, and by opening fire on the Chew House caused Wayne to retreat, and presently both of the American columns retired rapidly in the direction of their camp The surprise had failed Washington went into winter quarters at Valley Forge, 40m W. of Philadelphia. The British wintered in and around the city

GERMAN VOLGA REPUBLIC, an A S S R created in February 1924 It is situated between lat 49° 50′ N. and 52° N. and long 44° 45′ E and 48° 5′ E It is mainly bordered by the Saratov province, which it divides into two separate parts Samara touches it on the north-east, and Stalingrad and the Kazakstan A S S R on the south and south-east Its area is 26,753 sq km, one fourth lying on the right and three fourths on the left bank of the Volga river The district on the left bank is a plain, with chestnut-coloured soil passing over into salt steppe in the south-east where it nears the Aralo-Caspian depression. The water supply is poor and the streams often salty The right bank area is a plateau, cut by rivers into ravines which give it a hilly appearance, and it has some forest The streams here are not salt, and the soil in the north is black earth, towards the south the transition zone to the salt steppe begins Except for the Volga river the streams are shallow, liable to dry up, and not suitable for navigation or floating goods The climate is distinctly continental, average July temperature 73°, January 11°. The rainfall in the south-eastern part rarely exceeds 300 mm per annum, and even in the more favoured north-west only reaches 350 mm per annum. The number of days with rain is rarely more than 100, and most of these are in the period October to March This scanty rainfall cannot be relied on, and the region has always been liable to years of drought An added drawback is the liability to late spring frost even at the end of May, and to early autumn frost in September Dry winds from the desert to the south and east blow for more than half the year, and there are occasional severe storms Precarious agriculture is the main occupation and the 1921 famine reached terrible proportions in this district; the population in 1920 was nearly 700,000, but in 1926 was 571,089. Further droughts and bad harvests occurred in 1922 and 1924, but since then varieties of seed have been selected for their drought-resisting qualities and better harvests have ensued The chief crops are wheat, barley, rye, millet, maize and sunflower seed, in pre-1914 times wheat was largely produced for export, but the subsequent poverty and famine altered the balance of crops in favour of barley, rye, millet and sunflower seed; maize is also more widely grown than formerly Irrigation, the only safeguard against recurrent drought, is proceeding as rapidly as local finance will allow, and in 1925–6 the irrigated area was 13,500 hectares Irrigation works in progress of construction in 1928 cover an area of 40,000 hectares. Livestock diminished markedly during the famine period, but the balance is being gradually restored Horses and working cattle are still much below pre-war numbers but oil-tractors are taking their place Sheep, goats, pigs and camels are bred. The industries include flour-milling, tobacco-making from local makhorka, begun in 1922, a leather factory built at the town of Golom-Karamysh in the right bank district, bacon factories, and a factory built in 1926 at Markstadt (formerly Katherinestadt) on the left bank of the Volga, for the manufacture of oil tractors There are small sawmills in the forest area, and a large one at Pokrovsk, the administrative centre on the left bank of the Volga opposite to Saratov. Peasant industries are widespread

History.—About 27,000 German colonists were settled on the Volga river in 1760 and 1761 at the invitation of Catherine II by special manifesto, when the population of Russia was so much less than today that the government was concerned for the development of uncultivated lands The climatic difficulties of their new environment, lack of capital, oppression by officials and attacks by Kirghiz and Kalmucks diminished their numbers by 50% in the first ten years They were at first given special privileges, including exemption from army service, but in the mid-nineteenth century these privileges were annulled About 1870 the small measure of autonomy remaining to them was cancelled and the colonies broken up When war with Germany broke out, the German colonists were persecuted and in 1915 an Imperial ukase ordered their exile to Siberia Before this was carried out, the 1917 revolution took place In early 1918, a commission was organized at Saratov to organize Soviet rule among the German Volga peoples, and at that town in June 1918 the first Soviet Congress of the Volga Germans expressed a wish for autonomous government In October the Autonomous German Volga district was created by decree, and it became a republic in Feb 1924 Of its twelve cantons, 5 have purely German inhabitants, 4 mixed German-Russian or German-Ukrainian inhabitants and 3 are predominantly Russian or Ukrainian Of its population of 571,089 (1926) 67% were Germans, 20% Russians and 12% Ukrainians The German Volga Republic has a permanent representative in Berlin

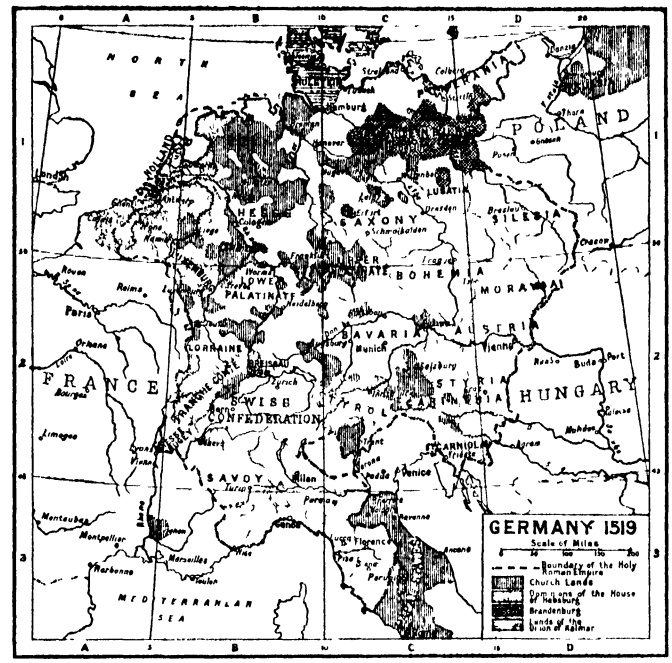
GERMANY (*Deutschland*), since Nov. 9, 1918, the German Republic, retaining its older name of *Deutsches Reich,* a country of central Europe, inhabited by the majority of the German-speaking peoples of Europe, German groups are, however, old established in several other States beyond its borders, and the proportion of these has been increased as a result of changes of territory following the World War of 1914–1918, which reduced the area of the *reich* from 208,830 sq m to 181,714 sq m, including the Saar district which was placed under a special régime. The *reich* is divided into two parts by what is called the Polish corridor, down the Vistula to Danzig and Gdynia on the Baltic East Prussia is thus separated from the main body of the *reich* which is bounded north by the Baltic sea and Jutland, north-west and west by the North sea, Holland, Belgium, Luxembourg and France, south by Switzerland, Austria and Czechoslovakia and east by Poland East Prussia borders on Poland and Lithuania A very far-reaching change from pre-1914 conditions is that Germany no longer touches Russia at any point, whereas their common frontier was formerly 843 miles. The distance from the extreme north-east of east Prussia to the extreme south-west of Baden (near Basle) is over 850 m, while the maximum length from north to south may be a little over 500 miles

Geology.—Germany consists of a floor of folded Palaeozoic rocks upon which rest unconformably the comparatively little

disturbed beds of the Mesozoic system, while in the north German plain a covering of modern deposits conceals the whole of the older strata from view, excepting some scattered and isolated outcrops of Cretaceous and Tertiary beds. The rocks which compose the ancient floor are thrown into folds which in the western half of Germany run approximately from west-south-west to east-north-east. They are exposed on the one hand in the neighbourhood of the Rhine and on the other hand in the Bohemian *massif*. With the latter must be included the Frankenwald, the Thuringerwald, and even the Harz. The oldest rocks, belonging to the Archaean system, occur in the south, forming the Vosges and the Black Forest in the west, and the greater part of the Bohemian *massif*, including the Erzgebirge, in the east. They consist chiefly of gneiss and schist, with granite and other eruptive rocks. Farther north, in the Hunsruck, the Taunus, the Eifel and Westerwald, the Harz and the Frankenwald, the ancient floor is composed mainly of Devonian beds. Other Palaeozoic systems are, however, included in the folds. The Cambrian, for example, is exposed at Leimitz near Hof on the eastern side of the Frankenwald, and the important coal-field of the Saar lies on the southern side of the Hunsruck, while Ordovician and Silurian beds have been found in several localities. Along the northern border of the folded belt lies the coal basin of the Ruhr in Westphalia, which is the continuation of the Belgian coal-field, and bears much the same relation to the Rhenish Devonian area that the coal basin of Liége bears to the Ardennes. Carboniferous and Devonian beds are also found south-east of the Bohemian *massif*, where lies the extensive coal-field of Silesia. The Permian, as in England, is not involved in the folds which have affected the older beds, and in general lies unconformably upon them. It occurs chiefly around the masses of ancient rock, and one of the largest areas is that of the Saar.

Between the old rocks of the Rhine on the west and the ancient *massif* of Bohemia on the east a vast area of Triassic beds extends from Hanover to Basle and from Metz to Bayreuth. Over the greater part of this region the Triassic beds are free from folding and are nearly horizontal, but faulting is by no means absent, especially along the margins of the Bohemian and Rhenish hills. The Triassic beds must indeed have covered a large part of these old rock masses, but they have been preserved only where they were faulted down to a lower level. Along the southern margin of the Triassic area there is a long band of Jurassic beds dipping towards the Danube, and at its eastern extremity this band is continuous with a synclinal of Jurassic beds, running parallel to the western border of the Bohemian *massif*, but separated from it by a narrow strip of Triassic beds. Towards the north, in Hanover and Westphalia, the Triassic beds are followed by Jurassic and Cretaceous deposits, the latter being here the more important. As in the south of England, the lower beds of the Cretaceous are of estuarine origin and the Upper Cretaceous overlaps the Lower, lying in the valley of the Ruhr directly upon the Palaeozoic rocks. In Saxony also the upper Cretaceous beds rest directly upon the Palaeozoic or Archaean rocks. Still more to the east, in the province of Silesia, both Jurassic and Cretaceous beds are again met with, but they are to a large extent concealed by the recent accumulations of the great plain. The Eocene system is unknown in Germany except in the foothills of the Alps, but the Oligocene and Miocene are widely spread, especially in the great plain and in the depression of the Danube. The Oligocene is generally marine. Marine Miocene occurs in north-west Germany and the Miocene of the Danube valley is also in part marine, but in central Germany it is of fluviatile or lacustrine origin. The lignites of Hesse, Cassel, etc., are interstratified with basaltic lava-flows which form the greater part of the Vogelsberg and other hills. The trachytes of the Siebengebirge are probably of slightly earlier date. The precise age of the volcanoes of the Eifel, many of which are in a very perfect state of preservation, is not clear, but they are certainly Tertiary or Post-tertiary. Leucite and nepheline lavas are here abundant. In the Siebengebirge the little crater of Roderberg, with its lavas and scoriae of leucite-basalt, is posterior to some of the Pleistocene river deposits.

A glance at a geological map of Germany will show that the greater part of Prussia and of German Poland is covered by Quaternary deposits. These are in part of glacial origin, and contain Scandinavian boulders; but fluviatile and aeolian deposits also occur. Quaternary beds also cover the floor of the broad depression through which the Rhine meanders from Basle to Mainz, and occupy a large part of the plain of the Danube. The depression of the Rhine is a trough lying between two faults or system of faults. The broader depression of the Danube is associated with the formation of the Alps, and was flooded by the sea during a part of the Miocene period. (P. LA.)



Physical Features.—Germany may be described broadly as the country from the Alps to the North and the Baltic seas, and it includes a number of very diverse zones and physical units, even less than many other countries does it approach any real unity of structure or physical geographical character. The country from the Alps to the Baltic may be divided into six sub-parallel zones. (1) the Alps which stretch across the south of Bavaria, (2) the upper Danube basin framed on the south mainly by the Alps and on the north by (3) the Alpine foreland or the Swabian Jura roughly parallel to th[e] the Franconian Jura turning northward as if [to] resistance of the old block of Bohemia, (4) Main and the Neckar between the Jura a highlands of mid-Germany running from northern side of the Bohemian block and (lowland between the north edge of the h[i] south and the coasts of the North [Sea]. A seventh physical region sta[nds] parallel zones, it is that of [the] It will be convenient to [take] its numerical order.

The Alps.—It [is] Lake Constan[ce] frontier here l[ies] of the Alps (1[,] None the less t[he] exquisite mounta[in] long lakes behin[d] See, has given its n[ame] of the ice-maxima [of] towards the Danube ha[s] swampy areas called Mo[ors] relatively rich. The chief [of] Inn, right-bank tributaries of

The Upper Danube Basin.—Schwarzwald (Black Forest) and of Constance and the Bavarian [Alps]

Alpine foreland (Jura) and the south-west border of the Bohemian block on the north. The river flows near the northern side of its basin, and from its left bank arise the dip slopes of the Jura, the scarp slopes of which face north or north-west and are steep where they face the Neckar The river follows the line of the Jura down to Regensburg (Ratisbon), beyond which it flows beneath and parallel to the granitic edge of the Bohemian block, leaving Germany at Passau The large tributaries of the right bank have been named, on the left bank the Wornitz flows through the Jura zone between the Swabian and Franconian Jura, and the Altmuhl and its feeders utilize a number of minor breaks in the sharp curve of the Franconian Jura The Wornitz joins the Danube at Donauworth, and parts of it may be called upon to help make the ship canal from Main to Danube which has been proposed The Altmuhl has been utilized in parts in connection with the small Ludwigskanal through the passes of the Franconian Jura linking Main and Danube The ways through the Franconian Jura lead to the Danube, near Regensburg, and to the basin of the Main at Nurnberg, which is on the Regnitz, and the historic importance of these two centres is thus to some extent interpreted. The Naab valley between Franconian Jura and Bohmer Wald also joins the Danube near Regensburg The uppermost part of the Danube is in Baden, and then it crosses Wurttemberg and Hohenzollern and Wurttemberg again to Ulm The upper basin of the Danube from the Iller eastwards to Passau forms one of the main elements of Bavaria Much land on the south is poor, but some areas towards the centre of the basin where the subsoil is loess are fertile Though Ulm on the west, Regensburg and Passau, all on the Danube, are historic and important, they are far surpassed by Munich and Augsburg on tributary streams and on somewhat higher land which permitted early cross-river communication

The Jura is built mainly of porous, Mesozoic rock dipping southward and the drainage is in many parts in deep cut valleys The ridge exceeds 3,000ft in only a few places in Germany. but the south-west border of Bohemia reaches nearly 4,900ft in the Bohmer Wald, which has the lower Bayrischer Wald in front of it The Swabian Jura is higher and less broken than the Franconian, and from the rawness of winter on it a large part is known as the Rauhe Alb, its ridge forming a part of the boundary between Bavaria and Wurttemberg Farther west, between the Neckar and the Danube, astride of the Jura lies the district of Hohenzollern, the early home of the late German
ily, for which reason this territory is politically a
though widely separated from the main area
Main and Neckar, right-bank tributaries of the
l west of the Jura ridge, their basins being
the Black Forest on the west and the mid-
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the Rhine the upstanding edge is
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Saverne but rising again in the Hardt The continuous block that once included Vosges and Black Forest was a Hercynian Massif, and the rift has given a section of the Rhine with a broad valley floor and parallel sides The course of the river is rough in places, and a volcanic mass, the Kaiserstuhl, stands out in the middle; the banks of the rapid river are rough land with few towns in the south, but from Speyer northwards they abound On the west side Alsace, now in France, is essentially the basin of the Ill, a left-bank feeder of the Rhine; on the east Baden is the land beneath the scarp edge of Schwarzwald which forms part of the boundary against Wurttemberg But the State of Baden extends north as far as the Odenwald, and in the region between Schwarzwald and Odenwald lies Carlsruhe, the capital of Baden, on a main express route eastwards from the Rhine to Munich, Vienna and beyond West of the Rhine the country becomes more and more influenced by the Rhine as the Vosges weakens north of Saverne, and the Pfalz or Bavarian Palatinate is a political unit around the Hardt (2,240ft)

THE MID-GERMAN HILLS

(5) The mid-German hills are mainly dissected plateaux of Palaeozoic rocks the history of which includes their folding into a mountain system in the Permo-Carboniferous phase, their planing down by long denudation and their uplifting as blocks in Tertiary times In the western half the Palaeozoic rocks outcrop almost everywhere, but the eastern half, east of the Rhine basin, is largely floored by Triassic rock with blocks of Palaeozoics brought up by faulting to form the Thuringer Wald and the isolated Harz mountains in the north In the western half the plateau hills trend almost south-west to north-east, the main lines being sharply cut at right angles by the Rhine gorge from Bingen to Bonn The Hunsruck (2,684ft) west of the Rhine is in line with the Taunus (2,890ft) east of it, and the Eifel (2,493ft) is similarly in line with the Westerwald (2,155ft) Hunsruck and Eifel are separated by the deep cut of the Moselle valley just as Taunus and Westerwald are by that of the Lahn Beyond the eastern rim of the Rhine basin are large volcanic masses, the chief of which are the Vogelsberg (2,530ft) and the Rhon (3,117ft), and this is a zone of much faulting It is drained mainly by the Weser and its tributaries and these last start close to the northern tributaries of the Main, so that there is a way through the mid-German hills from Frankfurt-am-Main in the south via Cassel to Hanover in the north, an important factor of the greatness of these cities East of the Weser the hill lines of the Harz (highest point the Brocken 3,747ft) and the Thuringer Wald (3,225ft) trend nearly north-west to south-east and are outlined and cut by faults with the result that they, and especially the Harz, have long been famed for metalliferous mining The valleys of the Thuringer Wald are historically famous for their numerous small petty states, but under the German republic these have been grouped as a Thuringian state In the rest of the mid-German hill region much of the land has been absorbed by Prussia, but small states still survive The Prussian Rhine province includes land on both sides of the Rhine (below Coblenz on the east and below Bingen on the west) in so far as that land is dominated by the life of the river and its cities, *i e*, it consists of the Rhine gorge from Bingen to Bonn and of the bay of lowland to the north From Mainz to Bingen the Rhine flows east to west, from the Rift valley to the gorge cutting through the mid-German hills In this section and the last section of the Rift valley (Worms to Mainz) the land is relatively low and forms one part of the State of Hesse, the land in the bend has loess subsoil and is an area of ancient settlement, attested by rich finds of prehistoric objects of several periods.

The south-eastern end of the Thuringer Wald and the north-eastern end of the Franconian Jura approach one another and the mountains farther east (Erz Gebirge and Bohmer Wald) in the Fichtelgebirge (3,355ft.), which thus seem to be a centre of orographical and fluvial radiation From them the Naab goes south between Franconian Jura and Böhmer Wald to the Danube, the Main goes west to the Rhine between the Thuringer Wald and the Jura, the Saale and its tributaries flow north between

the Thüringer Wald and the Erz Gebirge, while, in Bohemia, the Ohre flows east between the Erz Gebirge and the Bohmer Wald. Eastward beyond the Thuringer Wald the hills trend north-eastwards once more in the Erz Gebirge (4,052ft), the northern edge of the Bohemian block, as far as the sharp break, by which the Elbe passes from Bohemia to Germany, through a territory called from its scenery the Saxon Switzerland Beyond the Elbe the hills trend once more south-eastward as the Riesengebirge (5,260ft) and the Sudetes, forming the north-east side of the Bohemian block In the middle belt of Germany the hill lines form two obtuse angles, broken in the one case by the Weser, in the other by the Elbe, the lines enclosing these angles in the two cases are sub-parallel The resemblances between these lines and those of the Baltic coasts are a feature. Farther east than the Sudetes the zone of dissected plateau-hills hitherto followed sinks The rocks concerned become buried under newer deposits, or where they outcrop, as in Upper Silesia and Lysa Gora and the province of Kielce in Poland, they form only moderate hills, entirely subordinate to the great Carpathian mountain arc, a part of the Alpine system, which dominates the orography of the region. Between Carpathians and Sudetes is the gesenke, the depression that gives communication between Oder and Danube via the March, or between Vienna and either Breslau (Oder basin) or Cracow (Vistula basin).

6 The *northern plain* is marked off from the hills by the lines forming the two obtuse angles mentioned above, but there are in addition irregularities which give what may be called the gulf of lowland that narrows up the Rhine beyond Cologne and the lowland bay east of the Harz, framed by the Thuringer Wald and Erzgebirge, that is largely Saxony (Prussian province, and republic) Beneath the hills the subsoil in the east is loess in large patches, a zone of early settlement for the most part not densely wooded. Meuse, Rhine, Weser, Saale, Elster, Elbe and Oder emerge from the hills on to the plain, and related to their emergence, though not always on them, are large historic cities of which one may mention Aachen, Cologne, Hanover, Halle, Leipzig, Dresden and Breslau In Belgium and west Germany below the mid-German hills, running south-west to north-east, coalfields of great importance occur (Mons, Charleroi, Liège, Dusseldorf and the Ruhr) At the Weser, as already said, the general hill line changes direction, becoming west-north-west to east-south-east, but hills taking this direction also stand out west of the Weser into the plain as the Teutoburger Wald Between this on the north and the mid-German hills (Sauerland) on the south is the lowland of Westphalia, drained by Ruhr and Lippe, tributaries of the Rhine, and by the upper Ems The Saxon lowland has coalfields, especially round Zwickau, and ore-veins in the Erz Gebirge (Ore mountains), etc North-east of the Riesengebirge is another, but a smaller coalfield In upper Silesia and west Poland are still other coalfields, the former divided in the midst by the new frontier between Germany and Poland, which is subject to a number of special arrangements

The northern plain, apart from the foothill zone (fall line) just mentioned, has, as its main features, morainic hills, most arranged in lines more or less parallel to the Baltic coast and usually less than 600ft high, though the Turmberg, west of Danzig, in what is now the Polish corridor to the sea, reaches 1,086 feet In the east one zone of morainic hills (including the Turmberg) stretches between Danzig and Stettin, south of it and parallel to it lies the Netze valley South again another morainic zone may be traced eastward through the Masurian lake country at the back of east Prussia and westward in broken patches to Frankfurt-am-Oder. Its southern boundary is marked by the rivers Narew and (lower) Bug, the Vistula for some distance below Warsaw, the upper Warthe, and the east-west section of the Oder above Ratzdorf South of this again the land rises in Poland and in Germany with, in the latter country, Nieder Lausitz between the Spree and middle Elbe basins and farther west the Fläming between the middle Elbe and the Havel. The morainic zones are rich in small lakes, and those of eastern Germany, and the composite river lines between them, more or less focus on Berlin

West of the Berlin area (Mark of Brandenburg) the morainic belts trend on the whole west-north-westwards, one with many lakes, in Mecklenburg and Schleswig Holstein where its general direction becomes south-to-north, and one between the lower Elbe and the line of the Aller and Weser This latter, practically a continuation of the Flaming, is called the Altmark towards its eastern end (west of the Elbe) and the Luneburger Heide in the centre; rising to 560ft it dies down towards the North sea coast south of Cuxhaven West of the Luneburger Heide towards the Dutch frontier the land lies low in Oldenburg and Ost-Friesland and marsh abounds in the latter. Post-Pleistocene land sinking has brought the sea up the river mouths, so that most of Germany's ports are river ports and have developed outports below themselves, as Bremerhaven below Bremen, Cuxhaven below Hamburg, Travemunde below Lubeck, Warnemunde below Rostock and Swinemunde below Stettin A great difference, however, is to be remarked between the coasts of the North sea and those of the Baltic On the former, where the sea has broken up the ranges of dunes formed in bygone times and divided them into separate islands, the mainland has to be protected by massive dikes, while the Frisian islands are being gradually washed away by the waters On the coast of East Friesland there are now only seven of these islands, of which Norderney is best known, while of the North Frisian islands, on the western coast of Schleswig, Sylt is the most considerable Besides the ordinary waste of the shores, there have been extensive inundations by the sea within the historic period, the gulf of the Dollart having been so created in the year 1276 Sands surround the whole coast of the North sea to such an extent that the entrance to the ports is not practicable without the aid of pilots Heligoland is a rocky island, but it also has been considerably reduced by the sea The tides rise to the height of 12 or 13ft in the Jade bay and at Bremerhaven, and 6 or 7ft at Hamburg

The coast of the Baltic, on the other hand, possesses few islands, the chief being Alsen and Fehmarn off the coast of Schleswig Holstein, and Rugen off Pomerania It has no extensive sands, though on the whole very flat The Baltic has no perceptible tides; and a great part of its coastline is in winter covered with ice, which also so blocks up the harbours that navigation is interrupted for several months every year Its *haffs* fronting mouths of large rivers are rather extensions of the rivers than sea-bays cut off, though coastal subsidence has contributed to their evolution The Pommersche or Oder Haff is separated from the sea by two islands, so that the river flows out by three mouths, the middle one (Swine) being the most considerable The Frische Haff is formed by the Nogat, a branch of the Vistula, and by the Pregel, and communicates with the sea by means of the Pillauer Tief The Kurische Haff receives the Memel, called Niemen in Russia, and has its outlet in the extreme north at Memel Long narrow alluvial strips, called *Nehrungen,* lie between the last two haffs and the Baltic The Baltic coast is further marked by large indentations, the gulf of Lubeck, that of Pomerania, east of Rugen, and the semi-circular bay of Danzig between the promontories of Rixhoft and Brusterort

The rivers of the great lowland are naturally navigable and need very few locks for their improvement for this purpose Nearly every one of them has long east-west sections between morainic zones, and most of them cut through those zones in south-north sections, which sometimes have important towns such as Torun (Thorn) on the Vistula and Posen (Poznan) on the Warthe, both now in Poland, and Frankfurt on the Oder The east-to-west sections of two rivers in different parts of one and the same low zone between morainic hills have been linked in many cases by canals, *e g*, the Vistula with the Netze, the Oder with the Spree and the Havel Thus a system of river and canal communications supplementing railway and road connections focusses from a wide zone in the east upon Berlin and helps to account for the phenomenal growth of the city from insignificance in the mid-seventeenth century to a population of four millions at the present time The Oder is navigable from Ratibor near the Czechoslovakian frontier, and long stretches of the Warthe and Netze are also navigable, as is the Neisse, a left-bank tributary Large sections of Havel, Spree and Saale are navigable,

and the Elbe itself can be navigated right up into Bohemia and its tributary, the Moldau, as far as Prague. By means of the river and canal systems combined there is thus continuous inland water communication from Ratibor on the upper Oder, or Torun on the Vistula, to Hamburg and the Elbe mouth.

The development of this system of communications and of its focus at Berlin may be said to have changed the face of Germany. Previously the great lowland had been on the whole of secondary importance with the Hanseatic cities along its coasts and the fall line cities above enumerated near the hills, and Magdeburg and a few others between. The growth of Berlin as a focus developed the political power of Prussia, which spread both to the coast and to the foothills and received a further impetus when the potato spread as a food plant, especially on the sandy soils of the north, and still more when coal came to be utilised for industry Coal gave a new growth to many old cities along the foothills, thus making modern German industry in a considerable measure a new development of old cities as contrasted with modern British industry which mostly grew in places previously small. German industry has also brought many new towns to birth

Climate.—The climate of Germany is to be regarded as intermediate between the oceanic and continental climates of western and eastern Europe respectively. The differences in the range of temperature and the amount of rainfall throughout Germany are not so great as they would be were it not that the elevated plateaux and mountain chains are in the south, while the north is occupied by low-lying plains In the north-west no chain of hills intercepts the warmer and moister winds which blow from the Atlantic, and these accordingly influence at times even the eastern regions of Germany The mean annual temperature of south-western Germany, or the Rhine and Danube basins, is about 52° to 54° F, that of central Germany 48° to 50°, and that of the northern plain 46° to 48° In Pomerania and West Prussia it is only 44° to 45°, and in East Prussia 42° to 44° The difference in the mean annual temperature between the south-west and north-west of Germany amounts to about 3°

The valley of the Rhine above Mainz has the greatest mean heat, the mildest winter and the highest summer temperature Arys, on the Spirdingsee, on the lake plateau of east Prussia, has a like winter temperature to the Brocken at 3,200 feet The Baltic has the lowest spring temperature, and the autumn there is also not characterized by an appreciably higher degree of warmth In central Germany the high plateaux of the Erz and Fichtelgebirge are the coldest regions In south Germany the upper Bavarian plain experiences a harsh winter and a cold summer The warmest districts are the Rheintal from Karlsruhe downwards, less than 300ft above sea-level, and protected by mountains The same holds true of the valleys of the Neckar, Main and Mosel Hence the vine is everywhere cultivated in these districts The mean summer temperature there is 66° and upwards, while the average temperature of January is above 32° F. The climate of north-western Germany is oceanic, the summers not being too hot (mean summer temperature 60° to 62°), and snow in winter remaining but a short time on the ground West of the Weser the average temperature of January exceeds 32° (it is 34° at Cologne), to the east it sinks to 30°, and therefore the Elbe is generally covered with ice for some months of the year, as are also its tributaries The farther one proceeds to the east the greater are the contrasts of summer and winter While the average summer warmth of Germany is 60° to 62°, the January temperature falls as low as 26° to 28° in West Prussia, Posen and Silesia, and 22° to 26° in East Prussia and upper Silesia. The navigation of the eastern rivers is interrupted by ice.

Rainfall takes place at all seasons, but chiefly in summer. The rainfall is greatest in the Bavarian tableland and the hilly regions of western Germany. For the Eifel, Sauerland, Harz, Thuringian Forest, Rhon, Vogelsberg, Spessart, the Black Forest, the Vosges, etc., the annual average may be stated at 34in or more, while in the lower terraces of south-western Germany, as in the Erzgebirge and the Sudetic range, it is estimated at 30 to 32in. only The same average obtains also on the humid north-west coast of Germany as far as Bremen and Hamburg. In the remaining parts of western Germany, on the shores of farther Pomerania and in East Prussia, it amounts to upwards of 24 inches. In the best wine districts, *i.e.*, in the valley of the Rhine below Strasbourg, in the Palatinate, and also in the valley of the Main, no more than from 16 to 20in. fall. Mecklenburg, Brandenburg and Lusatia, Saxony and the plateau of Thuringia, West Prussia, Posen and lower Silesia have an annual rainfall of only 16 to 20 inches. Thunderstorms are most frequent in July. The soils of Germany, in correlation with these facts of climate, are generally of the brown group (*see* EUROPE) moderately leached, save near the sea where the leaching has generally been more intense and where the glacial subsoil often includes much sand The soils on the Jurassic rocks of the south are specially rich in humus

Vegetation.—Germany was largely covered with forests of oak and beech, with larch, birch and pine on the heights before man reduced it for his purposes, but it is none the less an error to think of it as pure forest There were always patches of loess with a lighter tree covering that were available for early settlement and that have yielded abundant evidence of settlement at many periods, and there were other patches also more or less forest free for reasons usually connected with the nature of the rock. Of the "clear" areas one may mention the foothill region and the southern edge of the great plain from Hanover to Dresden, including much of the lowland bay around Leipzig, a part of the Oder basin from the frontier down to Breslau, the country in the bend of the Rhine near Mainz, the basin of the upper Neckar, the Danube from Regensburg down to Passau and many another smaller area The lower mountains are often still covered with timber, and it is a feature of German civilisation that forest conservation has become a high art, the woods being largely of a more or less cultivated character with conifers dominant on account of their special utility On the whole the north is less densely wooded than the south, the moraine hills often being ill adapted for great forests, though the lowlands of the north-east still have many trees Areas specially rich in woodland include some between the Oder basin and the Elbe basin near the upper Spree, and in this forested area Wendish speech has survived Germanising influences, the Harz and the Thuringer Wald, the Rothaargebirge, the hills in the great bend of the Main above Frankfurt-am-Main, the Fichtelgebirge, the frame of Bohemia, the Odenwald and the Schwarzwald Woodland is practically absent in north-west Germany.

In the southern regions of warm summers where there is shelter the woods contain chestnut and walnut, and the fig, peach and apricot may be grown here and there Latitude 51° is approximately the northern limit of the vine in Germany, and it is mostly grown near Rhine and Danube and as usual near the crops limit, it is only special varieties grown with care that are of much value Reference has already been made to the potato which yields good crops in the sandy north, while the beetroot has also spread in the northern plain and mid-Germany. Flax grows chiefly in the north and hops chiefly in the south. Among the grains rye is important almost everywhere, with wheat, barley and oats as well, maize ripens only in the south; buckwheat mostly in the north Concerning the wild animals of Germany, little needs to be added to what has been said for Europe; wolves are rare except at times in the east, bears survive in the Alps and the elk in the forests of East Prussia The stork is seen for about 170 days, the house-swallow 160, the snow-goose 260 and the snipe 220, the period is 20–30 days shorter in the north than in the south.

Population.—In racial type the German population is very largely Alpine, that is broadheaded with medium to dark colouring, in Bavaria and parts of the mid-German hills, becoming markedly fairer and less broadheaded towards the north. Tall, fair and moderately broadheaded people are numerous, and the opinion has been advanced that they may represent a combination of Alpine (broadheads) and Nordic (fair hair) traits. There are areas with more longheads apparently in Oldenburg and in East Prussia, and doubtless elsewhere but the cephalic index seems to be higher than in Scandinavia or the British Isles. The Neckar

basin in Württemberg apparently contains more tall, fair elements in its population than do most other parts of south Germany. There has been considerable Slavonic immigration into industrial areas tending on the whole to increase the broad-headed elements. The Jewish type is strongly marked in many cities

The population as a whole is not easily compared with that of the years before 1914 because of territorial changes, but there can be little doubt that even the large numerical loss due to war casualties (estimated at 2 87 millions if deaths due to war causes but away from the army be included) is being made up, but a German estimate of what the population on the pre-war territory would have become by now gives a figure of 72 millions. The territories taken away by the treaties of 1919 had a population (1910) of 6½ millions, which would have become some 7½ millions by 1925 had there been no war The net population should on these estimates be 64½ millions; it was (at the 1925 census) 63,118,782 including the population of the Saar. The claim is made that the deficiency is due both to casualties and to diminution of births during the years 1914–18 The percentages of males and females in the 1910 census were 49 36 and 50 64, in the 1925 census 48 07 and 51 93, a great change attributable to war casualties in the main.

TABLE I

States	Area English sq m 1925	Population 1925	Density per sq m 1875	Density per sq m 1925
Saxony	7,589	4,996,138	407	863
Hesse	2,970	1,347,295	307	454
Baden	5,819	2,312,462	257	397
Anhalt	888	351,485	246	396
Schaumburg-Lippe	131	48,044	155	367
Thuringia	4,527	1,609,300	229	355
Brunswick	1,418	501,075	214	354
Lippe	469	163,577	256	349
Württemberg	7,532	2,579,453	245	342
Prussia (including Waldeck)	113,036	38,112,813	188	338
Bavaria	29,343	7,379,594	170	251
Oldenburg	2,480	545,749	132	220
Mecklenburg Schwerin	5,069	674,441	114	133
Mecklenburg Strelitz	1,131	110,371	95	98
Hamburg	160	1 152,489	2,625	7,203
Bremen	99	338,846	1,345	3,423
Lübeck	115	127,971	448	1,113
Saar District	738	770,000*		1,043

*Estimated

As during the period of industrial expansion in England so in Germany 1871–1914 the birth-rate was high It reached a maximum figure of 42 6 per 1,000 and was usually over 36, *i e*, a good deal higher than during the corresponding period in England By 1914 the birth-rate had come down to 26 8 and by 1924 to 21 1 (inclusive of still births), the figures for 1925 were about the same The birth-rate in England has declined far more, reaching 16·6 in 1927 The death-rate before 1900 was usually between 30 and 21 7 per thousand, but in the period 1900–14 it declined to 15·8, the difference being largely due to improved care of infants; by 1924 it had further declined to 12 9 through further developments of infant care The excess of births over deaths is thus 8 2 per thousand, or practically double the figure that obtains in England The table herewith shows how immensely the population of Saxony has grown during the 50 years 1875–1925, which are chosen because at both dates the country had a war disturbance a few years behind it, and they are thus in a reasonable degree comparable But the increase has affected nearly every part and has raised most of the constituent States above the density of 250 per sq mile The immense increase in the free cities is an indication of the general trend of population to the cities The population of all German cities with over 300,000 people is given in the first table in the next column

This limit is chosen because it is widely noticeable that in an industrial commercial state a city of this size often acquires a more or less metropolitan character In Germany history (the existence of constituent States and formerly of prince-bishops) has contributed greatly to the metropolitan character of many in the list The number of these large cities is about the same in proportion to the total population as in England and Wales The movement of population towards the towns and the larger increase in the towns is shown by the following figures —

Towns with over 300,000 Population

Towns	State	Population (1925)
Berlin	Prussia	4,013,588
Hamburg	Hamburg	1,079,092
Cologne	Prussia	698,064
Munich	Bavaria	680,704
Leipzig	Saxony	679,322
Dresden	Saxony	618,684
Breslau	Prussia	554,801
Essen	Prussia	468,696
Frankfurt-am-Main	Prussia	461,840
Dusseldorf	Prussia	431,096
Hanover	Prussia	422,435
Nurnberg	Bavaria	392,494
Stuttgart	Württemberg	341,461
Chemnitz	Saxony	331,641
Dortmund	Prussia	320,256

Census	Rural	Urban	Census	Rural	Urban
1875	61 0	39 0	1900	45 7	54 3
1880	58 6	41 4	1905	42 6	57 4
1885	56 3	43 7	1910	40 0	60 0
1890	53 0	47 0	1925	35 6	64 4
1895	49 8	50·2			

The urbanization of Germany is thus greater than that of France but much less than that of England and Wales, where the percentages of rural urban in 1921 were 20·7 and 79·3 Emigration from Germany is greater than it was prior to 1914, the total in 1926 was 65,281, and the average for the past four years higher, though those figures are not of great value because of the rush to the United States of America in 1923 before restrictions on immigration were fully enforced The figures in 1906–10 averaged about 26,500 The United States received 51,145 Germans in 1926 and Brazil 3,302

The Constitution.—Germany became organized as a republic under a constitution given by a National Assembly at Weimar on August 11, 1919, on the basis of sovereignty of the people and of recognition of the rights of constituent lands or states, with the proviso that by law any territory outside the "Reich" may be admitted to it if its people have indicated their desire to enter by their suffrages It is agreed that traditionally accepted common law (*Volkerrecht*) is to be recognized (Art 4) Administration and legislation, including financial legislation, relating to the whole republic are controlled by the organs of the constitution of the republic, but, in matters relating to a particular land or state, and not contravening the general law, power resides with the corresponding organs of the constitution of the land or state concerned The republic as a whole has exclusive charge of foreign and colonial affairs, questions of citizenship and migration, customs dues, coinage, armaments, postal organization and telephones It has to make laws relating to crime, passports, care of the poor, the press and public meetings, infant welfare, health services, protection of workers, war pensions, weights and measures, regulation of industry and transport by air, land and sea, insurance, theatres, protection of natural beauty, etc

The republic can make laws on many other points, but it is generally provided that a land may make a law for itself on a subject on which the republic as a whole has not legislated even though it may be held to come within the province of what the republic should do, always provided that the matter is not one of those reserved to the reich exclusively; but certain cases as, for example, those of protection of natural beauty and the organization of public undertakings, the reich has the power of criticism of the land's legislature, and the law of the republic takes precedence over the law of the constituent land The administration in

each land is, in general, carried out by officials of the land, but the reich has large duties and powers of oversight In case of dispute either the reich or a land can appeal to the Supreme Court or to other authority as may be provided in special cases by law Each land is required to have a constitution based on universal secret suffrage and the principles of proportional representation, and the same principles must be applied in the smaller units of local government The division of the *Reich* into lands and any alteration of the scheme of division or of boundaries is held to be subject to the will of the people concerned and careful safeguarding articles are included Disputes between lands are referred to the Supreme Court, and the president of the republic is required to carry out the decision of the Supreme Court A feature of the constitution is that there is nothing to prevent any group of people now outside the republic from asking for admission to the status of a land within it

The Government is under a president, who may be any German over 35 and who is chosen by universal direct suffrage, he has, more or less, the powers and duties of a constitutional monarch, he holds office for seven years and may be re-elected The Government consists of a chancellor and ministers appointed by the president, and the chancellor as well as his ministers are responsible for the acts of the Government

The *Reichstag* is the single-chamber legislature elected by proportional representation for the whole republic on the basis of party-lists, one seat in the *Reichstag* is allotted for every 60,000 votes No by-elections take place between elections, any vacancy being filled by appointment of the next person on the party-list The Ministry must have the confidence of the *Reichstag* The *Reichstag* is subject to dissolution and general election every four years, but the president of the republic may dissolve the *Reichstag* and order a new election, he can, however, do this only once on any one point. The *Reichstag* has special committees for foreign affairs Laws have to be passed by the *Reichstag* and are then published by the president of the republic unless he sees fit to decree a referendum on the subject, such a referendum is to be taken under circumstances set forth in the constitution (Art 73) To set aside a decision of the *Reichstag* by referendum it is necessary that the decision should be taken by a majority of the citizens, not a mere majority of those who vote

The *Reichsrat* or Council of the Reich is organized on the basis of the constituent lands or states so that each of the 18 (*see* Population table above) has at least one representative, but, if its population is two million or more, it has one representative for each million, but no state can have more than $\frac{2}{3}$ of the whole membership If there is an excess over an exact number of millions and that excess is equal to the population of the land or state with the lowest total, then the state concerned obtains an additional representative in virtue of such excess The constitution of 1919 provides arrangements for German Austria's representation in the *Reichsrat* Each land or state is represented in the *Reichsrat* by a member or members of its government, but, in the case of Prussia, which has 27 seats, half the seats are filled by representatives of the provincial governments Ministers are required to consult the *Reichsrat* on important matters or to refer them to its committees, on these committees no state has more than one vote Ministers may bring forward any resolution in the *Reichsrat* and the Government must call the *Reichsrat* on the request of one-third of its members If the Government wishes to introduce a bill to the *Reichstag* it must have the consent of the *Reichsrat,* but a bill approved by the *Reichsrat* must be taken to the *Reichstag* by the Government, it being understood that if the Government has objections they will be stated there The *Reichsrat* can object within 14 days to a law passed by the *Reichstag;* it is then referred back to the *Reichstag,* which has to have a reasoned statement of the objection If an agreement is not then reached, the president can order a referendum or suspend the law, but if that law has been passed by two-thirds of the *Reichstag* after knowledge of the *Reichsrat's* objections, the president must, within three months, either publish the law and put it in force or order a referendum

Any alteration of the Constitution must be passed by the *Reichstag,* which must have at least two-thirds of its members present, and such alteration must be voted by at least two-thirds of those present.

If the administration of a new law is carried on through the officials of a constituent land or state, the administrative scheme has to be sanctioned by the *Reichsrat,* otherwise the administration is in the hands of the Government (*Reichsregierung*)

The judiciary is independent of all political considerations and judges are appointed for life, and their removal against their own will is hedged with many restrictions The constitution provides for a Supreme Court for the *Reich,* but the judges other than those of the Supreme Court are appointed by the individual states The Supreme Court (*Staatsgerichtshof fur das Deutsche Reich*) would be alone competent to deal with accusations brought by the *Reichstag* against president, chancellor or ministers or with matters affecting the constitution

The constitution provides for the full equality of all citizens of both sexes before the law, and ensures to everyone the same rights in all parts of the *Reich* without impediment of movement within or out of the *Reich,* save only that a law may be made at any time for and by the whole republic to regulate movement away from Germany Persons of foreign speech resident in Germany are to be free to speak their own tongue and to teach it to their children Distinctions and privileges of rank are abolished—no German may accept a title from a foreign Power, this does not apply, however, in academic matters The principle of freedom of speech, of printing and of public meeting is set forth (Art 118, 123 and 124) The constitution further provides for complete freedom in matters of religion and there is no state church Education is made free, private schools have to obtain official permission, but schools belonging to religious groups are to be in no way hindered if their equipment and staff are satisfactory

The Constitution shows directness of democratic control in the mode of election of the president and in the arrangements for the referendum Its scheme of proportional representation on the basis of voting for party lists, however, makes popular control less direct The responsibility of parliament is markedly emphasised, but the party lists remove all possibility of by-elections or of true local responsibility of members, this tends on the whole to stabilise the constitution of the *Reichstag* The democratic idea is forcefully set forth

Religion.—Historically what is now Germany became divided in the 16th century into regions in which nearly the whole population remained attached to the Roman Catholic church and regions in which the population generally seceded from that church and became Protestant Broadly the south and the Rhineland remained Catholic, with the exception of north Wurttemberg, while the north became Protestant except upper Silesia and parts of the east There is and has long been a large Roman Catholic minority in Prussia and Oldenburg in the north, but Saxony, Brunswick, Thuringia, the Hanse Towns, Waldeck, Anhalt, Schaumburg-Lippe, Mecklenburg-Schwerin and Mecklenburg-Strelitz have only small numbers of Roman Catholics Hesse is rather more than two-thirds Protestant There are considerable Protestant elements in north Baden and north-east Bavaria The distribution of religious adherence has not changed greatly since the Thirty Years War save that immigrants from the west have altered a previous Roman Catholic into a present Protestant majority in several of the eastern regions of Prussia The facts of religious adherence seem to depend largely on the adherence in the 16th or 17th century of the then reigning families to one form of religion or another German Protestantism arose from two chief groups, the Lutheran and the Reformed, but, after 1815, a church union was developed, and in 1924 nearly all the Protestants of Germany became united in a German Evangelical Church Union There are a few Old Lutherans who have stood out against union, and the Moravian communities, a few Quakers, Methodists, Baptists, etc , may be mentioned

The Roman Catholic hierarchy in Prussia includes the archbishopric of Cologne with bishops at Munster, Paderborn and Trier The bishopric of Culm is still attached to the archbishopric

of Gnesen and Posen, though the rest of that archdiocese is now in Poland Breslau, Ermeland, Hildesheim and Osnabrück are directly subject to the Holy See In south Germany the archdiocese of Bamberg includes the dioceses of Eichstatt, Speyer, Wurzburg and Missen, the archdiocese of Munchen and Freising, those of Augsburg, Passau and Regensburg, and the archdiocese of Freiburg, those of Fulda, Limburg, Mainz and Rottenburg (in Wurttemberg) There are vicars apostolic for Saxony, Anhalt and the Northern Missions The Old Catholics who seceded from the Roman Catholic church in consequence of the definition of the dogma of papal infallibility are a small group

The Jewish rite has many adherents in several of the large cities, Hamburg, Berlin, Frankfurt-am-Main, Breslau, Königsberg, Cologne and Nurnberg There has, however, long been a tendency to give up observance of Jewish rites, largely on social grounds, so that the adherents to the Jewish rite are no measure of the amount of Jewish blood in the country The Jewish element is specially strong in and around Berlin

BIBLIOGRAPHY —In addition to the Statistical Yearbook and the *Wirtschaft und Statistik,* published bi-monthly by the Republic, there are many departmental statistical returns The new constitution is published in a Reclam Edition from Leipzig (1921); also by Anschutz, G, *Verfassung des Deutschen Reichs* (1926) The *Deutsches-Reichs-Adressbuch fur Industrie, Gewerbe und Handel* is published from time to time, the 1926 edition has four large volumes, they give facts concerning all towns and villages and a map and short account of each constituent State, there are also multifarious details concerning Germany in general, and these include a transcript of the constitution and many particulars concerning government officers and officials, members of *Reichsrat* and *Reichstag,* the Supreme Courts, and so on *Das Ortsbuch fur das Deutsche Reich* (Berlin, 1927), gives some details about every town and village Baedeker's guides are invaluable G Braun, *Deutschland* (1926, etc), is excellent and has a large bibliography for the regions of the country G P Gooch, *Germany* (1925), is an important study Andrée-Heiderich-Sieger, *Geographie des Welt-Handels,* Bd I *Europa* 4 Aufl (Wien, 1926), includes a long section on Germany *See* also Meitzen A., *Siedelung und Agrarwesen* 1895, Berlin (H J F)

DEFENCE

Under the *Treaty of Versailles*, signed on June 28, 1919 by representatives of the United States, the British Empire, France, Italy and Japan as "Principal Allied and Associated Powers" and by twenty-two lesser Powers (but not subsequently ratified by the United States), Germany was given a period ending on March 31, 1920 to demobilize and reduce her army to 7 divisions of infantry and 3 of cavalry, the total number of effectives after that date not to exceed 100,000 including a maximum of 4,000 officers, of whom not more than 300 were to be employed in the Ministries of War in the different states of Germany and in the administrations attached to them The civilian personnel for army administration services was not to exceed one-tenth of the personnel in each class provided by the Budget of 1913 "The Great General Staff and all similar organizations shall be dissolved and may not be reconstituted in any form" State customs officers, forest guards, coast guards, gendarmes and local or municipal police might not be assembled for military training, and their numbers were to be limited Up to the date when Germany should join the League of Nations her armaments, munitions and military material were strictly reduced, and after that date only to be increased with the sanction of the Council of the League Importation of all such material was prohibited The maximum (but not the minimum, as in the subsequent Treaty with Austria, *q v*) strength of army field formations was prescribed No grouping of divisions under more than two army-corps headquarter staffs was permitted

Universal compulsory military service was forbidden, only voluntary enlistment was permitted Officers retained in the army must serve therein at least up to the age of 45 years Newly-appointed officers must serve on the active list for at least 25 consecutive years, and not more than 5% of the total effectives must be discharged in one year for any reason before their time of service expired Other ranks must serve for 12 years, the same 5% rule applying to their discharge. The number of military schools and of students therein was strictly to be limited Educational establishments and societies and associations of every description were forbidden to occupy themselves with any military matters, to carry out any military instruction or to be connected with Ministries of War or with any other military authorities

All measures of mobilization or appertaining to mobilization were forbidden, and Germany further agreed not to allow any military, naval or air missions to leave her territory; to prevent her nationals from leaving to join the fighting forces of other Powers (except the French Foreign Legion), or to be attached to such forces to give them instruction All fortified works, fortresses and field works west of a line drawn 50 kilometres from the Rhine were to be demolished and no new ones constructed Works of this nature on the southern and eastern frontiers of Germany were to be kept in their existing condition Military (and naval) Air Forces were strictly forbidden

Such were the measures taken by the Allied and Associated Powers to ensure themselves against the recurrence of events after the Treaty of Tilsit which resulted in the arising of a military phoenix from the ashes of previous forces Germany's revised land frontiers extend for 5,944 kilometres, her sea coast for 1,733 kilometres To the "control of the frontiers" and to the maintenance of internal order the functions of the German army are limited by treaty The territory lying west of the Rhine and a zone 50 kilometres wide east of the Rhine have been demilitarized No armed forces can be kept or assembled there either permanently or temporarily No military manoeuvres can be carried out there and no material resources for mobilization retained In connection with the Versailles Treaty, as affecting the disarmament of Germany, it is important also to take note of the undertakings entered into at the same time by the representatives of Great Britain and America, subject to ratification, to "come immediately to the assistance" (*venir immédiatement à son aide*) of France in the event of any unprovoked movement of aggression being made against her by Germany These undertakings were not ratified

Under the Locarno agreements of 1925, Germany, Belgium, France, Great Britain and Italy undertook, in case of attack, invasion or resort to war by one of those Powers, "immediately to come to the help of" (*prêter immédiatement son assistance*) the Power thus attacked They also bound themselves to take the same action in the event of a violation of articles 42 or 43 of the Treaty of Versailles, which forbid Germany to construct fortifications on the left bank of the Rhine, or within 50 kilometres of the right bank, or to assemble or maintain military forces or permanent works of mobilization there In considering the adequacy or otherwise of the present-day German army to perform the functions prescribed by the Versailles Treaty, it is necessary to be acquainted with these Locarno agreements and to determine the extent to which they affect Germany's power to "control the frontiers" The budget estimates for the army for the year 1927–28 amounted to 478,703,000 Reichsmarks, compared with an actual expenditure of 357,131,000 in 1924–25 These figures do not include the cost of the Ministry, of army services outside the fighting forces, war charges, pensions or interest on debt

Recruitment and Service.—Recruitment is by voluntary enlistment Service in the army of the Reich is for 25 years for officers, for 12 years for other ranks, the conditions of discharge being as prescribed Cadets are trained for 4 years before becoming lieutenants and recruits do six months' training in depots before joining their units Facilities are given for all educated soldiers who wish to do so to pass the cadet examination, and no account is taken of origin when promoting cadets to officers' rank Men are trained during their army service for the calling which they may wish to follow when discharged, and every soldier after his 12 years in the army is assured of a post in the public service unless he desires to follow some other career On leaving the army, he receives a gratuity on which to live until he finds employment, and a certificate entitling him to apply for an official post He also receives outfit expenses, and, on request, government security to assist him to settle on the land

The budgetary effectives in the German army in 1927 numbered 4,291 officers, 20,671 non-commissioned officers and 74,229

privates; total 99,191.

Distributed in arms of the service, the figures were:—

Arm	Officers	Other Ranks	Total
Infantry	1,512	51,177	52,689
Cavalry	595	15,396	15,991
Artillery	589	10,238	10,827
Engineers	77	2,793	2,870
Communication troops	77	2,079	2,156
Train	161	5,572	5,733
Medical corps	63	2,800	2,863
Special	724	4,845	5,569
Medical and veterinary	493	2,800	3,293
Total	4,291	94,900	99,191

The organization of the army provides for 7 infantry divisions and 3 cavalry divisions, arranged in two groups (*see* VERSAILLES TREATY)—*Gruppenkommando*—the First Group containing 4 infantry and 2 cavalry Divisions, the Second Group 3 Infantry and 1 Cavalry Division Each division contains 3 regiments of infantry, 1 regiment of artillery, 1 pioneer battalion, 1 signal section, 1 motor transport section, 1 horse transport section and 1 medical section A cavalry division contains 6 cavalry regiments and 1 group (3 batteries) of horse artillery There are no "army troops" An infantry regiment, of which there are 21, contains 4 battalions, of which one is an instructional battalion Out of the 16 companies in a regiment, there is one for trench-mortars, 3 for machine guns and three for instruction A cavalry regiment, of which there are 18, includes 4 squadrons, 7 additional squadrons act as divisional cavalry, and there are 18 depot squadrons An artillery regiment, of which there are 7, contains 3 groups, each of 3 batteries either of 7 7cm guns or of 10 5cm howitzers, and there are 7 instructional batteries and 3 groups of horse artillery A Pioneer (engineer) battalion, of which there are 7, contains 2 companies, a search-light section and a pontoon company There are no railway engineer units The train includes 14 groups, of which 7 are motor-drawn and 7 horse-drawn; the medical service 7 groups; and communication service 7 groups A veterinary experimental station in Berlin; military Lehrschmieden (veterinary colleges) at Berlin, Hanover and Munich, and an engineering workshop at Schoneberg complete the army organisation

In estimating the potential war strength in trained military man-power, as compared with the supreme effort made in the years 1914–18, due account must be taken on the one hand of the reduction of the territory of the German Empire under the provisions of the Treaty of Versailles, on the other hand of the experience and military tradition handed down by the generation that passed through the great ordeal, and of the physical training and drill, though without arms, given to the youth of the country Under the Treaty (article 164) Germany agreed not to increase the maximum stock of arms in the country, after becoming a member of the League of Nations, without the sanction of the Council of the League, beyond the following maximum totals: rifles, 84,000 with 40,800,000 rounds of ammunition, carbines, 18,000 with 15,408,000 rounds, heavy machine-guns 792 and light machine-guns 1,134 with 15,408,000 rounds in all, medium trench mortars 63, with 25,200 rounds, light trench mortars 189, with 151,200 rounds, 7 7cm field guns 204, with 204,000 rounds; 10 5cm field guns (the maximum calibre allowed) 84, with 67,200 rounds The manufacture of arms, munitions or any war material only to be carried out in factories or works the location of which is approved by the Allied and Associated Powers Importation into Germany of arms, munitions and war material of every kind was strictly prohibited These figures may serve as a guide to the possibilities of further expansion of military strength. There are 3 arsenals

Higher Command.—The President of the Reich is the head of all the land forces of Germany. Under his orders, the actual command over all the armed forces is exercised by the Minister of National Defence of the Reich The actual army command is under the orders of a general officer, who acts as military adviser to the minister The minister's office is provided with a secretariat divided into five sections to deal with the army and the navy. The army command (*Heeresleitung*) contains five branches of the staff for questions of (1) personnel, (2) troops, including the study of military questions, (3) general army service, (4) military administration, (5) armaments; besides the staffs of the inspectors of army schools, infantry, cavalry, artillery, engineers and fortresses, communications troops, signals, medical and veterinary services. The only exception to the complete control of the ministry over the army in all matters is that Bavaria is allowed a special influence over appointments to commands in the 7th Infantry Division, stationed in Bavaria. The supreme control by the President of the Reich is complete The absence of a Great General Staff, in accordance with treaty obligations, will be noted

Distribution.—There are seven military areas, each containing a Division, recruited in the area Cavalry regiments are distributed over the whole country, with divisional headquarters at Frankfurt-am-Oder, at Breslau and at Weimar The seven divisional areas are.—

I	Countries N E of the Vistula, headquarters, Konigsberg.
II	Pomerania, Mecklenburg, Schleswig-Holstein, headquarters, Stettin
III	Brandenburg and Silesia, headquarters, Berlin
IV.	Country and Province of Saxony, headquarters, Dresden
V	Thuringia Hesse-Nassau, Württemberg and Baden, headquarters, Stuttgart
VI	Hanover and Westphalia, headquarters, Munster.
VII.	Bavaria, headquarters, Munich.

As affecting troop-movements in peace time, it is important to take note of the treaty undertakings, already mentioned, to assemble no armed forces in the demilitarized zones and to carry out no military manoeuvres therein Army training grounds are in use at Altengrabow, Arys, Doberitz, Grafenwohr, Hammerstein, Juterbog (for artillery), Konigsbruck, Munsingen, Munster, Neuhammer, Ohrdruf, Senne, Kummersdorf and Klausdorf (for engineers)

Military Education.—There are 4 army schools under the inspection of the army schools branch of the ministry of defence one at Dresden to train officers for the infantry, one at Hanover for the cavalry, one at Juterbog for the artillery and one at Munich for the engineers Other educational and academic organisations and societies and associations of every description, for members of whatever age, are forbidden by treaty to concern themselves with any military matters, and, more particularly, to instruct their members, or to allow them to be instructed or educated or exercised in the profession or use of arms

The manufacture or importation into Germany of armoured cars, tanks and of "all similar constructions suitable for use in war" are prohibited by the Treaty of Versailles, also, by the same authority, the use of "asphyxiating, poisonous or other gases and all analogous liquids, materials or devices" These are neither to be manufactured nor imported into the country The same limitation applies to materials specially intended for the manufacture, storage and use of these products and devices In 1926 the figures for certain chemicals in Germany were, for nitrate of soda 28,000 metric tons produced (all exported), for sulphur 99,000 produced, 74,000 imported and 57,000 exported, in 1925 2,247,000 metric tons of salt were produced and in 1926, 9,400 were imported and 798,000 exported For manufactured chemical products, the figures in the years given in brackets were for sulphate of ammonia 1,191,000 produced (1922), 1,200 imported and 464,100 exported (1926), for cyanide of calcium 238,000 produced (1922) and 1,200 imported (1925), for sulphuric acid, 1,040,000 produced (1922), 23,800 imported and 83,900 exported (1926), for nitric acid 430 imported and 17,210 exported, and for spirits (alcohol) produced 2,230,000 hectolitres (1925), 5,700 imported and 7,400 exported (1926) These figures, from the armaments yearbook of the League of Nations for 1927–28, give some idea of the magnitude of the German commercial chemical industry The German training regulations are based on future possibilities rather than on existing limitations to 100,000 men without many of the requirements of modern warfare, as General von Seeckt explains clearly in the preface. Mobility, manoeuvre

and surprise are the keynotes of the German doctrine which is embodied in such phrases as "inferiority of numbers must frequently be counter-balanced by greater mobility" and "the utilization of darkness as a concealment for movements will play a great rôle" There are references to the free use of rail and motor transport and indications of a tendency towards gas warfare

Permanent Fortifications.—A brief résumé of the recent history of the fortification policy of the late German Empire will bring into prominence the importance of the provisions for the future laid down after the World War The fixed defences maintained by the German empire (apart from naval ports and coast defences) belong to two distinct epochs in the military policy of the state. In the first period (roughly 1871–1899), which is characterized by the development of the offensive spirit, the fortresses, except on the French and Russian frontiers, were reduced to a minimum In the interior only Spandau, Custrin, Magdeburg, Ingolstadt and Ulm were maintained as defensive supporting points, and similarly on the Rhine, which was formerly studded with fortresses from Basel to Emmerich, the defences were limited to Neu Breisach, Germersheim, Mainz, Coblenz, Cologne and Wesel, all of a "barrier" character and not organized specially as centres of activity for field armies The French frontier, and to a less extent the Russian, were organized offensively Metz, already surrounded by the French with a girdle of forts, was extended and completed as a great entrenched camp, and Strassburg, which in 1870 possessed no outlying works, was similarly expanded, though the latter was regarded an instrument of defence more than of attack On the Russian frontier Konigsberg, Danzig, Thorn, Posen, Glogau (and on a smaller scale Boyen in East Prussia and Graudenz on the Vistula) were modernized and improved

From 1899, however, Germany began to pay more attention to her fixed defences, and in the next years a long line of fortifications came into existence on the French frontier, the positions and strength of which were regulated with special regard to a new strategic disposition of the field armies and to the number and sites of the "strategic railway stations" which were constructed about the same time Thus, the creation of a new series of forts extending from Thionville (Diedenhofen) to Metz and thence south-eastward was coupled with the construction of twelve strategic railway stations between Cologne and the Belgian frontier, and later an immense strategic railway station was undertaken at Saarburg, on the right rear of Thionville and well away from the French frontier, and many important new works both of fortification and of railway construction in Upper Alsace, between Colmar and Basel In August 1914 the rapid construction of semi-permanent works, which helped so materially to defeat the French offensive against the left-centre of the German advance, brought into prominence the value of such works, as did their absence on the other flank which was left open to the German turning movement

Passing to the present situation, Germany's land frontiers have no protection from natural features or barriers to aid the army in its mission of "controlling the frontiers" enjoined by the Versailles Treaty. These frontiers face, in the west, France, Belgium and Holland, and there are now no fortresses, on the east, Poland and Czechoslovakia, the fortresses being out of date and the frontier 170km from Berlin, in the north, Denmark; in the south, Switzerland and Austria The total land frontiers measure 5,944 kilometres, and the sea-coast 1,733 kilometres There are coast defence commands (naval) with headquarters at Wilhelmshaven, Borkum and Cuxhaven in the North Sea, and Pillau and Swinemunde in the Baltic Under the Versailles Treaty, the fortifications on the western frontier have been dismantled, and those on the eastern and southern frontiers remain as they were in June 1919 There are 14 fortification commands, 4 in No I military area, 2 in No II, 4 in No III, 1 in No V., 2 in No VI, and 1 in No VII

Army Air Forces.—Under the Treaty of Versailles, "the armed forces of Germany must not include any military or naval air forces. No dirigible (*ballon dirigeable*) shall be kept" Civil aviation is allowed to Germany and much encouraged, and certain technical points were enumerated, in agreement with the German Government, in 1922, as qualifying aeroplanes for use in warfare The possession of aircraft having these characteristics was forbidden An inter-allied aeronautical Commission, with branches in Berlin, France and Great Britain, was at the same time established to see that the provisions are not infringed

The Security Police (*Schutzpolizei*) are under the states, not under the Reich They receive no military training, and are under civil administration

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Navy.—The peace terms as they affected the German Navy were very severe Within two months of the Treaty of Versailles coming into force the German naval forces in commission were not to exceed 6 battleships of the "Deutschland" or "Lothringen" type, 6 light cruisers, 12 destroyers, 12 torpedo boats, or an equal number of ships constructed to replace them Germany was precluded from owning any submarines The personnel of the navy, including fleet, coast defences, signal stations and administrative services was not to exceed 15,000 officers and men, of which the officers and warrant officers were not to exceed 1,500 The whole of the warships interned in the ports of the Allies under the conditions of the Armistice or in neutral ports were to be surrendered In addition 8 battleships, 8 light cruisers, 42 destroyers, 50 modern torpedo boats, all submarines, submarine salvage vessels and docks for submarines were to be handed over or broken up Germany was forbidden to construct or acquire any warships, except to replace the units she was permitted to have in commission, and such warships were not to exceed the following displacement —armoured ships, 10,000 tons; light cruisers, 6,000 tons, destroyers, 800 tons, torpedo boats, 200 tons Unless a ship had been lost it was not to be replaced until 20 years, in the case of battleships and cruisers, or fifteen years, in the case of destroyers and torpedo boats, had elapsed since the date of launching Conscription was to cease entirely, and all recruiting was to be by voluntary engagement

Germany to-day (1928) is strictly conforming to these obligations, and the only alterations which have been made in the fleet allotted to her by the treaty have been the replacement of four cruisers by new ships and a further one projected, and twelve new destroyers for the same purpose, to all of which she is entitled Designs have been prepared for new 10,000 ton armoured ships to replace the obsolescent battleships The German Navy is administrated by a Naval Board, which is part of the Ministry of National Defence, at Berlin (E A)

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ECONOMIC AND SOCIAL CONDITIONS

Germany After the World War is different in geographical extension as well as in economic structure from the Bismarckian empire of 1871. Though the country was not broken up in scattered parts, as seemed likely immediately after 1918, its area has been considerably reduced Alsace-Lorraine and a few outlying districts handed over to Belgium have been lost on the western frontier, Posnania, parts of West Prussia and of Upper Silesia, have gone to Poland in the east, and a large area has been joined to Denmark In the west, the Saar area has been separated from the German economic body for the time being Germany, moreover, is no longer an unbroken territorial unit Danzig and the Polish Corridor have cut the connection between the Reich and East Prussia This province has thus become a kind of outlying dependency, enclosed by foreign customs frontiers, freely accessible from the mother country by sea only.

On the other hand, constitutional changes have greatly strength-

ened the economic unity of the Reich. The number of separate States forming the Bismarckian Reich has been reduced from 26 to 17 by the amalgamation of smaller units, either with each other (Thuringia) or with Prussia and Bavaria This process of amalgamation is likely to continue But the feature most characteristic of the German Union, the fact that Prussia is the predominant partner, has not been changed. The 16 other units, comprising not only the petty countries but Bavaria, Wurttemberg and Saxony as well, cover but 177,000 sq km with 24½ million inhabitants, whilst the remaining partner, Prussia, controls 293,000 sq km. and 38 million inhabitants

Some sort of unification is *en marche* The Reich has firmly grasped the financial sovereignty belonging to the States under the Bismarckian constitution. Whilst formerly the Imperial treasury was the pensioner of the States, the process has become inverted. the States, now called *Lander,* are restricted to such taxes as the Reich has seen fit to turn over to them, they draw most of their sustenance from the subsidies it is granting to them from proceeds of taxes assigned and collected by its authority It is not a sound system as different authorities are responsible for the raising and for the spending of the revenues; there is a good deal of haggling about the shares. But the very shortcomings of the system are driving all parties concerned towards greater unification, some of them conniving at it very much against their will. The Reich has by now built up its own system of tax gathering over its entire area; it is beginning to take over the separate financial services which the *Lander* so far have maintained for the assessment and the collection of taxes left to them for their own independent use. Germany is under way of becoming economically and financially a "united empire," somewhat like England, Wales, Scotland and Northern Ireland, whilst formerly she was a kind of union of the United States type

Natural Resources.—Germany is not a rich country as far as natural resources go Of her total surface of 468,000 sq km. (Saar area excluded) about 60,000 are unfit—at present—for cultivation, being covered by moors, river beds, hills and mountains, the latter rising on her south-eastern frontier to the level of eternal snow A huge plain stretches from near her western boundary through the Polish Corridor to her eastern frontier, fertile in some parts, it is true, but consisting elsewhere of thin sandy soils fit only to grow potatoes, rye and fir. Of the country's total area capable of being beneficially worked 120,000 sq km. are covered with forest, 190,000 sq km are under the plough, 77,000 sq km. are pasture and meadows The climate, though severe in the extreme north and in the high lying mountain lands, is genial enough for viticulture in the river-valleys of the west, the Rhine, the Moselle, the Main and the Saar The vintage of sheltered sites in favoured years is as unique as are the best French brands In the Rhine valley and other sheltered spots an inferior tobacco is grown—whilst the rich lands of central Germany, especially of the Prussian province Saxony, are producing sugar-beets containing a very high percentage of sugar Fruit growing is possible all over the country, the south-western and southern districts excelling in quality.

Germany's great natural assets are her coal mines She is supposed to possess 235,347 million tons, 5·4% of the world's total supply of coal Coal-bearing areas are found in many districts; the main centres of the industry are, however, the Ruhr district, which is producing about 78% of the total German production, and the Silesian area, especially Upper Silesia A very large part of this area has been handed over to Poland under the award of the League of Nations, resulting in a severe dislocation of the coal trade Many of the German coal seams are comparatively thin, especially in the Ruhr district where working costs are comparatively high On the other hand their situation close to great natural waterways and to efficient canals is favourable to distribution Upper Silesia, on the other hand, has been a land of very thick seams, and low working costs, but is rather badly situated for distributive purposes

Within the last 20 years the exploitation of the huge lignite deposits has been taken up The available German supply is estimated at 13 million tons (0 4% of the world's reserves). These deposits can be worked very cheaply, as they are close to the surface. As they are not mined, but rather scraped up by means of huge mechanical excavators, production is not dependent on an adequate supply of skilled miners. The most important of these new lignite areas are close to existing industrial centres. Thus power plants in the lignite area of central Germany are generating the electric power needed in Berlin. Lignite, moreover, has been made the base for the production of synthetic nitrate and can be used as cheap raw material for producing oil Germany's position as an iron-ore producing country has been greatly changed by the Treaty of Versailles. The loss of Lorraine has reduced her annual production from 28½ million tons in 1913 to five million tons in 1925. Having lost her main supplies, she is now but the fourth of the iron-ore producing countries of Europe. Her visible supplies of iron-ore are 726 million tons, 2·2% of the world total, whilst there are another 2,851 million tons (2 9%) estimated reserves

Apart from iron Germany's mineral wealth is not considerable There are some spelter, copper, silver, lead and a little tin, and, of course, a good deal of bauxite On the other hand the world's chief potash deposits are located in Germany They are estimated at 20 milliard tons The only other European country owning potash mines is France, who got control of them by the cession of Alsace-Lorraine

The many mountain districts, distributed over many parts of the country, make it fairly easy to use and exploit water power. Southern and south-western Germany, which are far away from the coal areas, are favoured by easy access to water power.

Broadly speaking, apart from coal, Germany is not conspicuous amongst the countries of the world for the possession of natural resources. Invention and scientific management rather than natural wealth are the mainstays of German economic life It is not by accident that she has become the home of applied chemistry

AGRICULTURE

There are two main systems of landholding forming the basis of German agriculture, each of them predominating in different parts of the country The east, especially the country to the right of the Elbe, is a land of big properties, some tracts like East Prussia and parts of Silesia being in the hands of comparatively few owners These estates are rarely let to tenants, they are run like home farms under the management of the owners or their administrators by means of hired agricultural labourers Of the 5,096,534 holdings only 1,373,625 are let to tenants, who farm but 12 4% of the total area used for agricultural purposes Since migration to the industrial centres has set in, there is very often a scarcity of labour; and many estates have to depend on migratory labour, most of it non-German

In the west, in the south and in most parts of central Germany the land is mainly held by peasant proprietors Some of them, especially in the north-west, own fairly large farms, for the working of which they employ hired labour Others again, especially in the Rhine valley, are small holders, running their farm or plot —some of them very intensively cultivated—with the help of their families The distribution of the total 5,096,534 holdings enumerated is (1925 figures):

Size of holdings	Number of holdings	Area covered
0·05–2 ha.	3,027,430	1,587,670 ha
2–20 ,,	1,850,608	12,082,485 ,,
20–100 ,,	199,825	6,768,629 ,,
100 and more ha	18,671	5,159,893 ,,

Not quite 222,000 holdings out of a total of over five million are "biggish properties," over 50 ac , and fewer than 19,000 are over 250 ac each

Agrarian Germany—outside certain districts—is a kind of peasant-democracy, dominated in some parts, it is true, by large estate owners, who farm on a large scale and who cling tenaciously to traditional and somewhat feudal social conceptions This sway is slowly disappearing Big estates are broken up, partly under the desire for closer settlement, partly as a result of the agricultural crisis which has hit the owners of big properties at least in certain parts of the country, far more severely than the farmers

working medium-sized and small holdings. Since 1918 about 15,000 new holdings have been established in Prussia alone

Though the policy of protection of agriculture was resumed in the summer of 1925, Germany has not become a self-supporting country. There is an occasional surplus of rye, but 2,172,205 tons of wheat—about 35% of the total consumed—were imported in an average year like 1926 The total value of food and feeding material imported reached nearly 4 milliard marks or about 27% of Germany's total imports (1927).

Of the country's total surface used for agricultural purposes 20,477,581 ha. were under some sort of tillage in 1926; 7,950,193 ha. were meadows and pastures

Division of Crops

	Area covered ha.	Tons harvested	Yield per ha 100 kg.
Rye	4,732,308	6,405,905	13 5
Oats	3,476,157	6,324,555	18·2
Wheat	1,601,210	2,597,185	16 2
Barley	1,485,510	2,462,541	16·6
Hay	5,468,436	23,257,336	42·5
Turnip	725,821	23,072,828	319 9
Sugar beet	402,935	10,495,308	260 5

Outside a few grazing districts mixed farming is the rule. Nearly everywhere cattle must be kept indoors in winter This being the case, stall-feeding predominates everywhere, aiming at dairy produce rather than at stock-breeding and fattening or sheep farming

Census of Livestock (1926)

Horses	3,873,131
Cattle	17,133,445
Sheep	4,080,472
Pigs	19,424,552

Pig-raising is the mainstay of the potato-producing estates as well as of many small farms Distilling alcohol from potatoes is one of the subsidiary industries of the big estates of the north, whilst in the south rural breweries have been attached to the comparatively few large estates existing there

Viticulture is important on the banks of the Rhine, the Main, the Moselle and the Saar. The value of the vine crop (1926) was 86 8 million marks (Saar area excluded) A few vineyards are found as far north as Silesia and in the Merseburg district Nearly 1,650,000 tons of raw sugar were produced in 251 factories, leaving about 100,000 tons for export, after providing for home consumption About 12 million ha are covered with forest, about 50% being private property, the rest belonging to the States and municipalities

German agriculture in 1928 was in a bad way. A system of duties on agricultural imports had been adopted since 1925 to raise the prices of the world market. Negotiable drawbacks on exports of agricultural goods have been devised to enable producers to export any surplus which might, after a good harvest, depress the artificially raised home prices The duty-free import of chilled or frozen meat is limited to 120,000 tons a year; its sale is subject to restrictions

Duties on Agricultural Produce

	Rate in marks per ton	Quantities imported 1926 in tons	Prices (marks) March 1927	
			In Hamburg	World markets
Wheat	50	2,612,147	263·30	231 per ton (Liverpool)
Rye	50	787,932	243 80	218 per ton (Denmark)
Barley	20	2,000,272	230 40	212 per ton (Denmark)
Oats	50	285,709	200·40	177 per ton (Denmark)
Butter	300	108,266	4 21	3·25 per kg. (London)
Cattle	180	33,848	1,200	855 per ton (Denmark)

Notwithstanding this artificial rise of prices, agriculture is not a paying concern Prices of agricultural produce must follow the movement of the world market; fluctuations cannot be prevented as in cartelized industries. Industrialists can stabilize prices at a level they consider profitable by a combination of protective duties with a centralized control of the market Agriculturists on the other hand pay greatly inflated prices for their equipment, whilst they receive prices by no means adequately raised

	Movement in percentages of	
	Agricultural prices	Industrial prices
1913	100	100
December 1925	130 7	145·3
„ 1926	133 7	143·8
„ 1927	136 6	142·3

Wages of agricultural labourers have risen considerably. They vary greatly in the different districts They amount to about 0 48 mark per hour in the Rhineland, but are only 0 34 mark in East Prussia Agriculture has benefited considerably by the results of inflation, inasmuch as the mortgages with which it was encumbered have been wiped out At the same time agriculturists lost their entire liquid capital as far as it was invested in government bonds and similar interest-bearing securities.

After stabilization, capital was extremely scarce. New mortgages were not forthcoming The rate of interest was 10% and more. As they were unable to get long-term credit agriculturists borrowed on bills of exchange. Co-operative credit organizations being numerous in Germany, this was comparatively easy, especially as the Rentenbank and the Central Co-operative Bank (Preussenkasse) were extending credit facilities to co-operative societies and their members in a liberal way

Co-operative Societies (1926)

	No of societies	Credit societies
General Union of Raiffeisen Societies	8,586	5,987
National Union of German Agricultural Societies	25,747	13,040
Co-operative Association of the National Land Union	1,090	166
Co-operative Association of the German Peasant Union	1,549	1,143

Of the 52,000 co-operative societies enumerated on Jan. 1, 1927, 20,251 were rural credit societies, the remaining 30,000 being co-operative buying, marketing or producing agencies The total number of co-operators (including members of consumers societies) was estimated at about five to six millions, or, counting their families at five to six persons, about 30 millions,—nearly half of the German population

Financial results, however, have been disappointing The debts have not been paid back Prolongation of short-term loans has immobilized the available means of the Central Co-operative Bank (Preussenkasse) to such a degree that there are about 800 million marks outstanding Even when these short-termed loans have been converted into long-termed mortgages—which is not easy to achieve—a crushing load will compel many proprietors, especially the big ones, to sell their estates About five years after the complete clearing of debts, brought about by inflation, the total annual debt service burdening agriculture is supposed to exceed the pre-war charges It has lately been estimated at seven milliard marks. The capital value, owing to the increased interest rates, may be less; it has reached the formidable figure of seven milliard marks A small part of these new burdens is due to the so-called valorization of the old debts, by which the former creditor will receive nominally 25% of his old mortgage in 1932 As these mortgages do not fall in before 1932 and as the interest paid on them in the meantime does not exceed 5% the real capital value of valorized mortgages is less than 20% But even so the burden on agriculture is very heavy indeed

Though a good deal of this borrowed money has been spent on making cultivation more intensive, results are disappointing.

Yields per ha , 100 kg

	Wheat	Rye	Barley	Oats
1913	24·1	19·3	22·0	22·0
1924	16 6	13·5	16·6	16·0
1925	20 7	17 1	18·1	16 2
1926	16·2	13·5	16·6	18·2

INDUSTRY

More than 41% of the German people are engaged in industry. Though the old handicraft system is by no means completely extinct, more or less modernized industrial establishments depending on mechanical power are the rule Of 1,842,913 industrial establishments only 293,279 might be classified as home industries The use of mechanical power has greatly increased, at the rate of 183 7% since 1907

The industrial census of 1925 classified German industry in 17 main groups These groups embrace 1,843,913 establishments, employing 12,482,442 workers (including 2,872,813 females) The number of these establishments has changed very little since 1907 (1 9%), but the number of people employed has grown by 26·8%, notwithstanding the great increase in the use of mechanical power. These groups are shown in the synopsis in next column.

Distribution of German Employment, 1925

	No of people employed	Value of produce in milliard marks	Percentage weight index
A. Agriculture and Forestry	9,762,000	10 0	
B. Industry	12,598,000	26 0	100 0
1 Industries producing producers' goods	6,677,000	14·1	54·1
2. Industries producing consumers' goods	5,921,000	11 9	45 9
C. Commerce and Transportation	5,384,000	12 0	
1. Commerce, banking, insurance	3,213,000		
2. Transportation	1,455,000		
3 Hotel-keeping, inns, etc	716,000		
D. Services	3,369,000	6 0	
1 Public Services	1,975,000		
2 Domestic Services	1,394,000		
Total	31,113,000	54 0	

VALUE OF OUTPUT OF GERMAN INDUSTRIES (1925) PRODUCING MORE THAN 1,000,000,000 MARKS

	Marks
Chemicals	3,000,000,000
Machines	2,900,000,000
Electro technical products	2,100,000,000
Coal mining (lignite excluded)	1,900,000,000
Rolling mills, finished goods	1,635,000,000
Steel works, mild steel	1,300,000,000
Cotton spinning	1,200,000,000

VOLUME OF GERMAN PRODUCTION (SAAR AREA EXCLUDED)

Mining, Iron and Steel Industries, 1927 (1926)

	1926 Separate undertakings	1926 Men employed	1926 Tons	1927 Tons
Coal mining	314	514,800	145,300,000	153,598,000
Lignite	364	77,000	139,200,000	150,806,000
Coking (oven)	15,508	24,800	27,300,000	32,261,000
Briquette-making from coal			5,900 000	4,971,000
Briquette-making from lignite			34,400,000	36,463,000
Salt and potash mining	89	21,860		
Potash (crude)			9,408,000	
Potash			1,260,000	1,200,000
Iron ore	182	14,200	4,793,353	
Lead, silver, spelter	40	11,783	1,700,000	
Arsenic, copper	12	10,382	953,000	

Synopsis of German Industries, Based on the Industrial Census 1925

A. INDUSTRIES PRODUCING PRODUCERS' GOODS.	Persons employed	Power used Horsepower
1. *Industries producing materials for generating power*		
(a) Coal	679,000	3,498,000
(b) Peat, oil, etc	16,000	24,000
(c) Electricity	85,000	222,000
(d) Gas	47,000	80,000
Total	827,000	3,824,000
2 *Basic industries*		
(a) Iron and metals	514,000	3,059,000
(b) Chemical produce	267,000	998,000
(c) Paper, paper goods, printing	554,000	978,000
(d) Leather	67,000	131,000
(e) Wood and wooden goods	137,000	371,000
(f) Materials for building	397,000	736,000
Total	1,936,000	6,273,000
3 *Construction industries*		
(a) Building and subsidiary industries	1,679,000	459,000
(b) Engineering	1,366,000	2,244,000
(c) Electro-technical produce	341,000	386,000
(d) Tools	341,000	232,000
(e) Coachmaking, wheelwright trade	104,000	109,000
(f) Case-making	49,000	62,000
(g) Tyres	34,000	49,000
Total	3,914,000	3,541,000
Industries producing producers' goods Total	6,677,000	13,638,000
B INDUSTRIES PRODUCING CONSUMERS' GOODS		
1. *Foodstuffs, drink and tobacco*	1,356,000	1,848,000
2. *Clothing*		
(a) Yarns and tissues	743,000	1,094,000
(b) Apparel (clothes and linen)	807,000	19,000
(c) Stockings and knitted wear	207,000	69,000
(d) Ribbons, etc.	56,000	18,000
(e) Hats, ties, furs	157,000	29,000
(f) Gloves	45,000	4,000
(g) Shoes	388,000	57,000
(h) Cleaning	187,000	32,000
Total	2,590,000	1,322,000
3. *Housing, luxuries, etc..*		
(a) Furniture	440,000	367,000
(b) Drapery, furniture coverings	157,000	95,000
(c) Lamps, jewellery, enamel	405,000	300,000
(d) China, earthenware, glass	255,000	164,000
(e) Wooden utensils, sticks, brushes, combs	216,000	116,000
(f) Goods made of leather, linoleum	98,000	25,000
(g) India-rubber goods	34,000	48,000
(h) Clocks, optical glasses, etc	153,000	56,000
(i) Musical instruments, toys	110,000	44,000
(k) Candles, perfumes, drugs	82,000	68,000
(l) Photography	16,000	
Total	1,975,000	1,283,000
Industries producing consumers' goods Total	5,921,000	4,453,000

Production of Pig Iron

	1926 Tons	1927 Tons
Total production	9,643,519	13,102,528
Consumption of scrap	6,761,000	
Total number blast furnaces.		
Existing	206	191
Working	109	116

Production of Raw Steel

	1926 Tons	1927 Tons
Total production	12,341,636	16,315,330

Rolling Mills

	1926 Tons	1927 Tons
Total production	10,276,082	12,866,773

(1926—80,000 persons employed)

Foundry Plants

	1926 Tons
Total production	2,046,000

Shipbuilding (1926)

	No. of ships built	Gross reg. tons
Total	60	180,548
Of these there were:		
Steamships	36	106,426
Motorships	22	70,478
Sailing ships	2	3,644

Outside the mining and the iron and steel industries which report regularly, a few figures can be gleaned from the Census of Production and some separate trade publications They mostly deal with the year 1925 —

Textile Trade (1925)

	No. of works	No. of spindles	Output in tons
Cotton spinning	454	11,250,000	304,527
Jute spinning	45	200,000	130,949
Worsted spinning	102	2,499,000	53,778
Linen spinning	56	331,000	22,504
Production of raw wool			22,800
Production of artificial silk			12,000

The textile trades employed nearly 1,200,000 workmen

Other Industries (1925)

	Output, tons
Chemicals	
Sulphuric acid production	1,800,000
Nitrogen	450,000
Superphosphate (1924)	500,000
Aniline dyes (1924)	72,000
Motor cars	No
Works	235
Persons employed	80,000
Passenger cars	38,988
Motor bicycles	48,783
Tractors	15,058
Trucks	9,364
Electrical power plants	Power generated
122 works	10,367,000,000 kw

The after-effects of the war and of the revolution greatly affected German industries The revolution brought about a different attitude of the working classes Labour's increased demands not only led to important changes in wages and hours of work, they greatly lessened the disparity between skilled and unskilled workers and made collective bargaining almost universal Inflation has reduced the 4½ to 5 milliard marks of bonded debt with which industrial concerns were saddled, to less than one milliard, if valorization is taken into account;—an advantage which was quickly lost when the Dawes plan placed five milliard marks representing an annual charge of 300 million marks, running for 38 years, on industrial concerns with the avowed object of equalizing the cost of production of German industries with those of competing countries.

On the other hand, inflation greatly dislocated the home market, the income of the large class formerly receiving interest on mortgages, debentures and other bonds, having been reduced by at least four-fifths. Moreover, the scarcity of capital following inflation cramped industrial reorganization A contracted home market was not offset by expanding foreign markets In many oversea countries industrialization set in to such a degree as to make the importation of manufactured goods more or less superfluous Whilst Germany was precluded from the full enjoyment of the most favoured nations clauses in the former enemy countries, her selling agencies were destroyed permanently in many cases, owing to the expulsion or non-admission of her nationals

Last, but not least, the Treaty of Versailles greatly dislocated some of the leading German industries, especially the mining industry, the iron and steel industry, the textile industry and, to a lesser degree, the chemical trade

The direct loss of the mining industry in producing capacity was about 19% of the production of 1913, the ceded part of Upper Silesia producing about 32 million tons of the production of 190 million tons, moreover, 13 million tons for the Saar district have to be deducted for the time being These losses could not be completely recovered The world's coal situation has changed; lignite has come to the forefront, oil and electricity have become serious competitors But production has gone up again It reached, in 1928, 154 million tons, or 82 4% of the production before the war. The number of persons employed has steadily fallen, in 1928, it was 514,800 or 80 7% of the former number This shows clearly that, notwithstanding the reduction of working hours, the output per worker is greater than before

The mining industry's chief difficulty was the obligation to furnish coal to France and Belgium in times of fuel scarcity, when this delivery of coal gave a start to their competitors. The greatest dislocation took place in the iron and steel trade, owing to the cession of Alsace-Lorraine The production of iron ore had been 28 6 million tons in 1913, of this output the districts remaining with Germany produced but 7 3 million tons—a reduction of 74 5% This production did not increase, it fell (1926) to not quite five million tons, the number of separate undertakings was reduced from 328 to 182, and the number of people employed from 43,000 to 14,000

Notwithstanding this very great reduction of its basic materials, the German iron and steel industry has recovered its position Amongst other losses there were 23 concerns with 114 blast furnaces, 21 steel works with 50 Thomas converters and 70 Martin hearths and 30 rolling mills These works were expropriated by the French government, the German government being bound to pay compensation, which was used for the re-erection of plants in German territory The former German owners, being in most cases owners of coal and coke in the Ruhr district, could easily start new works on the basis of their ownership of coal, whilst their French successors depended for the profitable running of their newly acquired Lorraine steel-works, on coal from the Ruhr and on the market of south-western Germany When the struggle for the Ruhr was over and when Germany regained her liberty of tariff legislation, it was seen that the German iron and steel industries were in a strong position By importing ores and by the use of scrap Germany had enough raw material to start again

By 1927 the average monthly production of raw iron had reached 1 136 million tons, against 1 397 million tons for the whole Reich in 1913, and the average production of raw steel 1·394 million tons against 1 429 million tons 1913 This reconstruction of the iron and steel works, forced upon the German owners by the French government, is one of the causes contributory to the crisis in the iron and steel trades of the world, caused by the erection of too many plants

German business life is highly organized Joint stock companies and limited liability companies are increasing in number and importance

Organization has not stopped at the formation of joint stock

	Joint stock companies		Limited liability companies
	No.	Nominal capital	No.
1913	5,139	16,527	26,790
1926	12,343	20,655	57,338

companies. During the days of inflation the concentration of industries in a few hands by all sorts of combines was highly popular Shrewd business men borrowed money to buy shares and plants, and repaid the loans in valueless paper money. Some of the new combines collapsed when credit became dear. Others chose the so-called "vertical" combination, trying to concentrate in one hand works representing the different stages of production. For some time the "integral" combination became the industrial ideal It was a self-sufficient industrial unit, which raised its own raw material and distributed its own finished produce by its own selling agency, after having sent the raw material through all manufacturing stages, in works under control of the management

The scarcity of credit which followed the stabilization of the mark dealt unkindly with these undertakings, but many have survived. It has been estimated that of the 12,000 joint stock companies existing Oct. 31, 1927, 2,100 are controlled by such concerns, whilst the nominal capital invested in these 2,100 undertakings is estimated to be about three-fifths of the nominal capital of the existing joint stock companies

	No of companies	Nominal capital in million gold marks	
		Maximum	Minimum
Joint stock companies	12,008	18 117	17 476
In combines	2,106	11·455	10 814

The relation between the companies is sometimes maintained by means of a holding company, in other cases interlocking directorates are supposed to be sufficient

The other form of combination, the "horizontal" combine, the object of which is to unite all works producing similar goods in some sort of union with the object of controlling prices, is more firmly established than ever Some of these combines, popularly called "cartels," do not go farther than to standardize contracts, conditions of payment and so on; others have distributed the markets—at home or abroad, by more or less loose agreements; others again—they are mostly called syndicates—have created central selling agencies, which fix a uniform price and regulate the output of the participating members with a view to maximum profits for the industry in the long run

Most of the basic industries, coal, lignite, pig iron, steel making, potash mining and many others, have adopted this highly centralized organization, securing a kind of co-operative monopoly for their members By raising prices above the competitive rates they have succeeded in keeping unprofitable works going at a profit charged to the home consumer, but they try at the same time to eradicate them either by buying their quota or by forcing technical progress and business efficiency upon them through a kind of compulsory education The available surplus which cannot be disposed of at monopolistic prices at home is sold abroad at competitive prices, thus providing foreign countries with half finished produce or raw material at a cheaper rate than the German manufacturers

In some cases, the producer of finished goods is compensated by a kind of drawback, to enable him to meet his foreign competitors on equal terms

In a few cases organization has gone beyond the "cartel" stage and a real trust has been formed, when all the enterprises concerned have been completely fused This has been done in steelmaking by the fusion of big steel works, and, more completely, in the chemical industry, where, in some branches at least, there is a kind of natural monopoly. The trust is a far more efficient form of organization than the cartel, if its stock has not been watered at formation, as it need not pay any regard to backward concerns It has not succeeded in getting real control of the industry in most cases Even the steel trust is but an extremely powerful unit of the steel cartels

It has been estimated that there are about 3,000 of such cartels, some extremely weak, while again, others are strong enough not only to run their own affairs but to wield a decisive influence on the fate of their customers. There is a change visible in the attitude of the government, which acted firmly when powerful combines tried to raise prices.

The Question of Nationalization.—Immediately after the revolution when Socialism was rife many plans were made for the nationalization of German industry. The nationalization of the mining industry seemed imminent, for the centralistic control existing in these syndicalized enterprises made the process easy enough. Foreign difficulties—the property of the Reich and the States was hypothecated for reparation payments—and the very close interlacing of the mining industry with the different phases of steel making prevented any immediate legislation Government did not nationalize, but a cumbersome public control of prices in mining and iron and steel making was established It has lately been exercised quite strenuously in the interest of the consuming industries

The complete breakdown of government and government finance during the last phase of the inflation period practically ended all schemes for nationalization The existing government and municipal works like the government railways and municipal tramways did not pay, as it was impossible to raise the rates of public utilities as quickly as the depreciation of the currency demanded Government undertakings seemed doomed, even where they had existed for a long time they were organized as private companies, the shares of which were held by the government or the municipality All the mining interests of the Prussian government, for example, were detached from the general administration and put into a separate company, owned by the Prussian State. Technical developments, in some ways, have worked in the same direction Of 45 cities with more than 100,000 inhabitants but five by 1926 depended entirely on electrical power generated in their own municipal plants, 20 others got their main supply from their own works, whilst 20 others got it entirely or mainly from other concerns There were 42 cities that drew 58·6% (1·783 million kw) from their own plants Whilst municipalization and nationalization had received a setback in these directions, the credit stringency following the stabilization of the mark forced the government into many enterprises At times government was the only agency possessing cash Industrial concerns in difficulties asked for State loans and subsidies and in this way the government became their silent partner when faith in government enterprise had completely gone

GERMAN GOVERNMENT HOLDINGS OF COMPANIES

I Holdings of the Reich

	Marks
(1) Vereinigte Industrie Aktiengesellschaft, called "Viag" This is a holding company embracing banks, electrical undertakings, aluminium works, nitrate works, engineering shops, etc , totalling	208,200,000
(2) Holdings of different departments:	
(a) Home Office publishing, wireless, etc	90,000
(b) Labour Office building companies, etc	536,000
(c) Food Ministry grain company, etc	21,000,000
(d) Transportation Ministry	6,000,000
(e) Ministry of Finance	58,800,000

II. Holdings of the States

Prussia	
(a) Preussag (holding company for mines)	4,500,000
(b) Electrical concerns	
Majority in six companies	
Participation in seven companies	
Totalling over	53,000,000

During the last few years German industries have been completely overhauled American experience and American capital have been drawn upon freely to rationalize German industry and to bring about greater efficiency Results have been excellent from a technical point of view, but not an unqualified economic success If costs have decreased, prices have not fallen And worst of all, financial results are still very meagre Joint stock companies numbering 7,000 and having a capital of 15 milliard marks, had debts amounting to 11 milliard marks These were less than corresponding debts for the year 1912–13, namely 41·89%, against 48·5%; but so were the profits Net profits were 4·8% against 10·86% 1912–13. Dividends were but 4·7 per cent.

Transportation.—Since Prussia nationalized her railways in 1876–79, other German States have followed suit Before the war nearly all German railways were State-owned; there were

but a few hundred kilometres in private hands when the Reich took over the railways from the States in 1919 by paying them 39·5 milliards marks (inflated) money, besides taking over the debts incurred by the States when building or acquiring railways. Notwithstanding this excellent bargain, the newly unified railways did not pay. The wear and tear of the war, the struggle for the Ruhr, the havoc of inflation, saddled them with heavy deficits, although formerly the Prussian railways contributed handsomely to the expense of the State. Under the London agreement which embodied the main features of the Dawes plan, the German railways were reorganized A company, called Deutsche Reichseisenbahngesellschaft, was formed, with a capital of 11 million gold marks in ordinary shares and three million gold marks in preference shares. The ordinary shares remained the property of the Reich. The preference shares (divided between the Reich and the company) were to be sold to the public, when the need for cash arose; up to 1928, 481 million gold marks had been sold Debenture bonds to the value of 11 milliard gold marks bearing 5% interest and 1% sinking fund were issued and handed over to the Reparation Commission, the annuity of 660 million gold marks attached to their service being a substantial part of the obligations payable under the Dawes plan.

Since this reorganization the German railways have done well They have earned the income on the bonds issued and the dividend due on the preference shares sold They have not yet earned a dividend on the common shares, but they have been able to transfer to capital account quite a considerable surplus

Whilst railway and postal matters are affairs of the Reich, roads and canals are built and maintained by State and municipal authorities The total length of the roads is about 216,256 km , 21 3% are maintained by State and provincial authorities, 59 2% by district authorities Most of the large cities have municipal tramways

Railways have not yet suffered much from the competition of the automobile There were 200,000 passenger cars in 1926 and 90,000 commercial vehicles On the other hand canals and rivers are serious competitors, Germany being covered by an extensive system of inland water transportation There are 12,216 km inland water-ways (2,213 km canals) and 23,416 river craft with a carrying capacity of nearly seven million tons

German shipping has been greatly affected by the war Of the mercantile marine comprising nearly 5,000 ships with over five million tonnage very little was left to Germany, as two and a half million tons were handed over to the Reparation Commission The value of these ships was estimated at four milliard marks, of which only a comparatively small amount (750 million marks) was admitted by the Reparation Commission Nearly the whole mercantile marine had to be rebuilt, a severe financial loss, no doubt, but not without some redeeming features, inasmuch as ages and types of the new ships fitted existing conditions far better than an old established fleet could have done

Postal administration has been completely unified There are about 47,000 separate post-offices and 333,000 postal employees The number of letters carried was 6,675 million or 107 per head (1925) The number of radio-subscribers is more than 1,500,000 The post office has been organized as a separate unit It has become an influential financial organization by creating a system of postal cheques which can be cashed all over the country The post office was expected to contribute about 100 million marks to the Reich's general revenue in the financial year 1928–29.

TRADE AND FINANCE

Commerce.—German commerce was paralyzed by the war Abroad the blockade cut short its activities, at home the control of food and of other necessities greatly reduced its sphere of usefulness The loss of the German colonies, the confiscation of German property and the expulsion and non-admission of German traders from many countries, prevented a quick recovery

At home, government control of economic life was continued after the war in many spheres, as inflation made it impossible to re-establish the free play of natural economic forces The fixing of prices in a quickly deteriorating currency not only hampered free movements. As there were no means of maintaining the value of liquid capital, traders invested either in commodities, often on a speculative basis, or in industrial assets or in foreign currencies. When stabilization set in, Germany had become an empty shell. Whilst industrialists and agriculturists had saved parts of their fortunes by putting them into plants, the merchant class as a whole was practically bankrupt. They and the investing public had borne the brunt of the catastrophe There always had been a tendency amongst German industrialists to set up selling agencies of their own. This tendency was greatly strengthened by the reduced financial capacity of the merchants and by the growth of cartels and organized concerns In pre-war days these tendencies were greatly facilitated by the industrial policy of the German banks As the banks were often the promoters as well as the partners (by holding shares) of industrial concerns, the ties connecting banking and industry were very close The merchant as a financier could easily be dispensed with, when the big joint stock banks were willing not only to finance the goods produced but to take up shares with the object of selling them to the public after the concern was properly nursed Relations between banks and industrial companies were very close, there was a successive interchange of directors to sit on the respective boards In times of great industrial prosperity the influence of the manufacturers on the banks was enormous; they became sometimes nearly independent of their support and influenced their policy by being their most important "depositors" In times of stringency, on the other hand, the banks regained control

Inflation nearly ruined the banks They realized far too late the wisdom the industrialists had very early exhibited that inflation is the borrowers' heaven and the creditors' hell The assets of all joint stock banks which had amounted to nearly 18 milliard gold marks on Dec 31, 1913, had fallen to 3 5 milliard gold marks on Jan 1, 1924 At the same dates the assets of the mortgage banks had fallen from 13 5 milliard gold marks to a little over one-half a milliard gold marks Since then there has been a quick recovery But the total share capital of all joint stock banks, which was a little over four milliard marks (without reserves), has not yet grown to 1½ milliard marks

Banking.—Before the war Germany had the gold standard The notes of the Reichsbank were legal tender, they were covered to one-third by a gold reserve, whilst the remaining two-thirds were secured by bills of exchange conforming to certain standards The country's total circulation was estimated at about 6 milliard marks During the war the bank was authorized to issue notes against treasury bills As a result of this overissue of notes the mark depreciated until in July 1923 during the struggle for the Ruhr the amount of treasury bills outstanding was 57 8 billion marks and the total note issue 43 6 billion marks In Dec 1923 the bank's available gold reserves, which had stood at about one milliard marks a year earlier, had fallen to 467 million marks The value of the gold mark had risen to one billion of paper marks By midsummer 1923 the mark as medium of circulation was doomed An emergency currency such as "gold certificates" was suggested To stave off the crisis, whilst currency discussion went on, taxation was put on a gold basis; for the first time for many years the landed interest had to bear its share The Reichsbank, which had not been willing to risk its gold in 1922 when there was a fair chance of success, had thrown away half of its holdings in the hopeless endeavour to raise the course of the mark at a time when the printing of marks proceeded at fantastic speed A foreign loan, to ensure success, could not be had, a home loan, it was supposed, was out of the question

A plan for the issue of a new money, to be guaranteed by mortgage bonds, funded on real estate, was broached These notes—they were later called the rentenmark—were to be secured by interest-bearing bonds; they could be automatically converted into them The interest was to be a first charge on real estate The total issue of the new money was to be limited to 4 2 milliards, 2·3 milliards of which were to be lent to the government, the rest to private concerns The plan which was to provide the government with funds to carry on the struggle in the Ruhr would have failed lamentably if the Stresemann government had not

had the courage to stop the fight, thus doing away with the main cause for unlimited expenditure It cut down the total issue to 2·3 milliards and greatly modified the whole scheme. The government succeeded, against all expectations, in floating a gold loan, which gave it a breathing space; it was echeloned in such small points that it could be used as stable currency during the period of transition When Luther became chancellor of the exchequer the new currency, the rentenmark, was issued, and the work of stabilization began It succeeded completely.

A little later the Reichsbank was reorganized according to the Dawes plan Its capital was fixed at 300 million marks, 120 million marks more than the capital of the old bank. Of the 300 million marks 177 million marks have not yet been called Its note issue must be covered up to 40% in gold, the remaining 60% in first class commercial bills The bank accepts deposits but does not pay interest on them. As these deposits are practically on call, a reserve of at least 40% in cash, cheques, bills, etc, is held against them The bank has established 448 branches all over the country; it is the country's great clearing house At the end of 1927 44,475 accounts were kept with her; the total clearings amounted to 270 milliards

Germany has practically returned to the gold standard by way of the gold exchange system No gold is in circulation, but the Reichsbank has accumulated a fund of 1,865 million marks Moreover, it owns a supply of about 300 million marks (February 1928), foreign gold standard devices, it is always ready to part with them, when the movement of the exchange makes it necessary It does not always find it very easy to control the level of prices by means of the discount policy, as, owing to the multiplicity of government funds, the control of the market is sometimes difficult to achieve

Germany's note circulation has slowly increased to very nearly four milliard marks to which must be added the notes of the four private banks issuing notes—their maximum issue is 194 million marks—and the notes of the Rentenbank which are slowly being called in Of the 2,080,178,583 rentenmarks outstanding in Oct. 1924 only 650,693,000 are at present outstanding Their place is partly taken by silver coins So far 883 million marks in silver and base metal have been issued

WEEKLY STATEMENT OF THE REICHSBANK FEB 29, 1928

	Marks
Assets	
Gold and bullion	1,888,350,000
(Deposited abroad)	85,626,000
Reserve in foreign currency	281,953,000
Bills of exchange and cheques	2,336,275,000
Silver and other coin	67,666,000
Notes on other German banks	9,303,000
Advances	117,112,000
Investments	94,239,000
Other assets	551,823,000
Liabilities	
Notes in circulation	4,268,220,000
Other daily maturing obligations	491,035,000
Other liabilities	221,285,000

State governments, government departments, provinces and municipalities have been accustomed to charter banks of their own with the object of doing their own business, independently of the Reichsbank and the private banks These public banks do not issue notes Though their capital is but a third of that of the big Berlin banks much competition takes place between them and the private joint stock banks Moreover, the savings banks have tried to enlarge their activities The saving banks, like all other institutions dealing with liquid money, were almost cleared out by 1924 Deposits in the savings banks had fallen from 19 milliard marks (1914) to 1 25 milliard marks (1924) Since then savings have grown considerably, reaching 4 665 milliard marks by the end of 1927, which shows that the havoc is slowly being repaired

The demand for credit is very great The official discount rates do not always tell the whole story, as actual credits taken have been very much more costly

The capacity of the German market to provide long term capital has been greatly reduced There are no longer foreign issues placed in Germany, all the available capital has to be used for home issues The total amount issued had reached a monthly average of 131 million marks in the years 1907–13; it fell to 12 million marks in 1925 After having risen to 108 8 million marks in the following year, it declined again to 81 8 million in 1927

Rates of Interest, Yearly Average

	Discount rate of the bank	Private discount		Yield of mortgages
		Long term	Short term	
	%	%	%	%
1924	10·			
1925	9 16	7·59	7 65	9·00
1926	6 74	4 96	5·75	7 75
1927	5 82	5·51	5 79	7 33

Since the capacity of the German market for taking up loans has greatly dwindled foreign credits have been essential The repatriation of German capital which had gone abroad furnished the means to start business Though the McKenna committee had estimated them at 8 milliard marks, they proved insufficient. Foreign loans had to be called for The first loan, the so-called "German external loan," was issued as part of the Dawes plan It provided the country with 800 million marks which helped the Reichsbank to get on a safe gold basis After it had been shown that the German budget balanced and that the German currency had become stable, borrowing on a large scale started. It has been estimated that at least five milliard marks have been borrowed by states, municipalities and private concerns

FOREIGN LOANS

Monthly Average, in Million Marks

	Total	Public bodies	Public corporations	Private concerns
1924	83·5	80 0		3 5
1925	103 4	31·6	22·8	48·2
1926	126·4	36 9	27·4	57 9
1927	140·5	65 9	22 4	52 5

Issued in Different Countries

	U S.A	England	Netherlands	Other countries
1924	42 0	20 4	4·3	16·8
1925	76·9	10 2	9 8	6·5
1926	89·8	11 3	14 0	11·3
1927	96 6	14 5	19 8	9·7

The indebtedness is offset to a small degree inasmuch as Germany must accommodate some of her customers, like Russia, with credits if she does not want to lose these markets These loans are the natural outcome of the difference in the rate of interest obtainable in Germany and abroad They are by no means cheap, as far as the costs to the borrower are concerned, 8–9% being nearer the mark than 7% They are likely to go on parallel with the reparation payments As long as Germany is unable to transfer 2½ milliard gold marks abroad (this is the standard rate under the Dawes plan) and to save enough money to provide annually for the needs of replacing her industrial outfit, she can either borrow the value of the annuities abroad and use her savings at home, or she can export her savings and import capital for her industrial needs The annual outflow of 2½ milliard marks is, in all probability, big enough, for some time to come, to keep the rate of interest in Germany above the level of that prevailing abroad If Germany had not had to pay 3 7 milliard marks abroad in the three years, 1925–27, she need not have borrowed five milliard marks, but could have done with a little more than one milliard marks

FOREIGN TRADE

The vicissitudes of Germany's economic fate during the last ten years are expressed in her foreign trade

Broadly speaking, exports have remained stationary, whilst imports have risen by nearly 30%, if no account of the depreciation of money is taken Assuming a depreciation of 50%, imports have fallen short by 14%, whilst exports have decreased by 33%.

Germany's Foreign Commerce

	Imports (in marks)		Exports (in marks)	
	Total	Per head	Total	Per head
1913	11,206,000,000	167	10,198,000,000	152
1924	9,265,000,000	147·5	6,585,000,000	148·5
1927	14,381,000,000	224·7	10,819,000,000	169

This result is not due to a mere change in prices The same decline is visible where quantities are concerned

The composition of imports and exports has not changed greatly. Foodstuffs and raw materials predominate as before, in imports; finished goods have remained fairly stationary. On the other hand, very nearly three-fourths of the total exports are exports of finished goods.

Germany before the war had an unfavourable balance of commerce which was compensated by German shipping, by services of German banks and insurance companies and last not least by German investments abroad These investments were variously estimated between 20 and 25 milliard marks. The Germany of to-day has an unfavourable balance of trade on quite a different scale The excess of imports over exports has risen from about 6% to nearly 35%. It cannot be explained any longer by the contributions foreign countries are paying to a creditor country rich in capital and commercial service organization, it is due to foreign countries restarting a broken down debtor by the help of loans

Within 1923–27 Germany has repatriated a considerable part of the eight milliard marks which had gone abroad to avoid annihilation by inflation. She had, moreover, to transfer the loans extended to her by way of importing merchandise She is quite likely to have an unfavourable balance of trade as long as borrowing goes on The excess of imports in that case will have to be met by loans and by the comparatively small income accruing to her from travellers and shipping The liberation of German property confiscated in the United States and now set free—it is valued at about one milliard marks—will have some correcting influence, as far as the debt balance is concerned

As Germany depends for foodstuffs and most of her raw material on supplies from abroad, she has to export finished goods Most of her exports in that line are goods which can be produced elsewhere Outside potash and a few chemicals she does not export non-competitive goods Most of the chief exports depend on previous imports German exports really amount to a finishing goods industry on a huge scale, an industry working on a fairly narrow margin

Like most old established industrial countries, Germany has suffered considerably by the destruction of European trade and the new protection If the rise in prices is taken into account, there are few countries whose imports of goods from Germany have not declined

Chief German Imports (arranged according to importance)

	1927		1913	
	Total marks	%	Total marks	%
Textiles (raw), total	1,967,800,000	13 7	1,591,400	14·8
Ore and metals	1,291,200,000	8 9	1,024,300	9 6
Feeding	948,900,000	6 6	849,600	7 9
Corn	836,000,000	5 8	464,500	4 3
Milk, butter, cheese	796,600,000	5 5	195,800	1 8
Oil-seed	673,200,000	4 7	537,500	5 0
Skin, etc	607,700,000	4 2	537,900	5 0
Wood	453,000,000	3 1	386,500	3·6
Textiles, finished goods	360,700,000	2 5	169,500	1 6
Cattle and meat	347,600,000	2 4	168,700	1 6
Hardware	306,800,000	2 1	69,200	0 6
Rice, potatoes, vegetables, etc	299,400,000	2 0	151,900	1·4

Chief German Exports
(Arranged According to Importance)
Exports on Reparation Account Excluded

	1927		1913	
	Total marks	%	Total marks	%
Textiles, total	1,488,500,000	13 7	1,346,000	13 4
Hardware	1,424,000,000	13·1	1,263,900	12 5
Chemicals	820,400,000	7 6	771,600	7 6
Machines	730,300,000	6 7	608,600	6·0
Coal and coke	617,600,000	5·7	721,800	7·2
Engineering goods	383,300,000	3 5	290,300	2 9
Base metal goods	373,500,000	3 4	365,800	3·6
Textiles (raw)	363,300,000	3 1	299,800	3 0
Leather, shoes	329,800,000	3 0	242,900 114,200	2 4 1·1
Chemicals (raw and half finished)	329,300,000	3 0	173,000	1 7
Paper, etc	321,900,000	2 9	225,400	2 2
Furs	226,400,000	2·1	193,300	1 9
Glass-ware	192,500,000	1·7	145,700	1·4
Clocks, etc.	132,400,000	1·2	75,700	0 7
Ceramics, etc	130,600,000	1·2	93,600	0·9
Toys	116,500,000	1·0	103,300	1·0
Skins	113,600,000	1·0	173,800	1·7
Music instruments	109,400,000	1·0	24,700	0·3
India-rubber goods	102,100,000	0 9	127,500	1·3

Direction of German Trade

Imports from	In million marks		Percentage of total imports	
	1927	1913	1927	1913
United States	2,072 9	1,711·2	14 4	15 9
Argentina	1,070 7	494·6	7 4	4·6
Great Britain	937 8	875 9	6 5	8 1
Netherlands	696 9	333 0	4 8	3 1
France	595 8	583 2	4 1	5 4
Czechoslovakia	559·2		3 9	
British India	526 1	541 8	3 7	5 0
Italy	524 8	317 9	3 6	3·0
Belgium	454 8	344 4	3 2	3 2

Exports to	In million marks		Percentage of total exports	
	1927	1913	1927	1913
Great Britain	1,178 7	1,438 2	10 9	14 2
Netherlands	1,120 8	693 6	10 3	6 9
United States	776 2	713 7	7·2	7 1
Czechoslovakia	522 5		4·8	
Switzerland	491·2	536 1	4 5	2·3
France	477 2	789·9	4·4	7·8
Italy	461 5	394 7	4 3	3 9
Sweden	409 3	229 8	3 8	2 3
Denmark	378·0	283 9	3 5	2·8
Austria	366·4		3·4	
Belgium	363·1	551 0	3 3	5·4
Russia	329 6		3 0	
Argentina	297 9	265 9	2 8	2 6

The German commercial situation is greatly affected by two important points Germany must work for a favourable balance of commerce, as without it she can neither fulfil her reparation obligations under the Dawes plan nor can she pay interest and sinking fund on the external loans she has been contracting On the other hand, her home market is unable to give sufficient employment to her thoroughly equipped industries She can only keep them busy by exporting In many cases her exports do not pay, as she has to sell them at competitive prices By means of the control of the home market industries in a protected, cartelised country home prices are raised sufficiently to pay for the profits exports are not yielding Thus the home market is again contracted, the price level is raised and Germany finds it very difficult to export goods manufactured at a high level of cost of production, in establishments encumbered by debts bearing a high rate of interest

There is a steady rise in the cost of living *see* table on page 262

This rise is partly due to causes outside Germany, for example increased cost of raw materials, and partly the outcome of economic but scarcely avoidable forces at home As rents are slowly raised to the level corresponding to the depreciation of money, wages must be raised correspondingly, if a decrease in the purchasing power of the working class is to be avoided

German Cost of Living (1913=100)

	Cost of living	Wholesale (total)	Manufactured goods
1924 . .	127·6	137·3	156·2
1925	139 8	141 8	156·7
1926	142 2	134·4	149·5
1927	148 4	137 6	143·3

SOCIAL CONDITIONS

Of the total population of 62·5 million people living in Germany on June 15, 1925, 5·7 millions exercised no calling. Of the remaining 56·7 millions 32 millions were engaged in some gainful occupation; whilst the remaining 28 7 millions depended on these breadwinners, another 900,000 were attached to them as domestic servants Of these 56·7 millions 13 millions—5·5 million breadwinners—were heads of businesses, proprietors, tenants, managers, etc More than 10 millions—5·3 million breadwinners—were employees (clerks, gangleaders, foremen and so on), 26 6 millions—14·4 million breadwinners—were labourers of all sorts Another 5 6 millions were members of the family helping in the work, nearly a million and a half consisted of non-attached domestic helpers

Of 14 4 million people depending on agriculture, 2 2 million breadwinners were "heads"; of 26 million people depending on industry 1·8 million breadwinners were masters or managers; of 10 6 million breadwinners engaged in commerce 1 2 millions were in this position The percentage of people in a position of economic independence or responsibility of some sort or other, varied between one-sixth and one-fifth of the numbers counted

Amongst the breadwinners in agriculture the number of labourers (2 6 millions) is little more than the number of heads (2 2 millions), but in this case 4 8 millions of family helpers—largely female—swell the numbers of the employed class In industry 1·8 million heads are confronted by over 11 million employees of some sort, very nearly two millions being women With few exceptions the modern system of working for a wage has spread all over Germany Over seven million people worked in shops with more than ten workers each and subject to factory legislation

German National Income.—The number of salaried people in Germany was 21 4 millions on June 16, 1925 From these, the administrators, managers, directors and others drawing comparatively high salaries must be deducted Or the number of wage earners in a more limited sense can be obtained from the statistics of social insurance The income of 17 7 million insured people calculated from premiums paid to social insurance, amounted to 24·1 milliard marks The 3 7 million people included in the first figure of 21·4 millions are not insured, they comprise government officials and salaried persons earning more than 6,000 marks a year. Their income may be estimated at 14·2 milliard marks a year The total "earned" income has thus been valued at 38 3 milliard marks If all people subject to social insurance were fully employed, and if no loss for unemployment (2 8 milliard marks 1927) and sickness (1 4 milliard marks 1925) had taken place, the total "earned income" of the German people would come to between 42 and 43 milliard marks a year, or an average of 2,000 marks (£100) per head

It is not easy to estimate the unearned income The statistics show the total income assessed to income tax (1925) at 12,757 million marks accruing to nearly four million people. This would be an average income of 3,197 marks per head (the income of the salaried classes which is taxed by a 10% deduction when salaries are paid and which is not assessed, is not included). But the conditions under which incomes had to be assessed and taxed after stabilization had begun, when the results of inflation were not clearly distinguishable, do not warrant any far-going conclusion And the same holds good to even a greater degree of the assessment for the property tax The total value of property subject to this tax was not quite 110 milliard marks The different estimates of the national income are more or less guesswork The national income is supposed to be between 50–55 milliard marks.

The German Working Class.—When the working-class leadership in the winter 1918–19 threw its weight into the scales against bolshevism, it was clearly realized that some sort of participation of the working class in the control of industry was unavoidable The various schemes of nationalization were more or less abandoned, though a coal council and a potash council were created, on which working-men were represented A system of work councils was, however, created, which enabled the workers in each factory, employing more than 20 persons, to choose representatives, participating in what was supposed to be the control of the management Members of these work councils—Betriebsräte—were entitled to sit on the board of the companies. This new move was regarded with high hopes by the workers and correspondingly with great fears by the management Both parties have been disillusioned The presence of the representatives of the working class has been used as a pretext by the management to keep from the public and its shareholders many things which really need not be considered confidential A similar disillusion was produced by the Economic Council (Reichswirtschaftsrat) which was supposed to be an economic parliament in which the producer's wisdom got the better of the consumer's folly Though workers and employers are equally represented upon it, it has no power, the real power, being in the hands of the great associations of the manufacturers (Reichsverband der Deutschen Industrie), the Land Union and the General Commission of Trade Unions, who exercise their influence directly on parliament The Reichswirtschaftsrat was not meant to be a conciliation board, but rather a super-parliament As such it has failed completely.

Organized Labour in Germany.—The position of the working class as such has changed enormously since the revolution When Prince Bismarck started his scheme of compulsory social insurance, one of his objects had been to wean the working class from the trade union movement by taking away the benefits from these organizations In that respect the plan of what is now called the "Corporate State" has not been successful Trade unionism has grown by leaps and bounds In the days of the revolution the number of trade unionists grew from 2 5 millions in 1913 to 8 millions in 1920 There was a great falling off later on, inflation nearly ruined many organizations (membership had fallen to 4 millions in 1924) In 1927 it had grown again to 8·2 millions Over half of them were organized (4 6) in the General German Trade Union Association, whose members were leaning towards the Social Democrats, over 600,000 are within the Christian trade unions who are antagonists to socialism and rather conservative, 150,000, called Hirsch-Duncker'sche, have what might be called liberal leanings There are communistic unions and unions subsidized by the "masters" Organization has spread amongst clerks, technical employees, foremen and so on—nearly 1 5 millions are in these organizations

The consumers' co-operative movement has had an even more phenomenal development From 1914 to 1925 consumers' co-operative societies grew from 2,416 with 1 8 million members to 2,474 with 3 2 million members Employers, in their turn, are equally well organized There are at least 1,611 employers' associations covering the whole Reich, to which must be added a few hundred associations limited to individual countries or districts. This broadly-spread system of organization made collective bargaining fairly easy when the revolution had demonstrated the power of the organized working class Before the war (1914) only one and a half million of workers enjoyed the benefits of collective bargaining On Jan 1, 1926, 7,533 separate agreements, binding 788,755 different establishments, were in force, 11,140,511 million workers were included in them.

Unemployment has varied considerably It was practically non-existent during the inflation days, when the investing public's capital, so to speak, was spent on keeping the working class busy Manufacturers and traders were relieved of the necessity of paying interest on their debts; as rents were practically non-existent their wage bills were about 20% below what they would have been if the working class had had to pay full rent. New credits for business people and for the government were extremely cheap; even after the bank raised its discount rate to 18% it was still extremely profitable to borrow money with the certainty of being able to return it when it had lost 50% of its value.

The Ruhr crisis and stabilization put an end to all that. Trade-unions reported that 13·5% of their members were out of work

on an average in 1924, against 2·8% and 1·5% for 1921 and 1922; 15·3 were working short time against 5 4 and 2·8%. The situation improved in 1925 when the percentage of totally unemployed fell to 7 1%; but it rose again to 18 3% 1926 and to 13 6% 1927 It has been estimated that the total number of unemployed, including short time workers, was as follows

Jan. 1, 1927	2,350,000
Dec 1, 1927	1,049,000
Jan. 1, 1928	1,763,000

The great reduction in 1927 was, no doubt, due largely to the spending of loans foreign as well as domestic in the reorganization of industries By the middle of 1926 2·8% of the resident population were on relief, by the end of 1927 this had fallen to 1 3%.

Originally the local authorities were charged with the relief for the unemployed, the central authorities coming to their aid Later on a programme of productive works was entered upon, on which at certain times over 150,000 people were kept busy A regular system of insurance has now been introduced, employers and employees contributing up to 3% of basic wages

Wages and Hours of Labour.—Wages have widely fluctuated in the last 15 years By the end of Oct. 1927 the average wages per hour were skilled workers, 1 019 marks; unskilled workers, 0 738 mark Wages have been rising steadily since stabilization

Weekly Wages

	Skilled workers	Unskilled workers
	Marks	Marks
1913	35 33	23 50
Jan 1924	28·45	21·18
Jan. 1926	45 98	34·05
Jan. 1927	46 36	34 46
Jan 1928	49 82	37 43

Part of this rise is due to the fact that rents, practically non-existent during the last phase of the inflation period, have risen steadily

The following table shows the movement in the purchasing power of wages in percentage

	Weekly wage of unskilled workmen	Raw material and partly manufactured goods	Finished goods
1913	100	100	100
1924	108 6	142 0	156 2
1925	135 0	141 0	156 7
1926	145 3	129 7	149 5
1927 (Jan–July)	151 7	130 5	143 7

Broadly speaking, the wages of the unskilled labourers have risen more rapidly than those of their skilled comrades, the differences of payment between the two classes of work are lessening There are, however, great variations between different localities and different trades Whilst in April 1927 the average for all skilled trades was 47 98 marks per week, bricklayers in the big cities received 56 73 marks, and textile workers but 32 06 marks

Hours of Labour.—An enquiry of the Department of Labour into 3,023 typical works employing 745,621 men for the months April, July, October 1926 showed the following hours of labour

Working hours	48–50	50–52	52–54	54–56	56–58	58–60	60
Number of works	172	314	680	195	40	29	7

There has been a considerable trend towards shorter hours Of the workers subject to collective bargaining in 1914 only 3·44% had the eight hours day, 34 19% worked 8–9 hours, 58 72% 9–10 hours and 3 62% over 10 hours In the mining industry the eight hours day is the rule An enquiry of the miners' unions, dealing with 70% of the Ruhr mines, showed that the working hours at the coal-face are 6 hours and 54 minutes, or 41 hours 24 minutes for the week. Above ground the average weekly hours were 53. In the metal industry a similar enquiry, dealing with 15,762 works and 1,441,481 workers, showed that 45 9% worked 48 hours, 52·3% over 48 hours (9 5% over 54 hours)

Social Insurance.—An extensive system of compulsory social insurance has existed in Germany for nearly 40 years Nineteen million people (30·1% of the population) are insured against sickness, 23 million against accidents (36·3% of the pop.) and 17 5 million (26 6% of the pop) are entitled to benefit, when incapacitated for work, to old age pensions, or widows' and orphans' pensions Outside the working class proper, employees (clerks, etc) are subject to separate compulsory insurance, when drawing a monthly income below 400 marks. (They number about 2 8 millions) They are also subject to insurance against sickness, when drawing an income below 300 marks monthly For the working class, the insurances, old-age insurance as well as insurance against sickness and against accidents, are absolutely compulsory

Apart from insurance against accidents, which is exclusively financed by the employers, social insurance is mainly contributory. Two thirds of the premium for insurance against sickness are contributed by the workers, one third by the employers Outside the miners' special organization (Reichsknappschaft), of more than 800,000 members, there are four different types of insurance agencies against sickness, organized in 7,667 separate "units " The administration of these units is in the hands of the contributors, employers and employees.

The total regular income of the insurance against sickness organizations was (1925) 1,264,382 marks, of which 1,240,500 marks were contributions, expenditure reached 1,189,984 marks, of which 1,094,110 marks were sickness benefits The average contribution per member was 68 marks; the cost of sickness benefit per member 60 marks, whilst administration costs swallowed up 4 46 marks per member Insurance against accidents is non-contributory for workers The employers are liable; they are organized compulsorily in 66 employers' societies—one for each trade for industry and 45 for agriculture. They dealt with about 900,000 cases and spent over 225 million marks in 1925

The third great group, insurance against invalidity (widows' and orphans' benefit), is contributory in equal parts from employers and employees Workers are classified in six standard classes Rents are paid when the insurer is incapable of work or when he has reached 65 years of age, or, after his death, to his widow and children Rents are supplemented by a government grant of 72 marks a year for invalids and their widows and of 36 marks for orphans Marks disbursed were 711 millions, of which 525 millions came from contributors, 186 millions from the Reich.

The employees' (clerks) insurance has been organized for a class of wage earners whose conditions of life were in pre-war days rather different from those of the working class proper Since then there has been a certain assimilation, in so far as clerks in banks, factories and counting houses are quite as little likely to become employers of labour as are the skilled working-men Moreover, the discrepancy in wages is no longer very marked in many cases, apart from the fact that clerks are supposed to draw monthly wages Insurance is compulsory for employees drawing less than 400 marks monthly, it is contributory, employers and employees sharing in the contributions Their chief object is old age pensions, widows' and orphans' benefits Their revenue was 287 million marks for 1926.

REVENUE AND EXPENDITURE OF ALL BRANCHES OF SOCIAL INSURANCE

Ordinary Revenue (in million marks)

	Total income	Contributions	Grants	Interest
1913	1,553 7	1,295·7	58 5	199 5
1926	3,018 0	2,571 9	248 1	198 0

Ordinary Expenditure

	Total expenditure	Benefits	Administration cost	Surplus
1913	1,088·8	956·2	111·8	464 9
1926	2,520 0	2,306 0	214 0	498·0

More than half the adult population of Germany enjoys the benefits of social insurance Nearly three milliards are spent by the different contributors attached to the different insurance sys-

tems If civil servants are included, it can be said that the great majority of the German people are "future" pensioners. Complaints have been rife that the costs for these pension schemes bear too heavily on the community at large The government's share contributed to social insurance has been comparatively small, it was a little more than 300 million marks in 1927. The share of the employers has been about 1·5 milliard marks Assuming that this 1·5 milliard marks were distributed amongst 20 million wage earners, each of them would cost about 75 million marks extra. This "additional wage" amounts to between one and a half and two weekly wages bills Spread over the whole year it would work out at a rate of an additional one mark to one and a half marks a week, or at an average rise of 3 pfennig the hour for the 48 hour week. This is just as much as the average rise the working class got in the first quarter of 1927, when the average wage per hour was raised from 94·9 pfennig to 98·3 pfennig Unskilled labourers were raised from 66 7 pfennig to 70 pfennig

Housing.—Rent control and inflation are jointly responsible for the very serious state of the housing of the people Before the war about 200,000 new dwellings (each for a new household) were built annually, whilst another 50,000 old dwellings were replaced by new ones—scarcely sufficient to accommodate the growing population. Most of the dwellings for the mass of the people were flats. The average owner of houses who let the flats to tenants rarely had enough money to build the house He had borrowed the necessary capital on mortgages; in many cases his income from rent was just sufficient to pay him for his work as administrator of the house after repairs and interest had been deducted. Inflation wiped out his obligations, but rent control plus inflation wiped out his income as well Rents were fixed by law; they became purely nominal Only after July 1926 did they reach the pre-war level They have lately gone up to 120% of the pre-war rent—which does not take into account the depreciation of money This has been a great boon for existing tenants, who have enjoyed a (decreasing) consumer's rent for many years It has enabled them to sell their tenant right or to let furnished apartments at competitive prices It has indirectly enabled all employers of labour to save on wages But it has made it very hard for new tenants to find apartments Building was very costly Few people were able to pay the rents necessary to make building possible The supply of new buildings did not reach the pre-war level before 1926

It has been estimated that about 950,000 German households are without proper dwellings This figure plus a yearly increase of 200,000 new houses up to 1935 must be reached if the truly abominable state of the housing situation is to disappear This development cannot be left to free competition Having once destroyed the equilibrium of supply and demand by planting in the existing capitalistic world a kind of bureaucratic socialistic oasis, a simple return to the ways of private capitalism is impossible Rents of new houses built on a purely business basis would be three times the pre-war rent, the cost of capital being prohibitive Whilst old rents are slow to correspond with the general run of prices, new rents are artificially lowered to 150–170% of pre-war rents The different State governments and municipalities collect about 50% of the old rents as a kind of house tax Parts of these proceeds, reaching about 1,430 million marks in 1926, are used for general government purposes, whilst at least 17%–27% (Prussia and Bavaria) of the present rents are given at cheap rates as building loans. Up to April 1926 1,638 million marks from the proceeds of the house tax have been spent for this purpose The rents of the existing tenants are thus partly used for the construction of new dwellings

Finance.—Government functions are divided in Germany between at least three authorities (1) The Reich, (2) the States and (3) the local government bodies (districts and municipalities) In the bigger States, like Prussia and Bavaria, provinces and government-district stand between the local government bodies and the central government Notwithstanding a great deal of self-government, German government is bureaucratic on its administrative side. Representatives of the Central Government are the resident heads of the various local units, entrusted with administrative functions, for which they are responsible to the Central Government as well as to the representative local bodies with which they have to co-operate Administration proper in this sense is in the hands of the Länder (States)

Administrative systems vary considerably, not only between the different Länder, some of them, like Prussia, comprising nearly 40 million inhabitants, others, like Mecklenburg-Strelitz, counting scarcely over 100,000 Even in Prussia there is an enormous difference in the various provinces Until lately the Reich had no proper administration, outside the foreign office and the navy—the army was a Prussian or a Bavarian service. This has been greatly changed since the revolution The services are both "Imperial" to-day, so is the inland revenue and the administration of customs and excises and a good deal of labour administration Administration proper (police), education in its various forms, justice, public health, the supervision of industry and so on, are matters appertaining to the Länder. The Länder, moreover, have a tax-collecting service of their own, though some of the smaller ones have lately entrusted the authorities of the Reich with the collecting of State taxes There is a good deal of overlapping in many cases between Reich authorities and State authorities

Of the total 12 milliards spent about eight milliard marks were collected by the Reich But two and a half milliards were handed back to the State and local government units, so that the expense of the Reich comes to about 5½ milliard marks As to the revenue, the Reich to-day is the chief taxing authority in Germany It has ousted the States from their former privileged position It controls not only customs and excise but the income tax, the corporation tax, the inheritance and the property tax as well In fact, there are no longer any taxes exclusively reserved to the States The Reich can take up whatever taxes it likes It has, however, allowed the States and the municipalities to levy certain taxes on land, buildings, business and so on.

As the States cannot carry out the tasks left to them with the proceeds of the taxes subject to their own control, they are entitled to participation in the Reich's most important taxes. the income tax, the corporation tax and some minor taxes Three-quarters of the income tax and of the corporation tax are handed over to the States from the Reich Moreover, the Reich has guaranteed them a minimum income from these sources of 2 6 million marks The States again have to share the refunds they receive from the Reich with the municipalities that, for instance, in Prussia get 40% of these refunds

At the beginning of the stabilization period, the Reich, like other debtors, was practically free from debt, inflation having wiped out all the debtors' claims A very strong popular movement arose, however, forcing the government to some kind of revalorization,—notwithstanding the fact that the Peace Treaty practically invalidated the home debt by giving all reparation claims priority over home debts The capital value of the valorized debt was 5,373·3 million marks A loan was issued in Jan 1927 to provide for certain productive works It realized 452·5 million marks To this must be added the external loan of 1924 of 932 5 million marks (redemption value), bringing the funded debt newly issued to nearly seven milliard marks There is additional new debt arising from bank loans during the end of the inflation period (loans from the Rentenbank or the Reichsbank) which average another milliard marks, and a few small claims The entire debt is over eight milliard marks or nearly double the pre-war issue (4 9 milliard marks, 1913)

As to the States, their financial position has changed enormously They have not only lost their financial sovereignty to the Reich, but have got rid of their chief assets, the railways, which were taken over by the Reich and afterwards used as one of the chief pledges for the purposes of reparation Whilst Prussia drew from her railways a minimum income of 210 million marks, available for general government purposes, the interest payable on the bonds and sinking fund (660 million marks) and the dividend on the preference shares practically swallow up the railway revenue, so that the Reich does not yet receive an income from its property.

The States still have some property, but its importance has fallen considerably in comparison to pre-war days. Their mainstay is the tax refunds from the Reich They are always trying to get them raised, and there is some justice in their claims, for the Reich has forced upon them certain standards of expenditure (salaries) and set them certain tasks without giving them adequate means for defraying them

BUDGET OF THE REICH 1928–29 (ORDINARY BUDGET)*

Revenue	
I Income and Property Taxes.	*Marks*
Income	2,900,000,000
Corporation	550,000,000
Property	520,000,000
Succession	100,000,000
Sales	1,050,000,000
II. Customs and Excise.	
Customs	1,050,000,000
Tobacco	760,000,000
Sugar	140,000,000
Beer	370,000,000
Spirit-monopoly	270,000,000
Champagne	15,000,000
Matches	11,400,000
Other excise	15,600,000
III Various smaller Taxes	940,000,000
IV Miscellaneous Revenue	
Post, etc	664,500,000
Total	9,356,500,000

Expenditure	*Marks*
Payments refunded to States	3,217,800,000
Salaries	792,200,000
Pensions, etc	1,782,500,000
Charges resulting from the war	209,600,000
Reparation charges	1,227,500,000
Social Insurance	375,400,000
Unemployment	100,000,000
Debt	475,800,000
Police	190,000,000
Miscellaneous expenses	985,700,000
Total	9,356,500,000

*The German budget is divided into the ordinary budget and the extraordinary budget The latter is regularly charged with expenditure defrayed from loans As no loans are to be issued for the time being, the extraordinary budget (charged with 146 million marks) can be neglected for the present

The States have had to revalorize their debts in the same way as the Reich As they are interested in development work, they have been forced to contract many new loans The outstanding loans of Prussia for the year 1928–29 amounted to 333 million marks The total interest and sinking fund needed for 1928 came to 57 million marks (17 million marks of which were for repayment, 21 million for interest on the above mentioned loans, and 19 million for repayments of treasury bills).

The total tax income of Prussian cities and local corporations (1925) was 1,421,506,000 marks Of this sum 796,237,000 marks came from municipal taxes on property, 112,324,000 marks from municipal taxes on consumption, luxury and so on and 33,420,000 marks from taxes on transportation, etc The share of the Prussian municipalities in the taxes of the Reich was 479,524,000 marks

Under the Treaty of Versailles Germany was saddled by the London ultimatum with a reparation liability of 132 milliard marks Of these 132 milliards 50 milliards were to be issued in bonds paying 5% interest and 1% sinking fund The remaining 82 milliards were to be issued when Germany was in a position to pay interest and sinking fund on them These liabilities have never yet been cancelled formally The London agreement of summer 1924 has, however, rearranged Germany's financial obligations in accordance with the main line of the Dawes plan Germany is to pay two and a half milliard marks yearly—after an interim period which came to an end on Aug 31, 1928 Of these two and a half milliard marks 960 million marks are supposed to be extra-budgetary charges The railways have been charged with 660 million marks a year and German industrial concerns with another 300 million marks These 960 million marks are the equivalent, at 5% interest and 1% sinking fund, of a capital sum of 16 milliard marks. Bonds of that amount have been issued to the representatives of the creditor powers who are supposed to float them later on the markets As these moneys do not reach the exchequer, they are supposed to be outside Germany's budgetary contribution. They take away, so to speak, an income, which is not an actual, only a potential, part of the German revenue system

The remaining 1,540 million marks are defrayed from customs, excise and the railway transportation tax. The revenue arising under this head goes into the account of the commissioner for controlled revenues up to the amount of 1,540 million marks (and a reserve fund) The surplus of these revenues is handed back to the German exchequer It amounts to nearly another milliard and a half The German budget is thus divided into two separate parts: a controlled budget and a free budget. When Germany has paid her share of controlled revenues, she can do with the rest as she likes She is free to spend as much money as she likes—provided she has paid up, and she can levy as much additional taxation as seems good to her She is even free to borrow as much money as she may think advisable But it has been insisted upon by the Reparation commission that the service of the new loans must rank behind the service of the reparation obligations Outside the "External Loan" issued in 1924 to start the Dawes plan, no reparation loan properly so-called is in existence, for the railway and industrial bonds are debentures issued by private corporations. They have so far not been placed abroad, as the Dawes plan insists upon safeguarding the German currency by preventing too heavy a pressure on foreign exchange For the same reason neither the number of years for which the 1,540 million marks are to run, has been fixed, nor the capital value attached to them In case the transfer of payments abroad were to disturb the stability of the German exchange, an adjustment is provided for And as long as this adjustment is possible, it is impossible to capitalize the annuities which may or may not be subject to it Assuming that the Reich retains about 5–5½ milliard marks of taxes collected by it, it has to hand over nearly 30% of them; its own free revenue is reduced to a little over 4 milliard marks

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ETHNOLOGY AND EARLY HISTORY

Our direct knowledge of Germany begins with the appointment of Julius Caesar as governor of Gaul in 59 B C Long before that time there is evidence of German communication with southern civilization, as the antiquities prove, and occasional travellers from the Mediterranean had made their way into those regions (*e g* Pytheas, towards the end of the 4th century), but hardly any records of their journeys survive The first Teutonic peoples whom the Romans encountered were the Cimbri and Teutoni, probably from Denmark, who invaded Illyria, Gaul, and Italy towards the end of the 2nd century B C

Julius Caesar in Germany.—When Caesar arrived in Gaul the Rhine practically formed the boundary between Gauls and Germans, though one Gaulish tribe, the Menapii, is said to have been living beyond the Rhine at its mouth, and shortly before the arrival of Caesar an invading force of Germans had seized and settled down in what is now Alsace, 72 B.C At this time the Gauls were being pressed by the Germans along the whole frontier, and several of Caesar's campaigns were occupied with operations,

either against the Germans or against Gaulish tribes set in motion by the Germans. During the period of Caesar's government he succeeded in annexing the whole country as far as the Rhine. (For the campaigns *see* CAESAR, JULIUS)

Later Campaigns.—After peace had been established in Italy by Augustus, attempts were made to extend the Roman frontier beyond the Rhine. Nero Claudius Drusus (*q v*) in the year 12 B C. annexed what is now the Netherlands and constructed a canal (Fossa Drusiana) between the Rhine and the Lacus Flevus, which partly corresponded to the Zuider Zee, though the topography of the district has altered. He also penetrated into regions beyond and crossed the Weser, receiving the submission of the Bructeri, and also of the Chatti and Cherusci (*qq v*). After Drusus' death in 9 B C., the German command was twice undertaken by Tiberius, who in A D. 5 received the submission of the Chauci and the Langobardi. A Roman garrison was left in the conquered districts between the Rhine and the Elbe About the same time a Roman fleet voyaged along the northern coast as far as the north of Jutland and received the nominal submission of the Cimbri (*q v*) and the Charudes In A D. 9 Quintilius Varus, the successor of Tiberius, was surprised in the *Saltus Teutobergensis* between the Lippe and the Weser by a force raised by Arminius (*q v*), a chief of the Cherusci, and his army, consisting of three legions, was annihilated. Germanicus Caesar made repeated attempts to recover the Roman position in northern Germany and exact vengeance for the death of Varus, but without real success, and after his recall the Rhine formed for the greater part of its course the boundary of the Empire. A standing army was kept up on the Rhine, divided into two commands, upper and lower Germany, the headquarters of the former being at Mainz, those of the latter at Vetera, near Xanten A number of important towns grew up, among which we may mention Trier (Augusta Trevirorum), Cologne (Colonia Agrippinensis), Bonn (Bonna), Worms (Borbetomagus), Spires (Noviomagus), Strasbourg (Argentorate), and Augsburg (Augusta Vindelicorum)

At a later date the frontier of upper Germany was advanced beyond the Rhine, and a fortification, known in its northern part as the *Pfahlgraben,* constructed to protect it It led from Honningen on the Rhine, about half-way between Bonn and Coblenz, to Mittenberg above Aschaffenburg on the Main, thence southwards to Lorch in Wurttemberg, whence it turned east to the Danube just below Hienheim. (*See* LIMES GERMANICUS.)

During the wars of Drusus, Tiberius, and Germanicus the Romans had ample opportunity of getting to know the tribal geography of the western part of Germany It will be convenient, therefore, to give an account of the tribal geography of Germany in the time of Augustus, as our knowledge of the subject is more complete for his reign than for several centuries later.

THE GERMAN TRIBES

Of the Gaulish tribes west of the Rhine, the most important was the Treveri, inhabiting the basin of the Moselle, from whom the city of Trier (Trèves) derives its name The Rauraci occupied the south of Alsace To the south of the Treveri lay the Mediomatrici, and to the west of them lay the important tribe of the Sequani, who had called in Ariovistus The Treveri claimed to be of German origin, and the same claim was made by a number of tribes in Belgium, the most powerful of which were the Nervii There is some obscurity concerning the origin of the name Germani. It appears to be a Gaulish term, and there is no evidence that it was ever used by the Germans themselves. Caesar records that four Belgic tribes, namely, the Condrusi, Eburones, Caeraesi, and Paemani were collectively known as Germani These tribes were all linguistically Celtic, and it is the prevailing opinion that they were not of German origin ethnologically but came from over the Rhine (Caesar, *De Bello Gallico* ii 4) The name Germani originally denoted certain Celtic tribes to the east of the Rhine, and was then transferred to the Teutonic tribes which subsequently occupied the same territory.

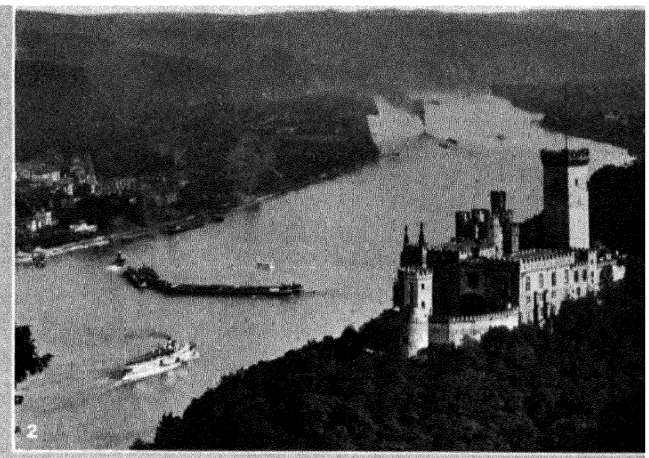
Tribal Movements.—There is little doubt that, during the last century before the Christian era, the Celtic peoples had been pushed considerably farther west by the Teutonic peoples, a process which was still going on in Caesar's time. The Boii (*q.v.*) were expelled from their territories in Bohemia by the Marcomanni (*q.v.*) in the time of Augustus. Caesar also mentions a Gaulish tribe named Volcae Tectosages as living in Germany in his time. The Volcae Arecomici in the south of France and the Tectosages of Galatia were in all probability offshoots of this people The name of the tribe was adopted in the Teutonic languages as a generic term for all Celtic peoples (O H G *Walha,* A S. *Wealas*). Ptolemy mentions a number of place-names which are certainly Celtic, *e g*, Mediolanion, Aregelia, Lougidounon, Lokoriton, Segodounon There is, therefore, a probability that a large part of western Germany east of the Rhine was formerly occupied by Celtic peoples.

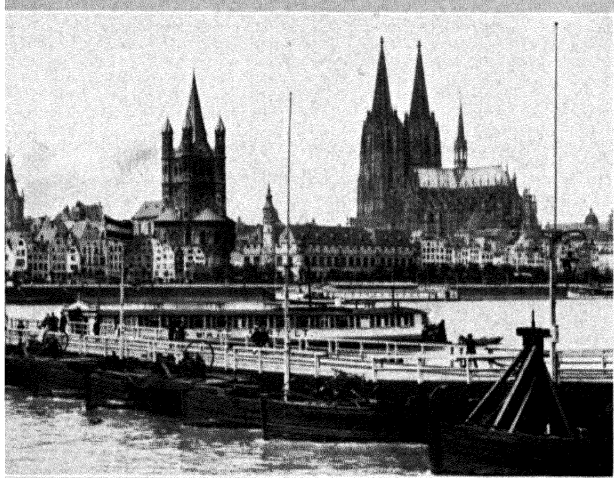
Tribes in the West and North.—Coming to the Germans proper, we find the basin of the Rhine between Strasbourg and Mainz inhabited by the Tribocci, Nemetes, and Vangiones, farther down by the Mattiaci about Wiesbaden, and the Ubii in the neighbourhood of Cologne, beyond them were the Sugambri, and in the Rhine delta the Batavi and other smaller tribes All these tribes remained in subjection to the Romans Beyond them were the Tencteri, about the basin of the Lahn, and the Usipetes about the basin of the Ruhr The basin of the Lippe and the upper basin of the Ems were inhabited by the Bructeri, and in the same neighbourhood were the Ampsivarii The upper basin of the Weser was inhabited by the Chatti, whose capital was Mattium (Maden on the Eder). To the north-west of them were situated the Marsi (*q v*), while the central part of the basin of the Weser was inhabited by the Cherusci, who seem to have extended considerably eastward. The lower part of the river-basin was inhabited by the Angrivarii The coastlands north of the mouth of the Rhine were occupied by the Canninefates, by the Frisii as far as the mouth of the Ems, thence onward to the mouth of the Elbe by the Chauci The basin of the Elbe was inhabited by Suebic tribes, the chief of which were the Marcomanni, who settled on the Saale during the latter part of the 1st century B C , but moved into Bohemia before the beginning of the Christian era, where they became a formidable power under their king Maroboduus (*See* SUEBI, etc) The Quadi were settled somewhat farther east about the source of the Elbe The Hermunduri in the basin of the Saale were in alliance with the Romans and occupied northern Bavaria with their consent. The Semnones dwelt below the junction of the Saale and Elbe. The Langobardi (*see* LOMBARDS) possessed the land between the territory of the Semnones and the mouth of the river Their name is preserved in Bardengau, south of Hamburg The province of Schleswig (perhaps only the west coast) and the islands adjacent were inhabited by the Saxons, while the east coast was occupied by the Angli The coast of Mecklenburg was inhabited by the Varini (the later Warni). The eastern part of Germany was much less known to the Romans; the Rugii inhabited the eastern part of Pomerania, where a trace of them is preserved in the name Rugenwalde The lower part of the basin of the Oder was occupied by the Burgundiones, and the upper part by a number of tribes collectively known as Lugii, who seem to correspond to the Vandals of later times Among the Lugii we may include the Silingae, who afterwards appear among the Vandals in Spain, and whose name is preserved in Slavonic form in that of the province Silesia. The Goths (Gotones) inhabited the basin of the Vistula about the middle of its course, but the lower part of the basin was inhabited by non-Teutonic peoples, among whom we may mention the Galindi, probably Prussians, and the Aestii, either Prussian or Esthonian, in the coastlands at the mouth of the river, who are known especially in connection with the amber trade.

WARS OF THE GERMANS

In the time of Augustus the most powerful ruler in Germany was Maroboduus, king of the Marcomanni His supremacy extended over all the Suebic tribes (except perhaps the Hermunduri), and most of the peoples of eastern Germany, including the Lugii and Goths But in A.D 17 he became involved in an unsuccessful campaign against Arminius, prince of the Cherusci, in which the Semnones and Langobardi revolted against him, and











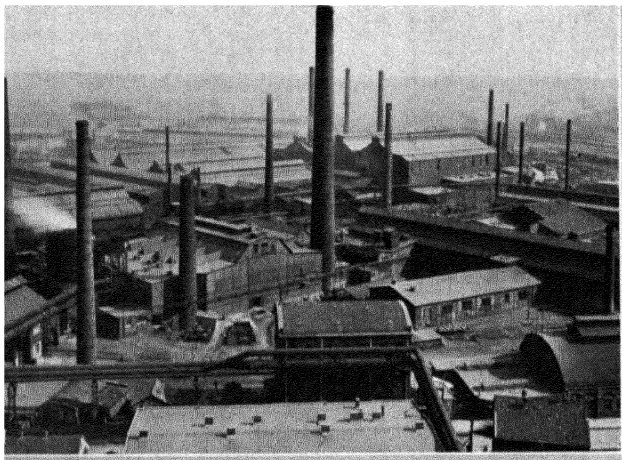


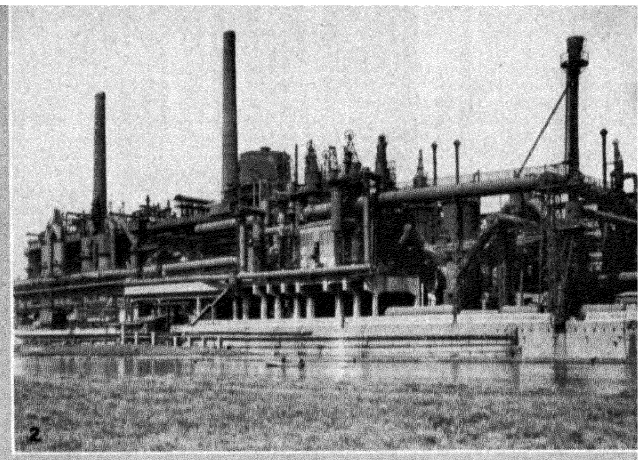
BY COURTESY OF (4, 6) THE GERMAN TOURIST INFORMATION OFFICE; PHOTOGRAPHS, (1, 2) REICHSZENTRALE FÜR DEUTSCHE VERKEHRSWERBUNG, (3, 5) EWING GALLOWAY

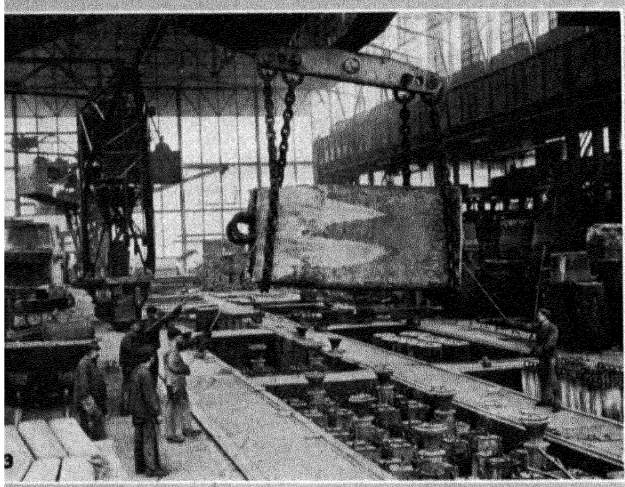
CASTLES AND CITIES ON THE RHINE

1. The castle of Thurnberg or "The Mouse," on the right bank of the Rhine near St. Goarshausen, built in 1363 by the Archbishop von Falkenstein. It was named the "mouse" by the counts of Katzeneinbogen, whose castle "The Cat" (Plate IV. fig. 5) stands opposite
2. Castle Stolzenfels, on the left bank of the Rhine near Coblenz, built by Friedrich Wilhelm IV. in 1835 on the site of a 13th century fortress
3. Cologne (Köln), the old metropolis of the Rhineland, showing the cathedral in the heart of the city and the pontoon bridge crossing the Rhine to Köln-Mulheim
4. The ruined castle of Rheinfels (at the right), situated on the left bank of the Rhine overlooking the town of St. Goar. It was built in 1276 by a count of Katzeneinbogen
5. View of Coblenz, showing the pontoon bridge crossing the Rhine. This city, situated at the confluence of the Moselle and the Rhine, is the most important military station on the latter
6. Mainz, capital of the province of Rhenish Hesse, on the left bank of the Rhine, opposite and below the influx of the Main. This is one of the headquarters of the Rhenish wine trade

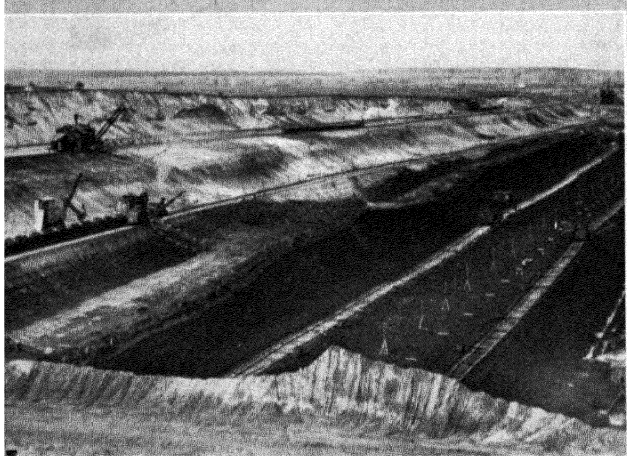
GERMANY

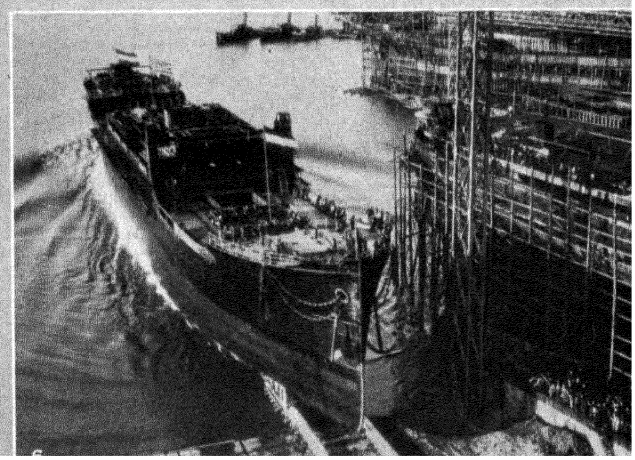












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LARGE INDUSTRIAL PLANTS IN GERMANY· STEEL, COAL AND SHIPBUILDING WORKS

1 View of Thyssens steel and rolling mills in the Ruhr District, one of the greatest iron and steel producing regions in the world This area includes the Stinnes, Krupp and other plants

2 Blast furnaces of the Stinnes works at Muhlheim, near Essen, in the Ruhr District, one of the most important steel centres in Germany

3 Interior of cast steel plant, Fried Krupp works, Essen, showing extra large ingot weighing 100 tons being lifted from casting pit by an overhead crane which carries the ingots to annealing pit

4. View of railway spring shop, Krupp works, showing stacks of completed springs for railway cars and locomotives

5 Typical scene showing workings in an open pit lignite mine at Leignitz, Silesia The most important of these new brown coal areas have been developed near to existing industrial centres Power plants in lignite area of central Germany generate electricity used in Berlin Lignite is also used for making synthetic nitrates and is a cheap raw material from which oil is obtained

6. Launching an ocean freighter at the Bremen shipyards, which are among the largest in the world. Since the war Germany's merchant marine has been largely rebuilt and many vessels for foreign owners have been constructed, the one shown being for a Greek line In 1928 Germany's shipyards launched 81 ships; total tonnage 376,416

two years later he was deprived of his throne by a certain Catualda The latter, however, was soon expelled by Vibilius, king of the Hermunduri, and his power was transferred to Vannius, who belonged to the Quadi About the same time Arminius met his death while trying to make himself king of the Cherusci. In A.D 28 the Frisians revolted from the Romans, and though they submitted again in 47, Claudius immediately afterwards recalled the Roman troops to the left bank of the Rhine In 58 the Chatti suffered a serious disaster in a campaign against the Hermunduri. They recovered very soon, and at the end of the 1st century had extended their power at the expense of the Cherusci. During the latter part of the 1st century the Chauci were enlarging their territories· as early as 47 we find them raiding the Roman lands on the lower Rhine, and in 58 they expelled the Ampsivarii. During the last years of the 1st century A D. the Angrivarii are found moving westwards probably under pressure from the Chauci, and the power of the Bructeri was almost destroyed by their attack In 69 the Roman territory on the lower Rhine was disturbed by the revolt of Claudius Civilis (*q.v.*) a prince of the Batavi who had served in the Roman army He was defeated by Petillius Cerealis at Vetera and arranged a capitulation in A D 70.

After the time of Tacitus our information regarding German affairs becomes extremely meagre. The next important conflict with the Romans was the Marcomannic War (166–180), in which all the Suebic tribes, together with the Vandals (apparently the ancient Lugii) and the Sarmatian Iazyges, seem to have taken part Peace was made by the emperor Commodus in A D 180 on payment of large sums of money.

The Alamanni, the Goths, and the Franks.—About the beginning of the 3rd century we find a forward movement in south-west Germany among a group of tribes known collectively as Alamanni (*q v*), who came in conflict with the emperor Caracalla (*q v*) in the year 213 About the same time the Goths made their appearance in the south-east and soon became the most formidable antagonists of Rome In the year 251 they defeated and slew the emperor Decius, and in the reign of Gallienus their fleets, setting out from the north of the Black Sea, worked great havoc on the coast of the Aegean (*see* GOTHS) About the middle of the 3rd century the name Franks (*q v*) makes its appearance, apparently a new collective term for the tribes of north-west Germany from the Chatti to the mouth of the Rhine

The Huns.—In the 4th century the chief powers in western Germany were the Franks and the Alamanni, both of whom were in constant conflict with the Romans The former were pressed in their rear by the Saxons, who at some time before the middle of the 4th century invaded and conquered a considerable part of north-west Germany The Burgundians made their appearance in the west shortly before the end of the 3rd century, settling in the basin of the Main, and some portions of the north Suebic peoples, perhaps the ancient Semnones, had already moved westward By the middle of the 4th century the Goths had become the dominant power in eastern Germany, and their king Hermanaric held a supremacy which stretched from the Black Sea to Holstein At his death, the supremacy of eastern Germany passed to the Huns (*q v*), an invading people from the east, whose arrival produced a complete displacement of population in this region With regard to the course of events in eastern Germany we have no knowledge, but during the 5th century several of the peoples previously settled there made their way into the lands south of the Carpathians and Riesengebirge, amongst whom (besides the Goths) may be mentioned the Rugii and the Gepides We do not know how far northward the Hunnish power reached in the time of Attila (*q v*), but the invasion of this nation was soon followed by a great westward movement of the Slavs.

The Burgundians and other Tribes.—In the west the Alamanni and the descendants of the Marcomanni, now called Baiovarii (Bavarians), had broken through the frontiers of the Roman provinces of Vindelicia and Noricum at the beginning of the 5th century About 435–440 the Burgundians were overthrown by Attila, and their king Gunthacarius (Gundahar) killed The remains of the nation shortly afterwards settled in Gaul About the same time the Franks overran and occupied the modern Belgium, and in the course of the next half-century their dominions were enormously extended towards the south (*see* FRANKS). After the death of Attila in 453, the power of the Huns soon collapsed

THE FRANKS AND THE SAXONS

In the 6th century the predominant peoples are the Franks, Frisians, Saxons, Alamanni, Bavarians, Langobardi, Heruli, and Warni. By the beginning of this century the Saxons penetrated almost, if not quite, to the Rhine in the Netherlands The old land of the Chatti was included in the kingdom of Clovis and Northern Bavaria was occupied by the Franks To the east of the Franks, between the Harz, the Elbe, and the Saale, lay the kingdom of the Thuringi The Heruli also had a powerful kingdom in the basin of the Elbe, and to the east of them were the Langobardi The Warni now dwelt in the regions about the mouth of the Elbe, while the whole coast from the mouth of the Weser to the west Scheldt was in the hands of the Frisians By this time all the country east of the lower Elbe was Slavonic Theodoric, king of the Ostrogoths, endeavoured to form a confederacy with the Thuringi, Heruli and Warni against Clovis in order to protect the Visigoths in the early years of the 6th century, but very shortly afterwards the king of the Heruli was slain by the Langobardi and their existence as an independent power came to an end In 531 the Thüringian kingdom was destroyed by the Frankish king Theodoric

During the 6th and 7th centuries the Saxons were intermittently under Frankish supremacy, but their conquest was not complete until the time of Charlemagne Shortly after the middle of the 6th century the Franks were threatened with a new invasion by the Avars In 567–568 the Langobardi, who by this time had moved into the Danube basin, invaded Italy and were followed by those of the Saxons who had settled in Thuringia. Their lands were given by the Frankish king Sigeberht to the north Suebi and other tribes who had come either from the Elbe basin or possibly from the Netherlands About the same time Sigeberht was defeated by the Avars, and they were followed by a movement of the Slavs, who occupied the basin of the Elster and penetrated to that of the Main

By the end of the 6th century the whole basin of the Elbe, except the Saxon territory near the mouth, had become Slavonic. The Warni now disappear from history, and from this time the Teutonic peoples of the north as far as the Danish boundary about the Eider are called Saxons The conquest of the Frisians by the Franks was begun by Pippin (Pepin) of Heristal in 689 and practically completed by Charles Martel, though they were not entirely brought into subjection until the time of Charlemagne The great overthrow of the Saxons took place about 772–773, and by the end of the century Charlemagne had extended his conquests to the border of the Danes By this time the whole of the Teutonic part of Germany had been brought under his government

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MEDIAEVAL HISTORY

When the Western empire came to an end, the region afterwards called Germany was divided into five main districts, and its history for the succeeding three centuries is mainly the history of the tribes inhabiting them In the north-east, dwelling

reality of his authority over the great dukes. On its suppression, the duchies of Franconia and Lorraine were at his disposal He kept the former in his own hands and granted Lorraine to Conrad the Red, an energetic and honourable count, whom he still further attached to himself by giving him his daughter for his wife. Bavaria, on the death of its duke in 947, was placed under Otto's brother Henry, who, after an unsuccessful rebellion, was a loyal subject. The duchy of Swabia was also brought into Otto's family by the marriage of his son Ludolf with Duke Hermann's daughter, and by these means Otto made himself master of the kingdom. For the time, feudalism in truth meant that lands and offices were held on condition of service; the king was the genuine ruler, not only of freemen, but of the highest vassals in the nation.

Otto's reign is important for the relations of Germany with external powers He intervened in the affairs of France where King Louis IV. and his greatest subject, Hugh, duke of the Franks, had each married one of his sisters. His wars with his northern and eastern neighbours were more important The duke of Bohemia, after a long struggle, was brought to submission in 950 Among the Slavs between the Elbe and the Oder the king was represented by Margrave Gero, who conquered much of the country north of Bohemia between the Oder and the upper and middle Elbe Margrave Billung, who looked after the Abotrites on the lower Elbe was less fortunate, mainly because of the neighbourhood of the Danes, who, after the death of King Henry, often attacked the hated Germans, but some progress was made in bringing this district under German influence. Otto, having profound faith in the power of the Church to reconcile conquered peoples to his rule, provided for the benefit of the Danes the bishoprics of Schleswig, Ripen and Aarhus; and among those which he established for the Slavs were the important bishoprics of Brandenburg and Havelberg In his later years he set up the archbishopric of Magdeburg, which took in the sees of Meissen, Zeitz and Merseburg.

Having secured peace in Germany and begun the real conquest of the border races, Otto was by far the greatest sovereign in Europe The latter part of his long reign was largely occupied with his intervention in Italy and its consequences About 951 Adelaide, widow of Lothair, son of Hugh, king of Italy, having refused to marry the son of Berengar, margrave of Ivrea, was cast into prison and cruelly treated She appealed to Otto; other reasons called him in the same direction, and in 951 he crossed the Alps and descended into Lombardy. He displaced Berengar, and was so fascinated by Queen Adelaide that within a few weeks he was married to her at Pavia But Otto's son, Ludolf, who had received a promise of the German crown, saw his rights threatened by this marriage He went to an old enemy of his father, Frederick, archbishop of Mainz, and the two plotted together against the king, who, hearing of their proceedings, returned to Germany in 952, leaving Duke Conrad of Lorraine as his representative in Italy Otto, who did not suspect how deep were the designs of the conspirators, paid a visit to Mainz, where he was seized and was compelled to take certain solemn pledges which, after his escape, he repudiated. War broke out in 953, and the struggle was the most serious in which he had been engaged Conrad the Red hurried from Italy and joined the rebels, in Swabia, in Bavaria, in Franconia and even in Saxony, the native land of the king, many sided with them The rapidity and strength of the movement is extremely remarkable Otto was, in fact, only saved by the presence of external peril The Magyars were as usual stimulated to action by the disunion of their enemies; and Conrad and Ludolf made the blunder of inviting their help The great battle against the Magyars was fought on Aug 10, 955, on the Lechfeld near Augsburg The Magyars were defeated, and from this time, they began to settle in the land they still occupy.

Entreated by Pope John XII , who needed a helper against Berengar, Otto went a second time to Italy, in 961; and on this occasion he received from the pope at Rome the imperial crown The significance of this event is discussed elsewhere (*see* EMPIRE). It gave to Otto certain definite advantages, a general increase of prestige, and new authority over the Church in Germany Otto had been led into Italian enterprises by considerations which no one in his position could have resisted, and his coronation was their inevitable consequence. Events were to prove that the association of Germany and Italy thus established would prevent the creation of a united monarchy in either country. In Otto's time the condition of Italy invited the intervention of a ruler who felt himself competent to establish order and reform the Church.

By the policy of his later years Otto did much to prepare the way for the process of disintegration which he rendered inevitable by restoring the empire. With the kingdom divided into five great duchies, the sovereign could always have maintained at least so much unity as Henry the Fowler had Yet Otto threw away this advantage Lorraine was divided into two duchies, Upper Lorraine and Lower Lorraine In each he appointed a count palatine, whose duty was to maintain the royal rights; and after Margrave Gero died in 965 his territory was divided into three marches, and placed under margraves, each with the same powers as Gero. Otto gave up the practice of retaining the duchies either in his own hands or in those of relatives Even Saxony, his native duchy and the chief source of his strength, was given to Margrave Billung, whose family kept it for many years To combat the power of the princes, Otto greatly increased the importance of the prelates He undoubtedly felt that, as church lands and offices could not be hereditary, their holders would necessarily favour the Crown He forgot that the passion for the rights of an order may be not less intense than that for the rights of a family.

During the reigns of Otto II (973–983) and Otto III (983–1002) much of the work of Henry the Fowler and Otto I was undone. Otto II had married Theophano, daughter of Romanus II , the eastern emperor, and his main ambition was the conquest of southern Italy Otto III hoped to achieve the unity of Christendom under his authority, and was little interested in the problems of the German kingship It is not strange that this period is marked by a reaction on the part of the kingdoms on the German border over which Henry and Otto I had extended their influence and by revolts within Germany itself The reign of Henry II , the successor of Otto III. (1002–24), was mainly occupied by an attempt to restore the royal authority over Germany and the border kingdoms, of which Poland (*q v*) was the most dangerous In this last respect his work was continued by his successor Conrad II , a Franconian noble (1024–39), under whom the eastern border was materially strengthened In the west, Conrad received the kingdom of Arles by the bequest of its king, Rudolph III (1032), and in Germany itself he was remarkably successful in regaining control over the duchies Franconia was under his own rule, and he was able to acquire Bavaria and Swabia for his son Henry. His power was greater than that of any other king since the death of Otto I , and he founded a notable dynasty

Henry III.—Henry III , who had been crowned German king and also king of Burgundy during his father's lifetime, took possession of his great inheritance without opposition in June 1039 During the late king's concluding years a certain Bretislaus, who had served Conrad with distinction in Lusatia, became duke of Bohemia, and made war upon the disunited Poles, easily bringing them into subjection. Thus Germany was again threatened with the establishment of an independent Slavonic State upon her eastern frontier To combat this danger Henry invaded Bohemia, and after two reverses compelled Bretislaus to submit at Regensburg He also gained the goodwill of the Poles by helping to bring about the return of their duke, Casimir I , who willingly did homage for his land The king of Denmark, too, acknowledged Henry as his feudal lord, and by several campaigns in Hungary the German king brought that country into the position of a fief of the German Crown. This war was occasioned by the violence of the Hungarian usurper, Aba Samuel, and formed Henry's principal occupation from 1041 to 1045.

In Germany itself Henry was successful Under him Germany enjoyed a period of internal quiet such as she had probably never experienced before, but even he could not permanently divert from its course the main political tendency of the age, the desire of the great feudal lords for independence For various reasons, the southern duchies, Swabia, Bavaria and Carinthia, passed from under his own immediate control His position was becoming

gradually weaker when in 1051 he invaded Hungary, where a reaction against German influence was taking place. After a second campaign in 1052 the Hungarian king, Andrew, was compelled to make peace and to own himself the vassal of the German king. On Henry's return, Andrew, encouraged by the support of disaffected German nobles, repudiated the treaty and the German supremacy in that country came to a sudden end. Among the causes which undermined Henry's strength was the fact that the mediate nobles, who had stood loyally by his father, Conrad, were not his friends

With Henry's reign, the relations between empire and papacy entered on a new phase. It was largely through him that the papacy was enabled to extend its authority over western Europe. In 1046 he entered Italy at the head of an army and secured the deposition of the three contemporary claimants to the papal see He then bestowed it on Suidger, bishop of Bamberg, who, as Pope Clement II, crowned him emperor; and after Clement three other German popes—Damasus II, Leo IX and Victor II—owed their elevation to Henry. Under them a new era began for the Church, and in thus reforming the papacy Henry III fulfilled what was regarded as the noblest duty of his imperial office, but he was preparing difficulties for his successors The last years of his reign form a turning-point in German history Great kings and emperors came after him, but none of them possessed the direct, absolute authority which he freely wielded, even in the case of the strongest the forms of feudalism more and more interposed themselves between the monarch and the nation, and at last the royal authority virtually disappeared During this reign the towns entered upon an age of prosperity, and the Rhine and the Weser became great avenues of trade

When Henry died in Oct 1056, the decline of the royal authority was accelerated by the fact that his successor was a child Henry IV., who had been crowned king in 1054, was at first in charge of his mother, the empress Agnes, but a succession of revolutions at court placed him under the control of Adalbert, archbishop of Bremen Adalbert's rule was very successful. Compelling King Solomon to own Henry's supremacy he restored the influence of Germany in Hungary, but in Germany itself and especially in Saxony he made many enemies, and in 1066 Henry, who had just been declared of age, was compelled to dismiss him

The Investiture Controversy.—Henry IV assumed the duties of government soon after the fall of Adalbert The first ten years of his actual reign were marked by a great revolt in Saxony (*q v*) which ended in the submission of the duchy In the later part of his reign began the dispute between empire and papacy commonly known from one of the questions at issue as the Investiture Controversy Its origin and history are discussed in other articles (*see* EMPIRE; PAPACY) The present article is only concerned with its effect on Germany, which from any point of view was disastrous It destroyed whatever possibility existed of an effective kingdom of Germany The authority of later kings like Frederick I or Henry VI is more artificial than that of Otto I. or Conrad II, it depends more obviously on the personality of the reigning king, and its sanction has evidently been weakened Henceforward the German kingship was on the defensive against the papal claim to universal dominion, and the papacy could generally obtain the support of the disaffected elements within Germany The resistance actually made by Henry IV to the new claims advanced by the papacy is a testimony to the work of Henry's predecessors. They had made the German kingship a political force, had compelled the most powerful of their princes to show it at least formal respect, and above all had identified it with the security of the German people against attack from the alien peoples of the East. In this their work was never wholly undone The defence of the eastern borders was always a royal duty, and the marks which were created for their protection were for many years under far more definite subjection to the king than the ancient duchies had ever been The real damage which Germany suffered through the investiture controversy came through the papal challenge to the respect which had hitherto been accorded to the royal authority implicitly, without speculation as to its origin or sanction.

Henry IV. died in Aug. 1106. The first years of his successor Henry V. were spent in campaigns in Flanders, Bohemia, Hungary and Poland and in the establishment of his power in Germany. His chief supporters were his nephews, the two Hohenstaufen princes, Frederick and Conrad, to whose father Frederick the emperor Henry IV had given the duchy of Swabia when its duke Rudolph became his rival. The younger Frederick succeeded to this duchy in 1105, while ten years later Conrad was made duke of Franconia, a country which for nearly a century had been under the immediate government of the Crown The two brothers were enthusiastic imperialists, and with persistent courage they upheld the cause of their sovereign during his two absences in Italy

The investiture controversy—the great outstanding question at issue between pope and emperor—was settled in 1122 by the concordat of Worms, a compromise by which the right of electing prelates was granted to the clergy, and the emperor surrendered the privilege of investing them with the ring and the staff. On the other hand it was arranged that these elections should take place in the presence of the emperor or his representative, and that he should invest the new prelate with the sceptre, thus signifying that the bishop, or abbot, held his temporal fiefs from him and not from the pope The settlement gave material advantage to the emperor, and he was able to establish good order in Germany before his death in 1125

Decay of the Royal Power.—The Franconian dynasty was now extinct, and after a protracted contest Lothair, duke of Saxony, the candidate of the clergy, was chosen king His first enterprise was a disastrous campaign in Bohemia, but before this occurrence he had aroused the enmity of the Hohenstaufen princes by demanding that they should surrender certain lands which had formerly been the property of the Crown Lothair's rebuff in Bohemia stiffened the backs of Frederick and Conrad, and in order to contend with them the king secured a powerful ally by marrying his daughter Gertrude to Henry the Proud, a grandson of Welf, whom Henry IV had made duke of Bavaria, a duchy to which Henry himself had succeeded in 1126. Henry was perhaps the most powerful of the king's subjects, nevertheless the dukes of Swabia and Franconia withstood him, and a long war desolated south Germany This was ended by the submission of Frederick in 1134 and of Conrad in the following year. Lothair's position, which before 1130 was very weak, had gradually become stronger He had put down the disorder in Bavaria, in Saxony and in Lorraine, a diet held at Magdeburg in 1135 was attended by representatives from the vassal States of Denmark, Hungary, Bohemia and Poland, and in 1136, when he visited Italy for the second time, Germany was in a very peaceful condition In June 1133, during the king's first visit to Italy, he had received from Pope Innocent II the imperial crown and also the investiture of the extensive territories left by Matilda, marchioness of Tuscany; and at this time the pope seems to have claimed the emperor as his vassal, a statement to this effect being inscribed in the audience hall of the Lateran at Rome Nothing could indicate more clearly than this fact how much of their old power the German kings had lost

Henry the Proud was confident that he would succeed Lothair, who had died on his return from Italy in Dec 1137; but, by a hasty and irregular election, Conrad of Hohenstaufen, duke of Franconia, was chosen king in March 1138 Henry the Proud rebelled and was declared to have forfeited his two duchies, Saxony and Bavaria, the former being given to Albert the Bear, margrave of Brandenburg, and the latter to Leopold IV, margrave of Austria Henry defended his rights with vigour and once again Germany was ravaged by war, for although he was unpopular in Bavaria he was strongly supported by the Saxons, who, since the time of Henry IV, had always been ready to join in an attack on the monarchy, and he had little difficulty in driving Albert the Bear from the land However, in Oct. 1139 Henry died suddenly, but his young son, Henry the Lion, was recognized at once as duke of Saxony, while his brother, Welf, upheld the fortunes of his house in Bavaria The struggle went on until May 1142, when peace was made at Frankfurt. Saxony, with the assent of Albert the Bear, was granted by Conrad to Henry the Lion, and Bavaria was given

to Henry Jasomirgott, who had just succeeded his brother Leopold as margrave of Austria But this was only a lull in the civil strife, which was renewed after the king had made a successful expedition into Bohemia. The princes clerical and lay were fighting against each other, and the Bavarians were at war with the Hungarians who gained a great victory in 1146. Notwithstanding the many sources of confusion Conrad was persuaded by the passionate eloquence of Bernard of Clairvaux to take part in the second crusade, he left for the East in 1147 and returned to Germany in 1149, to find Welf again in arms and Henry the Lion claiming Bavaria The king had done nothing to stem the rising tide of disorder when he died at Bamberg in Feb 1152 During this reign the work of conquering and Germanizing the Slavonic tribes east of the Elbe was seriously taken in hand under the lead of Albert the Bear and Henry the Lion, and the foundation of the margraviate of Brandenburg by Albert tended to make life and property more secure in the north-east of Germany

Frederick Barbarossa.—After Conrad's death Germany passed under the rule of one of the greatest of her sovereigns, Frederick I, called Barbarossa, nephew of the late king and son of Frederick, that duke of Swabia who had fought along with Conrad against Henry the Proud Frederick himself had also been closely associated with Conrad, who advised the princes to choose his nephew as his successor This was done, and the new king was crowned at Aix-la-Chapelle in March 1152 Allied through his mother to the Welfs of Bavaria, and anxious to put an end to the unrest which dominated Germany, especially to the strife between the families of Welf and Hohenstaufen, Frederick began his reign by promising to secure for Henry the Lion the duchy of Bavaria, and by appeasing Henry's uncle, Count Welf, by making him duke of Spoleto and margrave of Tuscany But the new king had another, and perhaps a more potent, reason for wishing to see peace restored in Germany. For his adventurous and imaginative spirit Italy and the imperial title had an irresistible charm, and in 1154, two years after he had ascended the throne, he crossed the Alps, being crowned emperor at Rome in June 1155 After this event the best years of his life were spent in Italy, where, in his long and obstinate struggle with the Lombard cities and with Pope Alexander III, he chiefly acquired his fame Although on the emperor's side this struggle was conducted mainly with German troops it falls properly under the history of Italy

The promise that Bavaria should be granted to Henry the Lion was not easily fulfilled, as Henry Jasomirgott refused to give up the duchy. At last, however, in 1156, after his return from his first expedition to Italy, Frederick reconciled the latter prince by making Austria into a duchy with certain special privileges, an important step in the process by which that country became the centre of a powerful State Henry Jasomirgott then renounced Bavaria, and Henry the Lion became its duke It was, however, in his other duchy of Saxony that the latter duke's most important work was done Although he often gave offence by his haughty and aggressive disposition, few German princes have earned so thoroughly the goodwill of posterity Since the death of Otto the Great the Slavonic lands to the east of the Elbe had been very imperfectly held in subjection by the Germans Devoting himself to the conquest of the lands lying along the shore of the Baltic, Henry succeeded as no one before him had ever done But he was not only a conqueror He built towns and encouraged those which already existed; he founded and restored bishoprics in his new territories, and between the Elbe and the Oder he planted bodies of industrious colonists. While he was thus at work a similar task was being performed to the south-east of Saxony by Albert the Bear, the first margrave of Brandenburg, who, by his energetic rule was preparing this country for its great destinies Already under Henry V Pomerania had come under the influence of Christianity, introduced mainly by Otto, bishop of Bamberg (1103–1139).

Early in his reign, by settling a dispute over the Crown of Denmark, Frederick brought the king of that country once more into the position of a German vassal Having spent the year 1156 in settling the Bavarian question and in enforcing order in the Rhineland and elsewhere, the emperor marched into Poland in 1157, compelled its ruler, Boleslaus IV, to do the homage which he had previously refused to perform, and in return for services rendered during the campaign and for promises of future aid, raised the duke of Bohemia to the rank of a king, a change which in no way affected his duties to the German Crown, but which gave him a certain precedence over other vassal princes The king of Hungary, too, although no attempt was made to subdue him, became a useful ally. Towards the west, Frederick asserted his authority in Burgundy or, as it was sometimes called, Franche Comté. In Germany itself internal order was established by a strict appliance of the existing laws against those who broke the peace, fresh orders for its observance were issued, and in Frederick the robber nobles found a most implacable enemy. The cities, too, flourished during this reign The emperor attached them to himself by granting to many of them the very liberties which, by a strained interpretation of his imperial rights, he withheld from the cities of Lombardy. Yet, notwithstanding his policy, in these directions the German nobles appear to have been enthusiastically devoted to Frederick. Time after time they followed him to Italy, enduring serious losses and hardships in order that he might enforce claims which were of no advantage to them, and which, previously, had been a curse to their nation Their loyalty is well illustrated by the famous scene at Besançon in Oct 1157 During a meeting of the diet a papal legate read a letter from Pope Adrian IV, which seemed to imply that the empire was a papal fief Indignant murmurs rose from the assembled nobles, and the life of the legate was only saved from their fury by the intervention of the emperor himself

The central years of his reign were mainly occupied with an attempt to enforce his rule upon Italy. To these years belong his quarrel with Pope Alexander III. and his wars with the cities of northern Italy (*see* PAPACY, LOMBARD LEAGUE) In his later years his interests were devoted to German affairs. Here, his chief enemy was Henry the Lion Rendered arrogant by success and confident that his interests were in northern, and not in southern Europe, the Saxon duke refused to assist Frederick in the campaign which ended so disastrously at Legnano Ascribing his defeat to Henry's defection, Frederick returned to Germany full of anger against the Saxon duke and firmly resolved to punish him The immediate cause of Henry's downfall, however, was not his failure to appear in Italy, but his refusal to restore some lands to the bishop of Halberstadt, and it was on this charge that he was summoned before the diet Three times he refused to appear, and early in 1180 sentence was pronounced against him; he was condemned to lose all his lands and to go into banishment For some time he resisted, but at length the emperor in person marched against him and he was forced to submit; the only favour he could secure when peace was made at Erfurt in Nov 1181 was permission to retain Brunswick and Lüneburg, which have remained in the possession of his descendants until our own day Bavaria was granted to Otto of Wittelsbach, but it lost some of its importance because Styria was taken from it and made into a separate duchy The extensive duchy of Saxony was completely dismembered The name was taken by the small portion of the former duchy which was given to Bernard, son of Albert the Bear, the founder of a new Saxon line, and the extensive western part was added to the archbishopric of Cologne. The chief prelates of Saxony and many of the late duke's most important feudatories were made virtually independent of all control save that of the Crown Frederick's object in thus breaking up the two greatest duchies in his kingdom was doubtless to strengthen the imperial authority But in reality he made it certain that the princes would one day shake off the imperial power altogether

Less serious than the struggle with Henry the Lion was Frederick's struggle with Philip of Heinsberg, archbishop of Cologne (d 1191), on whom he had just conferred a great part of Saxony When the emperor went to Italy in 1184 he left the government of Germany to his son Henry, afterwards the emperor Henry VI, who had been crowned German king in 1169 On all sides, but especially in the north-west, Henry was faced with incipient revolution, and while he was combating this the quarrel between Frederick and the papacy broke out again in Italy. At this juncture Philip of Cologne united the German and the Italian oppositions. Several princes rallied to his standard and foreign powers promised

and, but although very formidable in appearance the combination had no vestige of popular support. The greater part of the German clergy again proved their loyalty to Frederick, who hurried to Germany only to see the opposition vanish before him. In March 1188, Philip of Cologne submitted at Mainz. Germany was now at peace. With the accession of Gregory VIII. pope and emperor were reconciled, and by the marriage of his son Henry with Constance, daughter of Roger I, king of Sicily, the emperor had reason to hope that the empire would soon include Naples and Sicily In 1189 he started with a great army for the Holy Land. In June 1190 he was drowned in Cilicia.

Henry VI.—His son Henry VI became for a short time stronger than even Frederick had been Having in 1190 reduced Henry the Lion once more to submission, the new king set out to take possession of his Sicilian kingdom, being on the way crowned emperor at Rome At the end of 1191 he returned to Germany, where he overcame dangerous risings in the lower Rhineland and in Saxony, Thuringia and Meissen His success against the Saxon rising was partly due to his use of the influence possessed by his prisoner Richard I of England with Henry the Lion and his family. The latter made his peace in 1194, when his son Henry was promised the succession to the Rhenish Palatinate Returning from another visit to Sicily, the emperor was now so powerful that, in pursuance of his plan for making himself the head of a great world monarchy, he put forward the suggestion that the imperial crown should be declared hereditary in his family This proposal aroused much opposition, but Henry persisted with it, he promised important concessions to the princes, many of whom were induced to consent, and but for his sudden death, which occurred in Sicily in Sept 1197, it is probable that he would have attained his end

Great as was Henry's authority, many of the princes refused to recognize his son, Frederick, who had been chosen king of the Romans in 1196 This attitude was probably due to fear that the German princes would be entangled in Italian politics The friends of the house of Hohenstaufen, convinced that Frederick's kingship was not possible, chose the late emperor's brother, Philip, duke of Swabia, to fill the vacant throne, soon afterwards the enemies of the house found a candidate in the person of Henry the Lion's son, Otto of Brunswick Thus the struggle between Welf and Hohenstaufen was renewed and civil war broke out at once Philip's supporters were the nobles of southern and eastern Germany, while a few cities in the west owned his authority, Otto's friends were found mainly in the north and the north-west of the country If Germany had been unconnected with the papacy, or even if the papacy had been as weak as in the days of Henry VI, the issue of the strife would almost certainly have been an early victory for Philip Most of the princes and Philip II, king of France, were on his side But Innocent III declared for Otto in 1201, and civil war was only ended by Philip's murder in June 1208

Otto was now again chosen German king, and to mark the general reconciliation he was betrothed to Philip's daughter Beatrix Nearly all the princes acknowledged him, and as pope and king were at peace, Germany enjoyed a period of comparative quiet This, however, did not last long Having secured his coronation at Rome in Oct 1209, Otto repudiated the many pledges he had made to Innocent and began to act in defiance of the papal wishes To punish him the pope put forward his own ward, Henry VI 's son Frederick, who was living in Sicily, as a rival king While Otto was warring in Italy a number of influential princes met at Nuremberg, at the instigation of Innocent and his ally Philip Augustus of France, and invited Frederick to come to Germany Otto then left Italy hurriedly, but he was quickly followed by his young rival, who in the warfare which had already broken out proved himself a formidable opponent Seeking to mend his failing fortunes, Otto went to France to support his ally, the English king John, against Philip Augustus, and at the battle of Bouvines (July 27, 1214) his fate was sealed, although until his death in May 1218 he maintained a desultory warfare against Frederick

Frederick II.—Frederick II. was, if not the strongest, certainly the most brilliant of German kings For outward splendour his position was never surpassed, and before he died he possessed six crowns, those of the empire, Germany, Sicily, Lombardy, Burgundy and Jerusalem But Germany profited neither by his gifts nor by his prestige. After Bouvines he purchased the assistance of Valdemar II, king of Denmark, by ceding to him a large stretch of land along the Baltic coast; and, promising to go on crusade, he secured his coronation at Aix-la-Chapelle in July 1215 Then being generally recognized as king he was able to do something to quell disturbances in various parts of the country, and, in April 1220, to bring about the election of his young son Henry as king of the Romans But for this favour he had been compelled to pay a high price Seven years before, at Eger in July 1213, he had made extensive concessions to the church, undertaking to take no part in episcopal elections, thus surrendering the advantages gained by the concordat of Worms, and to allow to German bishops the right of appeal to Rome Proceeding a step farther in the same direction, he now promised to erect no new toll-centre, or mint, on the lands of the spiritual princes and to allow no towns to be built thereon Thus the prelates possessed nearly all the rights of sovereigns, and regarded the pope in Italy and not the king in Germany as their head, a state of affairs which was fatal to the unity, nay, even to the existence of the empire

Having made peace with Henry, count palatine of the Rhine and brother of Otto IV, and settled a dispute about the lands of the extinct family of Zahringen in the south-west of the country, Frederick left Germany in Aug 1220; engaged in his bitter contest with the papacy and the Lombard cities, in ruling Sicily, and, after several real or imaginary delays, in fulfilling his crusading vow, he did not return to it for 15 years During this period he was represented by his son Henry, in whose name the government of Germany was carried on by the regent Engelbert, archbishop of Cologne While Englebert lived the country was in a fairly peaceable condition, although, thanks to the emperor's concessions, the spiritual princes were predominant, and all possible means were taken to check the growth of the towns, whose interests and aspirations were not favourable to this state of affairs There was, moreover, a struggle between Valdemar of Denmark and some neighbouring German nobles But after Engelbert's murder (Nov. 1225) there was a change for the worse, and the only success which can be placed to the credit of the German arms during the next few years was the regaining of the lands ceded to Denmark in 1215, lands which included the cities of Hamburg and Lubeck. Under the rule of the new regent, Louis I, duke of Bavaria, confusion reigned supreme, and civil war prevailed in nearly every part of the country

After the treaty of San Germano, which was made with Pope Gregory in 1230, and the consequent lull in the struggle with the papacy, Frederick was able to devote some little attention to Germany, and in 1231 he sanctioned the great Privilege of Worms. This was a reward to the princes for their efforts in bringing about the peace, and an extension of the concessions made in 1220. The princes, now for the first time referred to officially as *domini terrae*, were given full rights of jurisdiction over their lands and all the inferior officers of justice were made subservient to them. Practically they became independent sovereigns, and to make their victory more complete serious restraints were laid upon the freedom of the towns Before this date King Henry had begun to take a personal part in the government and was already involved in a quarrel with Otto II, duke of Bavaria He disliked the Privilege of Worms and, favouring the towns against the princes, his policy was diametrically opposed to that of the emperor, however, in 1232 he went to Italy and promised to obey his father's commands But in 1234, at a time of great and increasing disorder in Germany, he rebelled, he appealed publicly to the princes for support, gained some followers, especially in his own duchy of Swabia, and made an alliance with the Lombard cities. Confident of his strength Frederick entered Germany with a few attendants in the middle of 1235, and his presence had the anticipated effect of quelling the insurrection; Henry was sent a prisoner to Italy and disappeared from history Then, in Aug. 1235, amid surroundings of great splendour, the emperor held a diet at Mainz, which was attended by a large number of princes. This diet is very important in the legal history of Germany, because here was issued that great "land peace" (*Landfrieden*) which became the model for all subsequent enactments of the

kind By it private war was declared unlawful, except in cases where justice could not be obtained; a chief justiciar was appointed for the empire; all tolls and mints erected since the death of Henry VI. were to be removed, and other provisions dealt with the maintenance of order.

In 1236, during another short stay in Germany, Frederick led the imperial army against Frederick II, duke of Austria, who had defied and overcome his representatives; having taken possession of Vienna and the Austrian duchies he there secured the election of his son Conrad, who had already succeeded his brother as duke of Swabia, as king of the Romans (May 1237) But in spite of these imposing displays of power the princes looked with suspicion upon an emperor who was almost a stranger to their country and who was believed to be a renegade from their faith, and soon after Frederick's return to Italy the gulf between him and his German subjects was widened by his indifference to a great danger which threatened them This came from the Mongols who ravaged the eastern frontiers of the country, but the peril was warded off by the efforts of Henry II, duke of Silesia, who lost his life in a fight against these foes near Liegnitz in April 1241, and of Wenzel I, king of Bohemia

The emperor's attitude with regard to the Mongol invasion is explained by events in Italy, where Frederick was engaged in a new and, if possible, a more virulent struggle with the Lombard cities and with Gregory IX As usual, the course of politics in Germany, which at this time was ruled by King Conrad and by the regent Siegfried, archbishop of Mainz (d 1249), was influenced by this quarrel Frederick of Austria had allied himself with Wenzel of Bohemia, and spurred on by the papal emissary had tried to set up a rival king, but both the Danish and the French princes who were asked to accept this thankless position declined the invitation, and Frederick and Wenzel made their peace, the former receiving back his duchies After the defeat of the Mongols, however, there was again the danger of a rebellion based upon a union between the princes and the pope Siegfried of Mainz deserted his master, and visiting Germany in 1242 Frederick found it necessary to purchase the support of the towns by a grant of extensive privileges; but, although this had the desired effect, Conrad could make but little headway against the increasing number of his enemies At last the papacy found an anti-king. Having declared Frederick deposed at the council of Lyons in 1245, Gregory's successor, Innocent IV, induced a number of princes to choose as their king the landgrave of Thuringia, Henry Raspe, who had served as regent of Germany This happened in May 1246, and the conduct of the struggle against the *Pfaffenkonig*, as Henry was called, was left to Conrad, who was aided by the Bavarians, until Feb 1247, when the anti-king died The papal party then elected William II, count of Holland, as Henry Raspe's successor, and during the state of anarchy which now prevailed in Germany the emperor died in Italy in Dec 1250

Upon his father's death Conrad IV was acknowledged by many as king in Germany, but in 1251 he went to Italy, where he was fully occupied in fighting against the enemies of his house until his death in May 1254 The struggle to maintain the position of the Hohenstaufen in Italy was continued after this event, but in Oct 1268, by the execution of Conrad's son Conradin, the family became extinct After Conrad's death William of Holland received a certain allegiance, especially in the north of the country, and was recognized by the Rhenish cities which had just formed a league for mutual protection—a league which for a short time gave promise of great strength and usefulness In Jan 1256, however, William was killed, and in the following year there was a double election for the German Crown, Alphonso X, king of Castile, a grandson of Philip of Swabia, and Richard, earl of Cornwall, brother of Henry III of England, being each chosen by parties of electors Neither obtained permanent recognition in Germany.

Expansion and Disunion.—The 13th century saw a notable expansion of Germany Prussia was occupied by the knights of the crusading Teutonic order, and the allied Knights of the Sword pushed farther east into Courland and Livonia Yet it was in this age that the German people lost the possibility of political unity The dissolution of the ancient duchies had given virtual independence to a great number of counts, barons and ecclesiastics of different rank and power. During the war between Otto IV. and Philip there was much encroachment upon the lands and prerogatives of the Crown, and the pre-occupation of Frederick II with Italian affairs prevented him from asserting any effective power in Germany In 1220 he formally confirmed the spiritual princes in their usurpations, 11 years later he granted still more extensive advantages to the princes both spiritual and secular, and these formal concessions were the legal basis of the independence of the princely class Frederick's immediate successors could not exercise any real authority, and they lost control over the border countries which had hitherto been dependent on or connected with Germany Denmark and Poland thenceforward rendered no homage to the German king Nevertheless the disunion of Germany should not be regarded as an unmixed evil It was only in small countries, such as England, that effective centralization could be established under mediaeval conditions Germany was far too large to be governed as a whole, and premature attempts in this direction could only lead to anarchy Against the dreary tale of local wars which fills much of German history should be set the impulse given to architecture, art, letters and education by princes who tried to earn reputation by the patronage which they gave to artists and scholars

The period from the death of Conrad IV to the election of Rudolph of Habsburg in 1273 is generally called the Great Interregnum, and it was used by the princes to extend their territories and to increase their authority

Until this time the territories of a prince were rarely divided among his descendants, the reason being that, although the private fiefs of the nobles were hereditary, their offices—margrave, count and the like—were in theory at the disposal of the king There was now a tendency to set this principle aside Otto II., duke of Bavaria, a member of the Wittelsbach family, had become by marriage ruler of the Rhenish Palatinate, and after his death these extensive lands were ruled in common by his two sons, but in 1255 a formal division took place and the powerful family of Wittelsbach was divided into two branches About the same time the small duchy of Saxony was divided into two duchies, those of Wittenberg and Lauenburg, and there were similar divisions in the less important States It was thus practically settled that the offices and territories, as well as the private fiefs, of the princes were hereditary, to be disposed of by them at their pleasure The process of division and subdivision which steadily went on broke up Germany into a multitude of principalities

Rudolph of Habsburg.—The end of the interregnum was brought about by the pope, who realized the necessity for some central power which could protect the interests of the Church in Germany In Sept 1273, at the instigation of Pope Gregory X, the electors raised to the throne a Swabian noble, Rudolph, count of Habsburg The situation on the eastern border was critical, owing to the power and aggressive policy of Ottakar II, king of Bohemia (*q v*) The victory won by Rudolph over Ottakar at Durnkrut (Aug 1278) for a time saved eastern Germany from disintegration By the annexation of all Ottakar's possessions except Bohemia, Rudolph became one of the chief territorial princes in the empire, and his energies were largely spent in providing for the interests of the family of which he was the head He has often been called the restorer of the German kingdom, but he has little real claim to this title He had all the sympathies and prejudices of the noble class, and his policy of territorial aggrandizement was perhaps justified by the condition of the German kingdom, the ruler of which had little strength save that which he derived from his hereditary lands Four years after the fall of Ottakar Rudolph obtained from the princes a reluctant assent to the granting of Austria, Styria and Carniola to his own sons, Rudolph and Albert In 1286 Carinthia was given to Meinhard, count of Tirol, on condition that when his male line became extinct it should pass to the Habsburgs If Rudolph was not the restorer of the empire, he was the real founder of the house of Habsburg

On Rudolph's death the electors, fearing the new power which

he had founded, passed over his son Albert and elected Adolph, count of Nassau (July 1291). Like his predecessor, Adolph wished to secure an extensive territory for his family. Meissen, which he claimed as a vacant fief of the empire, and Thuringia, which he bought from the landgrave Albert II, seemed to offer a favourable field for this undertaking, and he spent a large part of his short reign in a futile attempt to carry out his plan. Naturally he sought to isolate Albert of Habsburg, who was treating with Philip of France, and this led to an alliance with Edward I of England. But many of the princes were disgusted with him and at Mainz in June 1298 he was declared deposed He resisted the sentence, but Albert of Habsburg, who had been chosen his successor, marched against him, and in July 1298, at Gollheim near Worms, he was defeated and killed

After Adolph's death Albert was again chosen German king, and was crowned at Aix-la-Chapelle in Aug 1298 Like his father Rudolph, the new king made it the principal object of his reign to increase the power of his house, but he failed in his attempt to add Bohemia and Thuringia to the hereditary lands of the Habsburgs, and he was equally unsuccessful in his endeavour to seize the countries of Holland and Zealand as vacant fiefs of the empire In other directions he was more fortunate He recovered some of the lost crown lands and sought to abolish new and unauthorized tolls on the Rhine, he encouraged the towns and took measures to repress private war, he befriended the serfs and protected the persecuted Jews His greatest danger came from a league which was formed against him in 1300 by the four Rhenish electors, who disliked his foreign policy and resented his action with regard to the tolls Albert, however, supported by the towns, was victorious, and the revolting electors soon made their peace

After Albert's murder in May 1308, Henry, count of Luxembourg, a brother of Baldwin (1307–1354), archbishop of Trier, became king as Henry VII Although fortunate enough to obtain for his son John the crown of Bohemia, the aggrandizement of his family was not the main object of this remarkable sovereign, the last German king of the old, ambitious type His interest was not in his territory but in the empire, from the beginning of his reign he looked forward to securing the Lombard and imperial crowns His purpose to cross the Alps at the head of a great force was hailed with delight by the Ghibellines, whose aspirations found utterance in Dante's noble prose, but his life was too short for him to fulfil the hopes of his friends In the autumn of 1310 he went to Italy, and remained there until his death in Aug 1313 As in former times, the Italian interests of the emperor meant a weakening of royal authority in Germany and Henry's expedition produced some of the difficulties which confronted his successor, Louis of Wittelsbach

Louis IV.—His son, John king of Bohemia, was under age in 1313 After a year's delay there was a double election to the empire when the larger party chose Louis IV, duke of Upper Bavaria, and the smaller party chose Frederick, duke of Austria, the son of the emperor Albert I After a war of eight years, Frederick was defeated at Muhldorf in Sept 1322 The success of Louis was to some extent due to the imperial cities, which supported him from the first. But he was perhaps still more indebted for his victory to the outbreak of war between the Swiss and the Habsburgs The position of the Habsburg family was sensibly weakened by the defeat of Leopold of Austria at Morgarten in 1315, and thus this struggle for freedom, although belonging properly to the history of Switzerland, exercised much influence on the course of German history The long reign of Louis has a distinctive character owing to a conflict with the papacy which lasted until the emperor's death. The nature of the struggle is described in the article PAPACY Here it need only be noted that Louis, unlike earlier emperors, was supported by the great body of the German princes, lay and ecclesiastical, in his resistance to the papal claim to supremacy In asserting the independence of the empire he could rely on a national feeling which was intensified by the general opinion that the pope, now established at Avignon, was using his position in the interest of the French Crown. The most significant incident in the struggle is the definite assertion by the diet at Frankfurt in 1338 that the imperial power proceeded from God alone and that an emperor, duly elected, needed no papal confirmation. For the moment, it seemed as if the new national consciousness of Germany might find expression in the empire Nevertheless the reign of Louis was not marked by any serious attempt at centralization Louis, like the Habsburg emperors before him, put the interests of his house before other considerations, and before the end of his reign his family policy had brought a majority of the princes into opposition to him In July 1346, five of the electors met, and, having declared Louis deposed, they raised John's son Charles, margrave of Moravia, to the German throne For a time no serious steps were taken against Louis, but after King John had met his death at Crécy Charles, who succeeded him as king of Bohemia, began to make vigorous preparations for war, and only the sudden death of the emperor (Oct 1347) saved Germany from civil strife

In 1349 Charles of Moravia, son of King John of Bohemia, obtained recognition as king of the Romans His reign is important in the history of Bohemia (*q v*) In the empire his chief achievement was the issue of the Golden Bull (*q v*) Apart from this, the true interest of the reign lies in the movements beyond the range of the emperor's influence It is significant that at this time the *Femgerichte*, or Fehmic Courts (*q v*), vastly extended the sphere of their activities, and that in the absence of a strong central authority they were respected as a check upon the lawlessness of the princes The cities, notwithstanding every kind of discouragement, formed new associations for mutual defence or strengthened those which already existed The Hanseatic League carried on a successful war with Valdemar, king of Denmark, and his ally, the king of Norway, while its commerce extended to nearly all parts of the known world In 1376 some Swabian towns formed a league which, in spite of the imperial prohibition, soon became powerful in south-west Germany and defeated the forces of the count of Wurttemberg at Reutlingen in May 1377 Meanwhile, the emperor who, unlike his predecessor, avoided conflict with either the papacy or the princes, was steadily increasing the power of his house When he died in Nov 1378, he wore the crowns of the empire, of Germany, of Bohemia, of Lombardy and of Burgundy; he had added Lower Lusatia and parts of Silesia to Bohemia, he had secured the mark of Brandenburg for his son Wenzel in 1373; and he had bought part of the Upper Palatinate

After the death of Charles, his son Wenzel, who had been crowned German king in July 1376, was recognized by the princes as their ruler His reign is marked by a confused struggle between the German towns and princes in which the emperor was unable or unwilling to take any consistent part In the struggle the towns were driven to form associations for mutual support, which anticipate the greater town leagues of the next century (*see* SWABIAN LEAGUE)

Towards the close of the century the discontent felt at the incompetent and absent German king took a decided form The movement was led by the four Rhenish electors, and after some preliminary proceedings these princes met in Aug 1400, having declared Wenzel dethroned they chose one of their number, the elector palatine Rupert III, in his stead Rupert was an excellent elector, and under more favourable circumstances would have made a good king, but so serious were the jealousies and divisions in the kingdom that he found little scope for his energies outside the Palatinate Having secured a certain amount of recognition in the south and west of Germany, the new king turned aside from the pressing problems of government and in 1401 made a futile attempt to reach Rome After his return to Germany he had to face the hostility of many of the princes, and this contest, together with vain attempts to restore order, occupied him until his death in May 1410

Sigismund.—His successor, Sigismund, king of Hungary, is the most interesting figure among the emperors of the later middle ages He played a part in all the movements of his time—the crusade against the Turks, the reform of the Church, the creation of territorial principalities in Germany The religious rising in Bohemia which developed into the Hussite war (*see* HUSSITES)

distracted Sigismund's attention from Germany, into which the war often extended It was an unfortunate distraction, for Sigismund had many of the qualities of a radical reformer, and under other circumstances would have done much to adapt the imperial constitution to the conditions of his time As it was, the part which he played in the history of the council of Constance gave to the empire a prestige which had not belonged to it since the interregnum. In all his plans for the well-being of the empire Sigismund relied on the support of Frederick of Hohenzollern, burgrave of Nuremberg, and made a permanent impression on German history by establishing his ally in the mark of Brandenburg (1415). But the persistent opposition within Germany to any schemes of imperial centralization compelled Sigismund to concentrate on his territorial interests, and his historical importance lies in the fact that he is the real creator of the dominion which when inherited by the house of Habsburg, gave a new significance to the imperial title

Sigismund, who died in Dec 1437, was succeeded on the German throne and also in Hungary and Bohemia by his son-in-law Albert of Austria, and from his time, although remaining in theory elective, the German crown was always conferred upon a member of the house of Habsburg until the extinction of its male line in 1740 The reign of Albert II. was short Like the electors he observed neutrality in the dispute between the council of Basle and Pope Eugenius IV., and he put forward a scheme to improve the administration of justice He died in Oct 1439, and was succeeded by his kinsman Frederick, duke of Styria, who in 1452 was crowned at Rome as the emperor Frederick III

The importance of Frederick's reign lies in the steady disintegration of Germany In the west, the dukes of Burgundy were steadily consolidating their dominion at the expense of the empire, and the Swiss were achieving virtual independence In the east the Teutonic order was losing ground against the Poles, and in the north Schleswig and Holstein fell under Danish rule In Germany itself the greater families such as the Hohenzollerns and Wittelsbachs were turning their possessions into territorial principalities and Frederick himself followed their example Despite all discouragements, he foresaw the great destiny which lay before his house, and he did much to turn his dreams into reality by securing the marriage of his son Maximilian with the heiress of the Burgundian dukes To this obscure emperor the later Habsburgs owed the territories on the western border of Germany which gave them for centuries a unique influence in European politics

Maximilian I.—Maximilian, Frederick's son, came to the throne in 1486 with exceptional advantages He was heir to the extensive Austrian lands, and as the widowed husband of Charles the Bold's daughter Mary he administered the Netherlands Although he soon gave up these provinces to his son Philip, the fact that they were in the possession of his family added to his influence, and this was further increased when Philip married Joanna, the heiress of the Spanish kingdoms From Maximilian's accession the empire exercised in the affairs of Europe an authority which had not belonged to it for centuries

The reign of Maximilian I is important in many ways The emperor himself is an interesting figure, erratic and ambitious, but intelligent, and fully aware of the contrast between his imperial position and his actual resources His reign coincides with a strong movement among the princes for constitutional reform, led from within the electoral college by Bertold, archbishop of Mainz. Maximilian, in fact, was the first emperor to be confronted with a constitutional programme Naturally he had no sympathy with the limitation of imperial authority implied by the plan proposed by Bertold and his adherents Nevertheless the changes which were made in his time had great influence on the later imperial constitution (*see* EMPIRE, DIET; IMPERIAL CHAMBER) and in a sense the modern history of the empire begins with him. In the history of Germany his importance lies in his resistance to the French claim to the provinces which had formed part of the Burgundian dominion In this he was only carrying out his father's dynastic policy, and he had little support from other German princes Few at the time realized that the integrity of Germany was at stake in the struggle which Maximilian maintained with very slender resources.

In many respects the reign of Maximilian must be regarded as the end of the middle ages The feudal relation between the king and the princes and between the princes and their vassals had become purely nominal No real control was exerted by the Crown over the heads of the various States, and, now that war was carried on mainly by mercenary troops, the mediate nobles did not hold their lands on condition of military service The princes were sovereigns, not merely feudal lords, and by the institution of local diets in their territories an approach was made to modern conceptions of government The age of war was far indeed from being over, but men were at least beginning to see that unnecessary bloodshed is an evil, and that the true outlet for the mass of human energies is not conflict but industry. By the growth of the cities in social, if not in political, importance the products of labour were more and more widely diffused, and it was easier than at any previous time for the nation to be moved by common ideas and impulses Many causes contributed to effect a radical change in the point of view from which the world was regarded; and the strongest of all mediaeval relations, that of the nation to the Church, was about to pass through the fiery trial of the Reformation This vast movement in the later years of Maximilian definitely severed the mediaeval from the modern world.

The Reformation.—The seeds of the Reformation were laid during the time of the great conflict between the papacy and the empire During the struggle of Louis IV. with the popes of his day the feeling revived with fresh intensity At the same time the spiritual teaching of the mystics awakened in many minds an aspiration which the Church, in its corrupt state, could not satisfy, and which was in any case unfavourable to an external authority The Hussite movement further weakened the spell of the Church Still more powerful, because touching other elements of human nature and affecting a more important class, was the influence of the Renaissance, which, towards the end of the 15th century, passed from Italy to the universities of Germany The men of the new learning did not sever themselves from Christianity, but they became indifferent to it, its conceptions seemed to them dim and faded, while there was a constantly increasing charm in literature, in philosophy and in art No kind of effort was made by the Church to prepare for the storm At last Leo X, by his incessant demands for money and his unscrupulous methods of obtaining it, awakened universal hostility

The popular feeling for the first time found expression when Luther, on All Saints' day 1517, nailed to a church door in Wittenberg the theses in which he contested the doctrine which lay at the root of the scandalous traffic in indulgences carried on in the pope's name by Tetzel and his like This episode, derided at first at Rome as the act of an obscure Augustinian friar intent on scoring a point in a scholastic disputation, was in reality an event of vast significance, for it brought to the front, as the exponent of the national sentiment, one of the mightiest spirits whom Germany has produced Under the influence of Luther's strong personality the most active and progressive elements of the nation were soon in more or less open antagonism to the papacy

(J W. H ; W.A P.; X.)

HISTORY FROM 1519 TO 1648

Charles V.—Maximilian died in Jan 1519. After a long contest for the succession between his grandson, Charles I of Spain and Francis I of France, the former was elected in June, 1520, and in the following October was crowned at Aachen as the Emperor Charles V. The religious conflict had reached a critical stage, the bull of excommunication against Luther having just been published in Germany. Some of the Reformers cherished a hope that the new emperor's policy might be to act as a mediator for peace, not unfavourable to their leader. But though Charles showed later that he would not hesitate to oppose the pope in the sphere of politics, he held that he owed him entire allegiance in that of faith, and the protection of the Church had always been regarded as a chief function of the emperors Moreover the peoples under his direct sway were adherents of the old faith. He was king of Spain, Naples, Sicily and Sardinia, lord of the

Netherlands, the county of Burgundy and the Austrian archduchies and of the new lands beyond the Atlantic—by far the most important ruler of his time. He hoped to add north Italy to his dominions, and this was another motive for standing well with the Holy See. It was not surprising therefore that at the diet of Worms, in Jan., 1521, he issued the edict drawn up by Cardinal Aleandro denouncing the reformer. This was accepted by the diet, and Luther was placed under the ban of the empire.

At his election Charles had been required to accept a *Wahlkapitulation* (electoral agreement) embodying the conditions on which he was to receive the crown—a precedent followed at subsequent elections. This was confirmed by the diet. Charles, regarded as a foreigner by the princes, undertook to respect the freedom of Germany, use the German language and convene the diets on German soil. He was not to bring foreign troops into Germany or place German troops under foreign command. An administrative council, the *Reichsregiment* (State board of control) was to be set up, and after some debate between Charles and the princes it was settled that it should consist of 22 members with a president nominated by the sovereign. It was to govern Germany in his absence; at other times its functions would be only advisory. There was an undertaking to aid the emperor by raising and paying an army. In April, 1521, Charles invested his brother Ferdinand (afterwards emperor) with the Austrian archduchies and then left Germany to deal with disturbances in Spain and renew his struggle with Francis I.

The Civil Wars.—Serious trouble arose in his absence, making Germany the scene of civil wars. There the *Ritterschaft*, the knighthood of the empire, were a discontented class, which had suffered by the substitution of Roman law for the old feudal law, under which they were tenants-in-chief of the crown. They had now no share in government, and the suppression of private wars had deprived them of active employment. Two of their leaders, Ulrich von Hutten and Franz von Sickingen, had become supporters of Luther, hoping the coming changes in Germany would improve their position. Hutten held that there could be no reform in church and state while the country was divided into a number of small princedoms, and he planned a revolution to be effected with the help of Sickingen, who had got together a small army, with which in Aug., 1522, he besieged Trier (Treves), the city of a prince archbishop and elector of the empire. The place made a good defence, and on the approach of an army levied by the princes the siege was abandoned. The revolt ended with the defeat and death of Sickingen at Landshut in May, 1523. Hutten, broken in health, took refuge in Switzerland, where he died a few weeks later. Luther and his friends had stood apart from the movement, though the knights had proclaimed the freedom of Germany from papal influence as one of their aims.

A more serious revolt was the rising in south and central Germany known as the Peasants' War (*Bauernkrieg*). The small farmers and peasants had real grievances, partly the outcome of changing economic conditions, but largely of the grasping policy of the princes and great landowners. Like the knights, they had lost many of their traditional feudal privileges by the introduction of the new system of Roman law. In many districts there were obstacles to migration and re-settlement which led to their small holdings being subdivided till, with an increasing population, they became too small to support a peasant family. Since 1461 there had been a recurrence of minor local outbreaks. The first movements of a rising on a wide scale took place in 1522 while the revolt of the knights was still in progress. As in former movements the standard of revolt was the *Bundschuh*, a peasant's clog upon a pole. As the rising spread many knights and adventurers joined the peasants, and they found friends among the poorer workers of the towns. A new feature of the revolt was that the rebels put forward a religious as well as a social programme, one of their claims being that each village should elect its pastor. There were appeals also to scriptural prophecies interpreted to predict the coming of a new era of freedom and prosperity. Some of the lords granted the more moderate claims of the peasants, amongst these peace-makers being the elector palatine, the bishops of Bamberg and Speyer and the abbots of Fulda and Hersfeld. Luther wrote a pamphlet warning the princes that their oppression had caused the rising, and that the reasonable claims of the peasants should be granted, but telling the latter that their grievances did not justify their violence, and they should negotiate for peace. Meanwhile the rising spread along the Rhine and across the Main into Thuringia. It was not till the summer of 1525 that the war ended, and ended in disaster for the rebels. After their first successes they had indulged in reckless outrages on life and property, and the princes, when their forces got the upper hand, wreaked a ferocious vengeance on them. Luther encouraged these reprisals in a pamphlet "On the Murderous Peasant Hordes," urging that the rebels deserved no mercy.

Rival Forces in the Diets.—During the civil wars the *Reichsregiment* had proved an inefficient organ of government, soon to disappear from German history. Meeting at Nuremberg in 1522, it had voted supplies for defence against the Turks, but many of the cities resisted its levy of taxes, and on an appeal to Charles its scheme was vetoed. It had left to a group of princes the suppression of the revolts. It had declined to enforce the edict of Worms, and a new meeting of the diet only ventured to direct that it should be enforced "if possible." The party of the reformers was gaining ground and had the support of several of the princes. There was much secularization of church property, suppression of monasteries and the introduction of the Lutheran service in numerous churches. A notable event of 1525 was the action of Albert of Hohenzollern, grand master of the Teutonic order, who, supported by most of its knights, declared for Luther, secularized the property of the order and made himself the personal ruler of its territory between Poland and the Baltic—a first step towards the building up of the future Prussian kingdom. All over Germany men were falling into line on one side or the other of the religious conflict. Charles vetoed a proposal for a national assembly to decide the questions at issue. The Catholics under the archduke Ferdinand and Cardinal Campeggio met at Regensburg to concert measures against Lutheranism, while on the other side assemblies at Speyer and Ulm declared their intention of forwarding the teaching of the new doctrines. In 1525 the Catholic princes formed a defensive league at Dessau, and the reformer princes took a similar step next year at Gotha.

In the diet that met at Speyer in June 1526 the reformers were the stronger party. A message from Charles in Spain, calling on the diet to forbid innovations and enforce the edict of Worms, was rejected, on the ground that when the emperor wrote it, three months earlier, he and the pope were at peace, but were now at war. The diet decreed that pending a national council each prince should regulate the religious affairs of his own dominions. After this wherever the reformers were in power—notably in Saxony, Brandenburg, Hesse and the Palatinate, and in Strassburg, Nurnberg, Ulm and Augsburg—the religious changes went forward. But when the diet met again three years later at Speyer under the presidency of the archduke Ferdinand, the Catholic party was stronger, and a message from Charles required the repeal of the decree of 1526. But the Catholics were anxious for a truce, and with the approval of Melanchthon, who was also striving for peace, secured the adoption of a decree that until a Council met the reformers should abstain from further changes, but that in their states the Catholic minority should have freedom to practise their religion. Philip of Hesse with four other princes and the delegates of several cities protested against any limitation of their powers, and declared their resolve to disobey the decree. Melanchthon wrote of this rejection of the *modus vivendi* as "a terrible affair." The protest was the origin of the new name of "Protestant," soon applied to and accepted by the reformers.

Charles V., having this year made peace with the Pope and Francis I., was crowned by Clement VII., at Bologna in Feb. 1530, and then went to Germany to make a personal effort to settle its troubles. The Protestant forces were now divided by the conflict between the Lutherans and the followers of the Swiss reformer Zwingli, whose influence extended to the south German cities. In June, 1530, the diet was convoked at Augsburg. By the emperor's invitation, as a basis for discussing a religious peace, the Lutherans presented a statement of their position, drawn up by Melanchthon, its articles accentuating points of agreement with the Catholics and dealing cautiously, and even vaguely, with

points of controversy. It is known as the "Confession of Augsburg," and forms still the confession of faith of the Lutheran Evangelical Church. It led to long debates which ended, as was to be expected, in failure to effect an agreement Four of the Zwinglian cities at once protested against it Numbers of the Lutherans themselves denounced its guarded statements A conference between Catholic and Lutheran theologians only accentuated points of vital difference Several of the Lutheran princes and their friends left Augsburg In November the diet ended with a decree issued by Charles giving the Lutherans till the following April, to reconsider their position, calling for submission to a settlement, and leaving it to the imperial courts to insist on the restoration of confiscated Church property, and referring to the hope of a final peace being effected by a General Council

In Jan. 1531 at Cologne Charles secured the election of his brother, the archduke Ferdinand, to the dignity of king of the Romans, which implied succession to the empire Meanwhile Ferdinand would act as his representative in Germany instead of the discredited *Reichsregiment*. In April the Lutheran leaders formed at Schmalkalden in Hesse the defensive alliance known as the "League of Smalkald," which was joined by nine princes and eleven cities. It entered into relations with Denmark, the Zwinglians of Switzerland and the emperor's rival Francis I Tension with France and the Turkish peril made the emperor hesitate to go to extremes The latter danger was serious The Turks had conquered Serbia and overrun Hungary, and only an outbreak of pestilence in their army had saved Vienna Early in 1532 the emperor convoked a diet at Regensburg The Lutherans absented themselves, and though the Catholics voted supplies for the Turkish war they opposed the emperor's policy of concessions to their opponents Charles then entered into direct negotiations with the Protestant princes, which resulted in July in "the peace of Nuremberg," granting temporary toleration to the Lutherans, which was renewed in the following years His reward was immediate and substantial His subjects vied with each other in hurrying soldiers to his standard and the advancing Turkish army was soon in full retreat

Internal Affairs of Germany.—Protestantism now made considerable progress especially in Anhalt and Pomerania, and thanks chiefly to the energy of Philip of Hesse, and the support of Francis I., the Lutheran claimant to Wurttemberg, Duke Ulrich, was forcibly restored to his duchy Ferdinand found himself obliged to recognise the restoration and to promise that he would stop all proceedings of the imperial courts against the members of the Smalkald League. Other events were less favourable to the supporters of the new religion The mad outbreak of the fanatical Anabaptists at Munster, though suppressed, caused widespread alarm, and there was an abortive attempt at a revolution by the extremists at Lubeck. A renewal of the war between the empire and France in 1536 was followed by an enlargement of the League of Smalkald and its prolongation for ten years Amongst its new members was Christian III of Denmark. About the same time Bucer arranged the friendly agreement between the Lutherans and Zwinglians, known as the concord of Wittemberg (May 1536). Thus strengthened the Protestant princes declared against the proposed General Council at Mantua. In June 1538 the Catholic princes formed a new defensive alliance, the League of Nuremberg, but though he had made a truce with France in this same month Charles was more conciliatory towards the Protestant princes than some of his supporters, and in April, 1539 he came to terms with them, without, however, granting all their demands This year the Lutheran Prince Henry succeeded his Catholic brother as duke of Saxony Ducal and electoral Saxony were thus won to the Protestant party, and with its gains under the elector Joachim II in Brandenburg, it was now practically dominant throughout North Germany

In 1542 Charles was again involved in war with both France and Turkey, and the League of Smalkald took advantage of his troubles to expel its opponent Henry, duke of Brunswick-Wolfenbüttel, from his duchy and establish Protestantism therein The citizens of Regensburg declared for Lutheranism, and Hermann von Wied, prince archbishop of Cologne, and William, duke of Gelderland, announced their secession from Rome. The Protestants were now at the height of their power, but their ascendancy was soon to be destroyed more by their own division and the folly and imprudence of their leaders than by the skill and valour of their foes The unity and power of the League of Smalkald was undermined by dissensions between John Frederick, the ruler of electoral Saxony, and Maurice, who had succeeded Henry in ducal Saxony, and the bigamy of Philip of Hesse, carried through under a dispensation signed by Luther and several of his colleagues, made him many enemies and endangered his legal status, so that in June 1541 he saved himself by coming to terms with the emperor. Thus the League lost its most important leader. In 1543 it looked on helplessly while Charles crushed Duke William of Gelderland and added his duchies to the lands of the Habsburgs. Charles, however, hesitated to make a general attack on the Protestants, and in accordance with the promises made in 1539 at Frankfurt, arranged conferences between the two religious parties, which, however, gave no result The diets held at Regensburg and Nuremberg failed to give any solution of the religious question, and made grudging votes for the war; but at the diet of Speyer in 1544 lavish promises to the Protestants obtained supplies with which a new army was placed in the field In September of that year Charles concluded the treaty of Crépy with Francis I. and had his hands free to deal with the affairs of Germany

Victory of Charles.—Charles was influenced by political even more than religious considerations He regarded Protestantism as a movement that had divided and disorganised Germany, and endangered both the system of the empire and the supremacy of the Habsburgs He now meant to break up the League, and at the same time use his influence for the convocation of a General Council, which would deal with the abuses of discipline that had weakened the Catholic Church Pope Paul III , not without hesitation, summoned the Council which met at Trent in Dec 1545, and Charles prepared for war He made peace with Turkey, and secured the neutrality of Bavaria and the support of Maurice of Saxony He detached from the League those who were too timid or too lacking in zeal to face a conflict Meanwhile its members were divided in policy, and neglected war preparations in the hope that another religious truce would be patched up Luther, lamenting in his last days the Protestant divisions, died at Eisleben on Feb 18, 1546 It was not till the diet met at Regensburg in June that a group of the Protestant princes, headed by Philip of Hesse, and John Frederick, the ruler of electoral Saxony realised the peril and at last began preparations for defence In July they were placed under the ban of the empire and war began in the south Charles had brought reinforcements from Italy and the Netherlands Several cities, with Ulrich of Wurttemberg and the elector Palatine submitted to him The Leaguers were forced northwards from Saxony along the Elbe valley At Muhlberg on April 24, 1547, Charles forced the crossing of the Elbe with hardly a show of resistance, and scattered the army of the League John Frederick was taken prisoner and Philip of Hesse soon after surrendered

Maurice was rewarded by the Saxon electorate being added to his duchy, more than one of the Lutheran princes hastened to court the conqueror's good will, and Charles met the diet at Augsburg in Sept 1547 confident in his power to remodel German affairs.

But his over-confidence led to mistakes of policy. The princes evaded his chief demands by prolonged debate, and were soon encouraged by news that he was quarrelling with the pope over the proposed removal of the Council from Trent (in the empire) to Bologna (in the Papal States) Charles imagined he could settle the religious question himself. He proposed the acceptance of a compromise set forth in a decree known as the "Interim," as it was to be in force till the decisions of the Council were known His critics, both Protestant and Catholic, spoke of it as "the Interim religion " Only a minority of both parties were ready to accept it He did not satisfy either earnest Lutherans or orthodox Catholics, by slurring over points of difference in vague formulae.

Revolt of Maurice of Saxony.—Maurice of Saxony began

to prepare to change sides once more. He built up a secret alliance with several of the Lutheran princes and obtained promises of help from Henry II. of France, with whom a secret treaty was signed in Jan. 1552. Charles was off his guard when the storm suddenly burst in March. Henry II invaded Western Germany, declaring he came as the defender of German freedom Maurice seized Augsburg, and with his friends marched on Innsbruck, where the emperor was residing Charles fled across the Brenner, and in May negotiations were opened with the revolted confederates, and by July the peace of Passau was arranged. Charles set at liberty John Frederick and Philip of Hesse, and agreed that the Lutherans should have full religious liberty

Maurice then went to help Ferdinand against the Turks, but his ally, Henry II of France, continued the war against Germany He had seized Metz, and Charles failed in an attempt to recover it Another of Maurice's allies, Albert of Brandenburg, after "living on the country" in Franconia, was for awhile with the emperor's army against France, and then resumed his bandit raids, which became such a terror that a league of the princes, formed by Maurice, united in driving him out of Germany Maurice lost his life in this campaign

The Peace of Augsburg.—In Feb 1555 the diet met at Augsburg to settle a final peace on the general basis of the treaty of Passau Ferdinand presided for his brother It was agreed that Catholics and Lutherans should be placed on an equal footing in the empire but Calvinists were excluded by both parties from this settlement The Lutherans were to retain all church property they held at the date of the peace of Passau But the peace of Augsburg did not really establish either religious freedom or individual toleration The principle of State supremacy—*cuius regio eius religio*—was accepted

The treaty was published in Sept 1555 Charles had left the settlement entirely to his brother His health was failing, he was tired of the troubled affairs of Germany, and anxious chiefly to consolidate his Spanish dominions in the hands of his son Philip (now the husband of Mary Tudor) He abdicated, in January 1556, entrusting Spain, the Netherlands and his oversea empire to Philip, while Ferdinand took over the conduct of German affairs, though it was not until after the death of Charles (1558) that he was formally installed as emperor

Ferdinand I.—During his short reign Ferdinand I devoted himself to enforcing the peace of Augsburg War with the Turks went on till 1562, and he had to deal with local troubles in Hungary, Bohemia and north Germany Efforts were made, with no result, to compose the growing differences among the Protestants In his Catholic dominions he supported the reforms decreed at Trent in matters of ecclesiastical discipline The Catholics were now gaining ground thanks largely to the reforms in clerical training ordered by the Council, and the missionary and educational work of the Jesuits Before Ferdinand died in July 1564 the Counter-Reformation had begun Some changes had been introduced in the empire Lutherans now sat among the judges in the imperial courts, and the Aulic Council or *Hofrat*, established by Maximilian I for the Austrian lands, extended its authority over the empire and was known as the *Reichshofrat*

Ferdinand's son and successor, Maximilian II (1564–1576), was a man of tolerant views, had even been at one time suspected of an inclination to Lutheranism. He secured his election by a declaration of fidelity to the old faith, but for awhile cherished optimistic but misleading dreams of effecting a peaceful religious reunion in Germany His first diet at Augsburg in 1566 gave no encouragement to these hopes The Catholics stood firmly for the decrees of Trent, and the Protestants gave new proof of their divisions by an attempt to exclude the Calvinist prince palatine, Frederick II from the advantages of the peace of Augsburg This led to Frederick and the Calvinists entering into closer relations with France and the Dutch Netherlands, while the Lutherans, now led by Augustus of Saxony, courted the friendship of the emperor But even they were divided, while the Catholics were still gaining ground Albert of Bavaria boasted that without force or strife most of his people had been won to the Catholic cause The emperor now abandoned his reunion projects and was for awhile occupied with a Turkish campaign The new diet at Speyer in 1570 was chiefly engaged in debates on the abuses resulting from the enlistment of Germans by foreign agents as mercenaries, but nothing practical was done It is to Maximilian's credit that he tried to mediate between his cousin Philip II. and the revolted Netherlands He was engaged in negotiations with a Polish party, which wished to elect him as King of Poland, when he died in October 1576

Rudolph II.—He was succeeded by his son Rudolph II. (1576–1612) The drift of events during his long reign can be explained by noting as the chief factors the growing strength of the Catholics, not only in the Habsburg territories but also in south Germany and wide tracts of the Rhineland and Westphalia; the efforts of the Protestant leaders, now no longer prominent divines but politicians and princes, to obviate the divisions that weakened them, by sinking sectarian differences in a common alliance against the house of Habsburg, which they regarded as the chief protector of the Counter Reformation, finally the formation of opposing Catholic and Protestant leagues—the prelude to the Thirty Years' War The first effort at a Protestant union was made in the very month of Rudolph's accession (Oct. 1576), when Augustus of Saxony drew up a moderately worded Lutheran profession of faith, the *Formula Concordiae*, which was accepted by a large number of princes and cities; but an influential minority refused it, and it only accentuated existing divisions In the years that followed the Catholics secured not a few successes. An immigration of refugees from the Netherlands into north-west Germany led to troubles, and the local Catholic government was driven from Aachen in 1581. The *Reichshofrat* declared the movement a rebellion, but it was not till 1598 that Protestant worship was abolished at Aachen and the Catholic government restored At Cologne in 1582 the prince archbishop, Gebhard von Truchsess, became a Calvinist, married and declared his intention to retain both his see and its territory He was placed under the ban of the empire, and numbers of his subjects took up arms against him, aided by troops from Bavaria This local conflict, the "War of Cologne," lasted for nearly five years The Protestant princes stood neutral except John Casimir, a zealous Calvinist, with some military experience, who was acting as regent of the palatinate in the minority of his nephew He gave some help to Gebhard, who was finally driven from his see and took refuge at Strassburg, where he instigated an unsuccessful rebellion Meanwhile the Catholics succeeded in establishing their faith in several of the dioceses they had lost

After the death of Augustus of Saxony there was another brief alliance of the Protestant princes, under the leadership of his successor Christian I and of John Casimir An opposition party was organised in the diet, but with little practical result, and the deaths of the two leaders in 1591–92 put an end to the alliance between Lutherans and Calvinists for a time. But in the diets held at Regensburg in 1593 the Protestant princes drew together Under the leadership of Christian prince of Anhalt they put forward demands for new concessions and in the latter assembly tried to hinder or delay the payment of subsidies for a new war with Turkey In 1598 they advanced a theory that in the diet the decisions of a majority did not bind the minority, and in the diet of 1603 they asserted the same position, protested against various decisions of the *Reichshofrat* and finally withdrew from the diet in a body The war with Turkey lasted from 1593 to 1606, when peace was negotiated not by the emperor but by his brother Matthias, who, on account of Rudolph suffering from attacks of mental failure, had been declared head of the house of Habsburg Rudolph resented this indignity and his relations with his brother were strained till his death in January 1612

During the latter years of his reign the leader of the Catholic party in Germany was Maximilian, the duke of Bavaria In 1607 he was given an imperial mandate to deal with a religious riot in the free city of Donauworth, and after suppressing it retained the city under his government Alarmed by this arbitrary act, the Protestant princes formed, in 1608, the Evangelical Union, and in response the Catholics, led by Maximilian, united in a similar confederation, afterwards known as the Catholic League. As the

Union was headed by the Calvinist elector palatine, Frederick IV., many of the Lutherans were slack in supporting it, but it became very important by an alliance with Henry IV. of France, who was ready to profit by German quarrels and was interfering in a disputed accession to the duchies of Cleves and Julich. War between the two confederations on this question seemed imminent, but after the murder of Henry IV in May 1610, the Union did not venture to fight

The Thirty Years' War.—Rudolph II. was succeeded by his brother Matthias (1612–19). He had no children, and the Habsburgs selected as his heir the archduke Ferdinand of Styria During the brief reign of Matthias the Union and the League jealously watched each other It was a time of dangerous tension Matthias died in March 1619, and in the following August the Habsburg archduke of Styria obtained the imperial crown as Ferdinand II (1619–37) He had already practically eradicated Protestantism in his archduchy, and was determined to secure the triumph of his church in the empire On his accession he found himself faced with troubles, troubles in his hereditary dominions, and a serious crisis in Bohemia, the conflict which was the first phase of the Thirty Years' War Its beginning is usually dated from the revolt of the Protestant nobles in Bohemia in 1618 There had since the days of Huss been a strong party in the kingdom opposed both to Rome and Vienna When Ferdinand's accession was announced, the revolted Bohemians refused to acknowledge him and elected as their king, the elector palatine, Frederick V, a son-in-law of James I of England Ferdinand, on both dynastic and religious grounds, was determined to subdue the Bohemians At first troubles in his other hereditary states made it difficult to take decisive action But Spain promised help by invading the Palatinate, and early in 1620 it was arranged that Maximilian of Bavaria should send the army of the League under the famous Tilly to assist the emperor Frederick received little help from the Protestant princes, most of the Lutherans disliking the alliance with a Calvinist leader He had hoped for English support, but James I. went no further than allowing volunteers under Vere to take part in defending the Palatinate Tilly marched into Bohemia and on November 8, 1620, routed Frederick's army in the decisive battle of the Weissenberg (the White Hill) near Prague. Frederick fled only to find Spinola's Spanish veterans and a Bavarian force overrunning the Palatinate, so that he was obliged to leave Germany His hereditary lands were declared forfeit, and handed over to Maximilian. The war died down into mere desultory fighting against Frederick's only remaining adherents, Christian of Brunswick and Count Mansfeld

The war blazed up again on a larger scale in 1625 The emperor's successes and the rising power of Maximilian of Bavaria alarmed the Lutheran princes, and a new Protestant combination was formed, of which the leading member was King Christian IV. of Denmark, who as duke of Holstein was a prince of the empire Two confederate armies were soon in the field, the princes accepting for them the leadership of King Christian and Count Mansfeld. Unwilling to depend entirely on Maximilian and the League, and unable to raise a large force of his own, Ferdinand accepted the offer of the celebrated Wallenstein to raise, equip and maintain in the field at his own cost an army of 20,000 men, mostly veteran troops, on condition that he should command them and have a free hand He was a wealthy Czech noble, who had seen service in the Turkish wars, and had a real military genius with the mentality of a soldier of fortune A Catholic, at least by profession, and serving the Catholic emperor, his levies were made up of a mixture of Catholics, Protestants and all kinds of adventurers ready to fight under any successful leader He meant to pay and supply his army by levying contributions on the country in which it operated As the war went on many of the armies in the field were not unlike Wallenstein's In April 1626 with his hard fighting mercenaries he defeated Mansfeld at Dessau, and in August Tilly with the army of the League defeated Christian of Denmark at Lutter The victors united their armies and invaded Denmark. Wallenstein now formed in union with the Spaniards an ambitious scheme for cutting off the supplies of the Netherlands and controlling those of North Germany by seizing the North sea and Baltic ports. He was only partly successful, and after five months' siege had to abandon the attempt to seize Stralsund. But Denmark was at the mercy of the imperialists, and in May 1629 had to conclude the peace of Lübeck

Intoxicated by success, Ferdinand had only two months before issued the ill-advised "edict of restitution," ordering the restoration of all ecclesiastical lands taken over by the Protestants since the peace of Passau in 1552 This stirred up widespread opposition. While it was still being debated, Maximilian and his colleagues of the Catholic League united in demanding the dismissal of Wallenstein, now duke of Friedland, governor of the conquered territories of Mecklenburg and Pomerania, and rightly suspected of dangerous personal ambitions Ferdinand had to yield just when new dangers were arising In the summer of 1630 Gustavus Adolphus of Sweden declared himself the champion of the Protestant cause in Germany, and established himself with a strong force in Pomerania How political rather than religious motives were now influencing events is shown by the fact that he had the promise of subsidies for the support of the war from the France of Cardinal Richelieu

Gustavus, probably the ablest soldier of his day, had already extended the Swedish power to several of the Baltic lands, and at first the Protestant princes were slow in uniting with him, suspecting his real object was further Swedish conquests on the Baltic shores But they soon welcomed his aid He pushed forward to the Elbe gathering strength with success He captured Frankfort-on-Oder, added the Saxon army to his own and defeated Tilly and the main army of the League at Breitenfeld near Leipzig in September 1531. Then while the Saxons won Silesia and invaded Bohemia, Gustavus marched triumphantly through Central Germany and established his headquarters at Mainz In April 1632 he invaded Bavaria; Tilly was killed in a lost battle on the Lech; and Gustavus occupied Augsburg and Munich Ferdinand now appealed to Wallenstein to take command again Wallenstein only consented on being given control of all the imperial forces and the right of making treaties and granting pardons He then drove the Saxons out of Bohemia, repulsed an attack made by Gustavus on the entrenched camp near Nuremberg, but was defeated by the Swedes at Lutzen (November 16, 1632) It was for them a costly victory, for Gustavus was killed leading a cavalry charge The crown passed to his daughter Christina, but, under the government of the Chancellor Oxenstjerna, the Swedes continued the war

In April, 1633, at Heilbronn the Swedes and their German allies agreed to arrangements for the conduct of the war The military command was divided between Bernhard, duke of Saxe-Weimar and the Swedish general Horn. France was still supplying money to the allies The war went on in the Rhine and Danube valleys, the Swedes entering Alsace and Bernhard capturing Regensburg Wallenstein showed no longer his former vigorous leadership There was enough reason for dissatisfaction to evoke a movement for his dismissal Ferdinand yielded and in January 1534 declared Wallenstein deposed from command He tried, however, to retain control of his army, but next month, as a result of a conspiracy among his officers, he was assassinated.

Commanded now by the archduke Ferdinand, king of Hungary (later the emperor Ferdinand III), the Imperialists began a successful campaign by recapturing Regensburg and Donauwörth and then, aided by Spanish troops, winning a complete victory over the Swedes and their allies at Nordlingen (Sept, 1634) The fortunes of the confederates were at a low ebb, but France presently came to their aid Richelieu signed an alliance with Sweden at Compiègne in April, 1635, and next month France declared war and put her armies in motion But by this time there was a movement for peace in Germany Men of all classes were tired of the long conflict, in which they saw their country wasted and ruined as the cockpit for contending armies which levied contributions on city, town and countryside, and whether they were friends or foes left a trail of misery in their track John George, the Lutheran elector of Saxony, took the lead in the movement, and despite Swedish opposition signed in May, 1635, the Treaty of

Prague with the emperor. The vexed question of Restitutions was settled by fixing November, 1627, as the date up to which their possession would be recognised and even later occupations were to stand for 40 years to come, during which amicable arrangements might be made. The elector agreed to assist the emperor to recover territories occupied by the Swedes, and to place the Saxon army at his disposal, receiving in return a small increase of his own dominions The elector of Brandenburg, the duke of Würtemberg and several of the cities soon adhered to the treaty.

In this last phase the war became a struggle between the Bourbon and the Habsburg interests The Swedes won some successes in north Germany but in these campaigns after France came in the important field of operations was in the west and south. The French armies on one side drove the Spaniards back in Flanders, and on the other crossed the Rhine, and under Condé and Turenne, with some help from Bernhard and the Swedish general Wrangel penetrated far into south Germany (On Bernhard's death in 1639 his army was taken over and paid by the French)

The Treaty of Westphalia.—While these operations were in progress preliminary negotiations for a general peace had already begun at Hamburg and Cologne, before the death of the emperor Ferdinand II in 1637 But it was not till Dec , 1641, that under his successor, Ferdinand III , a treaty was signed at Hamburg, by which it was agreed that peace conferences should meet at Munster and Osnabruck in March, 1642, the emperor treating with France at the former and with Sweden at the latter The Catholic princes of the empire were to be represented at Munster and the Protestants at Osnabruck The conferences did not actually begin till 1645, when the elector of Brandenburg had made, and the elector of Saxony was about to make, a truce with Sweden In three years many controversial questions were settled, with much diplomatic playing for advantages, but at last in Oct 1648 the treaty of Westphalia was signed, ending the Thirty Years' War

France gained possession of the "three bishoprics"—Metz, Verdun and Toul, with the Austrian territory in Alsace Sweden was granted Western Pomerania, Stettin, Verden and Bremen, and in virtue of this cession became a member of the empire Hanover, Brandenburg and Saxony received some increase of territory, and the Rhenish palatinate was divided between the electoral house and Bavaria Switzerland and Holland, long actually independent, were formally recognized as independent nations The German states of the empire were accorded a measure of independence by the recognition of the right to make alliances even with foreign powers, with the nominal proviso that these should not be injurious to the emperor or the empire The princes were to regulate the religious affairs of their territories, and though there was a stipulation for individual religious freedom, practically for long after in many states those who did not belong to the officially established religion were under some disabilities To the imperial diet was left the settlement of treaties and laws affecting all Germany By a compromise 1524 was fixed as the date for settling the question of the ecclesiastical lands This left to the Catholics recent gains in the Habsburg territories The general effect of the treaty was to relax the connection between the Habsburg and the other German lands The empire survived, but there was a foreshadowing of the future change when the Habsburg emperor at Vienna would be no longer emperor of a "Holy Roman Empire," but emperor of Austria But for another century and a half he was to represent the dignified tradition of some of the greatest memories of European history (A H A)

GERMANY AFTER 1648

The condition of Germany after the conclusion of the Peace of Westphalia was indeed tragic The population had decreased in the course of the Thirty Years War from about 30 millions to 20 millions; the greatest decrease was shown in the rural population on whom the hardships of the war fell heaviest, causing them to migrate in large numbers to the cities Many villages were totally deserted, and the old conditions were not completely restored until the middle of the 18th century

Agriculture was almost at a standstill; large numbers of the land workers had been killed, or enrolled as mercenaries in the armies; stock had been destroyed, and houses burnt to the ground. Without capital and credit, the peasants were reduced to utter dependence upon the great nobles and land-owners who only furnished them with the money to rebuild their houses and replenish their stock on extremely hard terms Everywhere their dues were increased and their rights of tenure diminished A peasant without capital could not hope to improve the state of his holding In consequence of the depopulation of the land the demand for agricultural produce had decreased, prices of livestock and grain had fallen and the area of land under cultivation had steadily diminished

Nor did the great landowners fare any better. They suffered in like manner with the peasants, and in order to maintain their estates were forced to raise mortgages on their properties at a high rate of interest If, in spite of these conditions the nobility succeeded for the most part in maintaining their properties, it was chiefly due to the administrations of the different States, who came to their help by declaring moratoriums or by the remission of interest By the establishment of a *Fidei-kommiss* the aristocracy sought to preserve their landed property to their families' estates, the same object prompted the prohibition of the sale of noble estates to townsmen which survived in many cases until the beginning of the 19th century The great landlords were also seldom in a position to carry out any agricultural development, and it was only gradually that a certain number of them, at the instigation of the ruling princes, began to cultivate the potato, which had been newly imported from America, and other foodcrops and to plant fruit trees and tobacco

Industry and commerce had been equally ruined by the wars The disorganization of industry had favoured the import of foreign goods; the lack of purchasing power and skilled labour made recovery difficult The country was flooded with French and English goods through the agency of the Dutch merchants The once flourishing German trade in products of industrial art had almost entirely ceased; the South German linen and cloth industry decreased and the quality too, deteriorated Official regulations were of little avail, and it was only the immigration of the French Huguenots in the second half of the 17th century that gave new life to German industry The ancient organizations of the handicraft workers, the gilds, had become rigidly occupational associations; bad trading conditions and want of capital hindered the introduction of the factory system which was already developing widely throughout western Europe German trade suffered specially from the fact that the mouths of the great German rivers were in foreign hands, the Dutch held the mouth of the Rhine; the Swedes and Danes the Weser, Elbe and Oder and the Poles the Vistula German participation in world commerce was very restricted; German merchants were confined to internal trade and were often only agents for foreign investors

Germany had been a wealthy country in the second half of the 16th century, but now money was scarce and furniture, art treasures and other valuables had been looted in large quantities by foreign armies The crushing levies which the towns had to pay to preserve themselves from the hand of the invader had brought them to the verge of ruin The mineral wealth, which had formerly been a main contributory source of German prosperity, especially the silver mines, was partly exhausted and partly diminished in value through the growing imports of precious metal from America This loss of national wealth could only be replaced in the course of centuries

Intellectual life had also suffered severely Hard conditions had made material interests and the struggle for daily bread predominant The striving after wealth and material comfort obsessed the nation, impoverished and demoralized by war The sense of nationality was at a low ebb and the generation that had grown to manhood during the war had no other conception than that Germany was predestined to be ill-used by her neighbours Confidence in the national strength had vanished and even patriotic pride and the culture that springs from it had been sorely diminished A vast number of Spanish and French words had

been introduced into the German language, while court life and ceremony, fashion, and all social intercourse came more and more under French influence. This foreign culture descended from the court and the city patricians into the ranks of the middle-classes until the peasant class alone remained untouched by it

Organization.—The political life of Germany was in a no less deplorable state The imperial authority had become utterly powerless, lacked an administrative system, and was possessed of only a very limited revenue. When the Peace of Westphalia gave to the individual States the right to form associations among themselves or with foreign powers in so far as such alliances were not directed against the emperor and the empire, the emperor was reduced in fact to the position of president of an aristocratic republic. He was unable to make laws or levy taxes without the consent of the *Reichstag,* which since 1663 had been permanently established at Regensburg It was composed of representatives of all the mediatized estates and was divided into the three chambers—electoral princes, princes and cities. The first chamber consisted of representatives of the eight electors of the empire—the archbishops of Mainz, Cologne and Treves, the king of Bohemia, the dukes of Saxony and Bavaria, the margrave of Brandenburg and the count-Palatine of the Rhine, in 1693 a ninth was added, the elector of Hanover The second chamber was composed of representatives of all the greater princes whilst the lesser counts and lords were combined in separate bodies each possessing a single vote The third chamber consisted of the representatives of the mediatized cities, their right to a casting vote when the other two houses disagreed was however disputed, and they were virtually condemned to insignificance The working of this assembly was rendered very difficult by the fact that the representatives of the different estates had to obtain the consent of their principals on every vote As communications were difficult and slow, the proceedings were often dragged out interminably and it became excessively difficult to obtain consistent decisions.

Apart from the *Reichstag,* there existed a further general imperial organization, the *Reichskammergericht,* the supreme judicial body of the empire. It met first at Speyer and later at Wetzlar, and was financed by the estates Its effectiveness was seriously impaired, however, because the greater principalities were exempt by special imperial privileges from its jurisdiction In addition the emperor maintained a separate *Reichshofgericht* at Vienna which was in perpetual conflict over questions of competence with the *Reichskammergericht* Moreover, as the procedure was very complicated the hearing of processes was almost incredibly prolix, and at times a decision was never reached An enquiry held in 1772 revealed that no less than 61,233 suits were still awaiting judgment by the *Reichskammergericht*

The empire was unable either to take precautions to safeguard its territory, or to preserve law and order among its citizens and protect the interests and lives of its subjects abroad There existed no regular taxation, and the empire possessed no army or police force. The necessary duties were collected on the basis of a register in which each constituent estate of the empire was assessed at a definite rate These amounts, however, were regularly diminished in consequence of the protest of the different estates that their ability to pay was rated too highly; and payment into the imperial treasury was very irregular When the empire went to war each estate had to furnish a stated quantity of troops and ordnance also recorded in a register When the numerous small contingents did assemble at the oppointed date and place, which very rarely happened, the troops were variously armed and for the most part were made up of raw levies. The organization of larger forces was very difficult because no State would permit its soldiers to be placed under foreign command When it is also remembered that the troops were never trained together, it is easy to understand that an imperial army composed in such a manner rarely possessed any real military effectiveness.

It can therefore be said with truth that since the Peace of Westphalia there had never been a common political life in Germany. For administrative measures were carried out not by the empire but by the individual territories that had grown up within it and had practically attained to the status of independent States. The number of these States was extraordinarily large, and has been estimated at some 1800 including some amazing examples. The smallest territories were the dominions of the knights of the empire, numbering some 1,475 These were nearly all situated in south-west Germany and their joint population amounted to about 500,000. Each individual territory averaged about 300 inhabitants. These territories therefore, were no more than properties which, since their owners were free knights of the empire, were not under the dominion of a prince, but directly dependent on the emperor and the empire. In this instance the capacities of land-owner and sovereign lord were united in the same person, who administered the law and exercised police-rights over his little territory. These knights of the empire were unrepresented in the *Reichstag*

Then there were 51 free imperial cities with a total population estimated at about 750,000, and, included in their number, were certain of the more important ancient commercial towns such as Hamburg, Bremen, Nuremberg, Augsburg, Ulm, Strasbourg and Frankfurt-am-Main; but the vast majority were small and insignificant country towns of 2–3,000 inhabitants in south-west Germany who had had the good fortune, like the knights, to be protected by their ancient privileges from coming under the rule of a prince. For the most part these towns and cities were governed by a small number of patrician families who monopolized all positions of influence and profit and often gained a reputation for devoting the revenue of the town more to their own special interests than to those of the citizens at large With certain exceptions, these towns were little animated by civic spirit and the desire for economic progress Moreover they were overshadowed by the capitals rising round the residences of the princes—although these had not the advantages enjoyed by the free cities

The 63 ecclesiastical principalities (archbishoprics, bishoprics, abbacies) with their population of some three millions, had special characteristics. Here the supreme lord was a bishop or abbot elected by the cathedral chapter with whom he shared the administration of the district The chapter was almost entirely composed of the nobility of the neighbourhood, since these religious foundations and orders afforded the nobles a convenient opportunity of providing for their younger sons in a manner befitting their rank For the most part the administration was bad, and it was not until the 18th century that a few of the ecclesiastical princes were sufficiently enlightened to introduce important reforms Many bishops used their high position to further the interests of their families by making over to them ecclesiastical estates and by filling the chapters with their relatives

The temporal principalities and countships numbered between 170 to 200; the number varied because the estates were often divided among different lines of the same family, or many principalities united by inheritance under one prince A patriarchal form of government characterized the smaller principalities, in which the prince was personally acquainted with the majority of his subjects, concerned himself in their family affairs, and expected them to take a similar lively interest in the joys and sorrows of his own family. Nearly all these lesser princes maintained a magnificent court and employed a number of officials out of all proportion to the size of their principalities; they were especially inventive in introducing fresh methods of taxation by which they sought to obtain the money for the upkeep of their courts A true political life was naturally impossible in all these miniature states, and was only to be found in the few larger principalities Of these, the greatest was in the possession of the house of Habsburg which ruled over a vast territory in south-east Germany composed of the kingdoms of Bohemia, Austria, Styria, Carinthia, Carniola and Tirol with, in addition, a number of scattered possessions in southern Suabia stretching to the banks of the Rhine. These territories could not be regarded as constituting a single State, for from time to time they were divided among various branches of the ruling house, and it was only in 1665, after the failure of the Tirolese line, that Leopold I. finally united all the possessions of the Habsburgs. The individual States, however, retained their own administration and diets and the central authority for the whole territory, which Maximilian I. had begun













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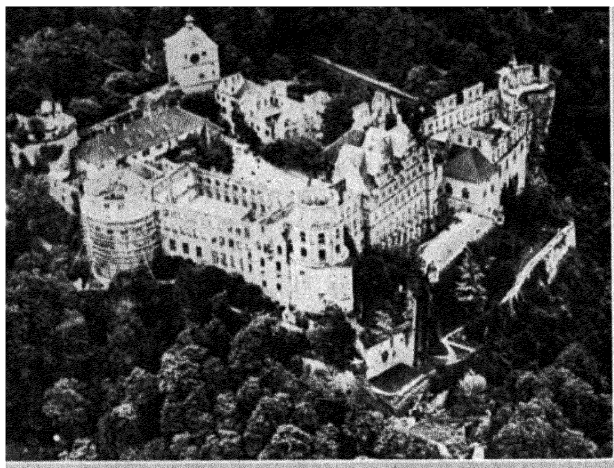
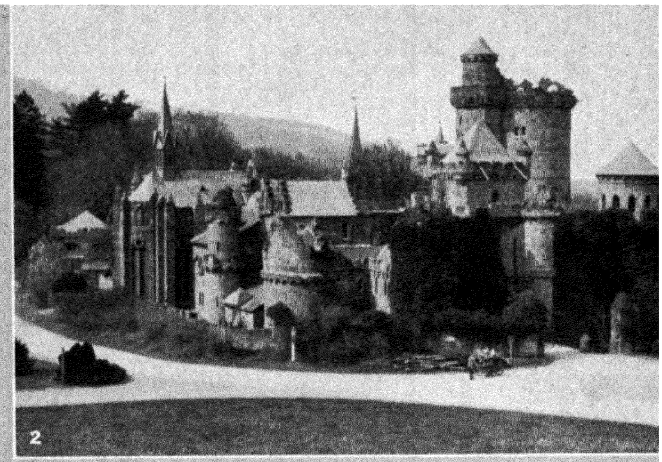
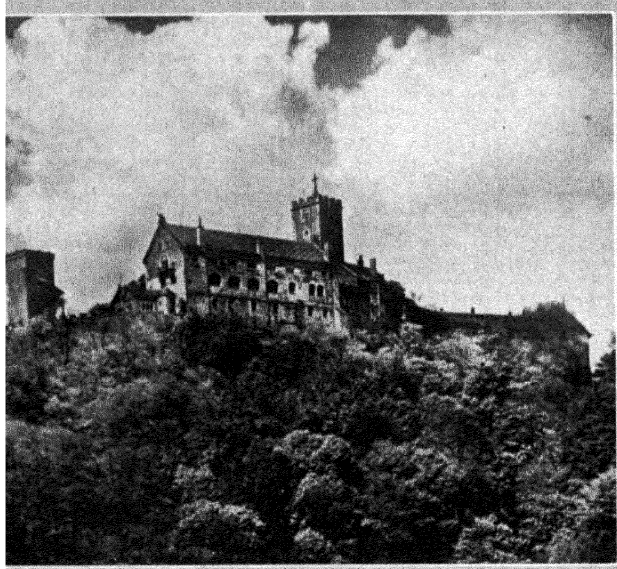
PROVINCIAL TYPES IN NATIVE COSTUME

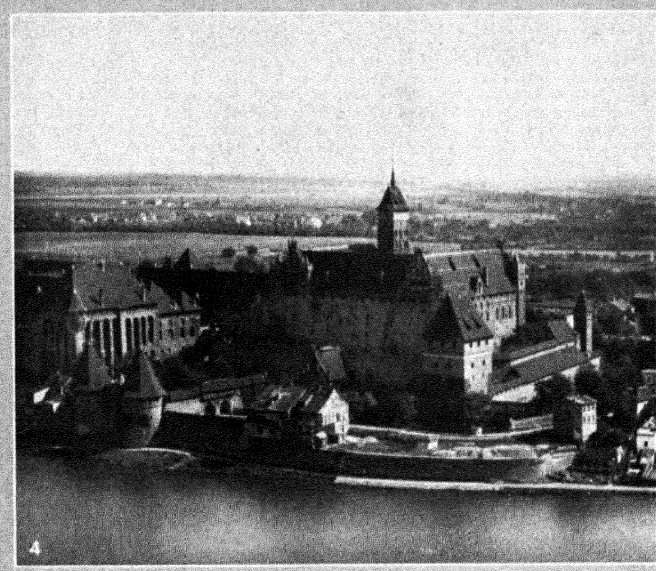
1. Women of the Spreewald, a marshy wooded district near Berlin, inhabited by a Wendish people who retain the speech, customs and picturesque costumes of centuries ago. The women wear a wide-winged headgear, richly embroidered neck cloths, wide skirts and aprons
2. Characteristic dance of peasants of the Bavarian mountains, in the costume of the region; the men in knee-length leather breeches with embroidered suspenders and girdles, and felt hats adorned with goat's beard or eagle's feather; the women in wide skirts and aprons and embroidered neck cloths
3. Five "Wandervögel" (wandering birds), a name popularly applied to the young men and women of Germany, largely students, who travel on foot through the picturesque regions of the country, singing folk-songs
4. Bavarian "Wandervögel," in the costume of the province, photographed in Bremerhaven. They are travelling as a "Klampfe," or a guitar-and-violin band, in order to earn their living as they tour the country
5. A bridal couple, natives of the Schwalm district of Hesse, and a well-wisher congratulating them, according to custom, on the threshold of their new home. They are wearing the elaborate and multi-colored festive costume of that district
6. A bridal party of Hanauer Land, a Black Forest district in Baden, in peasant costume. In the background is a typical Black Forest house

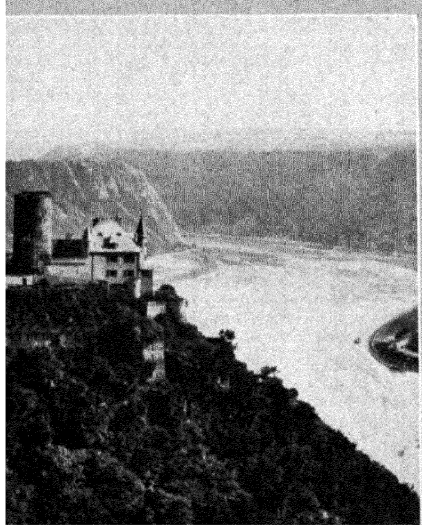
GERMANY

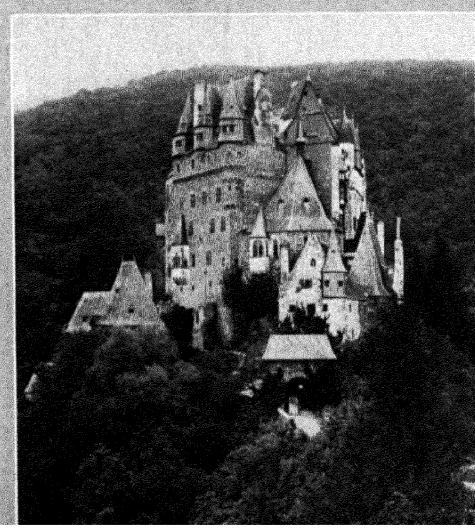


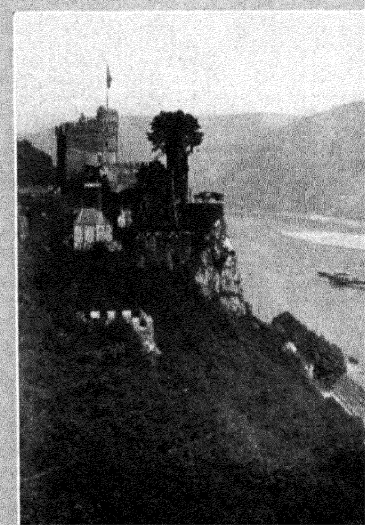












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CASTLES OF THE RHINELAND AND CENTRAL GERMANY

1. An aerial view of Heidelberg castle, near Heidelberg on the Neckar
2. Lion's castle near Cassel, Hesse-Nassau, built in the 15th century
3. Wartburg castle, Thuringia, founded 1070. Here the *minnesingers* held their contests in 1207 and Luther translated the Bible in 1521
4. Marienburg castle, East Prussia, built in 1192
5. "The Cat," left bank of the Rhine above St. Goarshausen, erected 1393 by the Counts Katzenelnbogen
6. Castle Eltz on the Moselle, built by the Counts von Eltz in 1157
7. Castle Rheinstein, 260 feet above the river on the left bank of the Rhine. Built in the 13th century and restored in the 19th

to establish, was still very unwieldy and exercised little control.

Next in importance came the territories of the house of Hohenzollern. The margrave of Brandenburg had inherited in the 18th century the district of East Prussia which had hitherto owed allegiance to Poland At the same time he inherited from the last duke of Julich the district of Cleves in western Germany together with the countship of Mark and Ravensberg in Westphalia After the death of the last Pomeranian duke, the Treaty of Westphalia gave to the Hohenzollerns Lower Pomerania and, as compensation for Upper Pomerania, ceded to Sweden the former bishoprics of Magdeburg, Halberstadt and Minden The centre of their territory extended from the Elbe and the Hartz mountains almost to the bank of the Vistula while East Prussia, which was cut off from the central territory by Polish West Prussia, and their territories on the Rhine and in Westphalia, formed districts loosely joined to the main body The individual districts maintained substantial independence and did not look upon themselves as forming part of a single united territory, but rather as districts that had by chance come into the hands of the same ruler After the Habsburgs and Hohenzollerns, came the house of Wettin which was divided into so many branches that the head of the house, the elector of Saxony, only ruled personally over a portion of its territories The same was true of the house of Wittelsbach of which the most powerful member was the elector of Bavaria, ruling over the largest and most compact territory, whereas the widely-scattered lands in the Palatine were divided among numerous cadet branches of the family In north-western Germany the leading rôle fell to the house of Guelf, whose lands in Hanover and Brunswick were shared among innumerable members of the family If account be taken of the duchy of Wurttemberg and the margravate of Baden in the south, and the lands of the house of Hesse in central Germany, all the more important territories then existing will have been considered In these greater states there existed estates in which the land-owning aristocracy exerted the predominant influence, but in which the civil population of the towns was also represented These diets claimed that no new legislation could be enacted, no fresh taxation introduced, and no burden of loans laid upon the State without their consent having first been obtained While the princes endeavoured to reduce the old established power of the estates, they did not dare to suppress it outright With the assistance of their paid officials, and supported by the standing armies which had been maintained in all the greater States since the Thirty Years' War, the princes succeeded in the course of the 17th and 18th centuries in permanently augmenting their power, until in fact they became absolute rulers; while the rights of the estates dwindled away more and more

Administration and justice were far better in these greater States than in the smaller territories, and by developing the police system the princes ensured peace and order within their States Political life in Germany was confined to these larger States The only question was whether they would not gradually become wholly independent, and thus destroy the last traces of that national alliance of all the Germanic peoples that still existed in the old Imperial State Union (*Reichsverband*) In that event, Germany would have been divided into a number of independent States, each of which would have pursued its own special interest, and one could then have spoken of a German nation in so far as the inhabitants of the different States possessed in common a similar language and certain common elements of intellectual culture. Such a collapse of the empire could only be avoided either by strengthening the power of the empire to such a degree that the central authority could bring the individual territories into submission, or by one of these territories becoming so strong that the remainder would be forced to submit to its leadership

THE AGE OF LOUIS XIV.

The sovereign princes of the German States were not sufficiently gifted to construct a real Government in the midst of the difficulties then prevailing in Germany. Ferdinand III. (1637–57) had been brought up in a strictly religious atmosphere and was dominated by his confessors He had never given evidence of any special qualities His eldest son, Ferdinand, who during his father's life-time had been chosen as his successor by the imperial electors, died before him in 1654, and, notwithstanding all his endeavours, the emperor was unable before his death to bring about the election of his younger son, Leopold, as king of the Romans Hence when Ferdinand died in 1657 an interregnum ensued that lasted for almost a year, until finally the electoral princes united to elect Leopold (Aug 18, 1658) who, however, was compelled to sign a capitulation by which the imperial rights were still further reduced

Leopold I.—Leopold, who until 1705 was to be the head of the German peoples, was 18 years old at the time of his election He had originally been destined for the church, he was a thorough theologian, and a pious and bigoted churchman Very reluctantly he abandoned his religious life in order to assume the duties of a temporal ruler He invariably regarded the promotion of the interests of the Catholic Church as his first duty, while those of the house of Habsburg and of his Austrian territories had for him a quite secondary importance He had little sympathy for the empire and its needs Under the influence of his Spanish mother, his education had been entirely Spanish, and in his immediate circle Spanish alone was spoken Though kindly, well-intentioned, benevolent, and even weak by nature, Leopold was pitiless and unyielding in all matters involving either interest of the Church or his own sovereign rights His firm conviction that he was an instrument and agent for the execution of the Divine will endowed him with an almost unshakable spiritual equanimity Although he was not a man of action, Leopold was exceedingly tenacious in maintaining his own point of view and in guarding his own interests

In the first decade after the Peace of Westphalia, the primary concern of all the estates was the maintenance of peace As the war between France and Spain lasted until 1659, and as grave issues were arising in north and east, Germany could easily have been involved again in a general war As no one believed in the ability of the emperor to safeguard the empire from this danger, there grew up a network of alliances between the different estates for mutual defence The elector Johann Philipp of Mainz succeeded in uniting the most important Catholic and Protestant princes in a great defensive alliance The Confederation of the Rhine was signed on August 16, 1658 for three years, and had for its object the full execution of the Peace of Westphalia, the prevention of foreign wars and the defence of its own territories But, in fact this alliance, which the emperor regarded as directed against his authority, very soon became largely dependent on France It was frequently renewed and lasted until 1667.

During the first northern war (1656–60), the emperor in the Catholic interests supported the Catholic king of Poland; whilst the elector of Brandenburg, who at the outset supported Sweden, later entered into an understanding with Poland and the emperor These wars, however, were waged for the most part outside the territory of the empire, and Germany was far more deeply disturbed by the course of events on her western frontier

The French Wars.—Since 1661 Louis XIV had personally governed France, and, in accordance with the traditional French policy, which had been built up under Richelieu and Mazarin, he sought to advance the French frontier to the Rhine and to include Belgium within the French kingdom Belgium and the Franche-Comté still belonged to Spain, and hence Louis' policy led in 1668 to a renewal of war between France and Spain The intervention of England, Holland and Sweden brought the war to a conclusion after a few months by a peace which Spain purchased at the cost of the surrender of certain fortresses in southern Belgium As Louis XIV was unable to dissolve this Triple Alliance, he endeavoured by means of a sudden invasion to crush Holland and succeeded in winning over the archbishop of Cologne, the elector Palatine, and the bishop of Munster, to allow the passage of his armies through their territories The neighbouring States who feared that they would be involved in the war, witnessed these intrigues with great disfavour and invoked the assistance of the emperor and the empire As moreover, Louis XIV had, without any legal grounds, driven the duke of Lorraine, who was a prince of the empire, out of his duchy, the empire had good cause

to intervene

But Leopold still hesitated to take any action against Louis XIV In view of the anticipated extinction of the Spanish branch of the Habsburgs, his main policy was to unite the Spanish monarchy with his own territories This policy depended for its success upon the acquiescence of the French king, and since Louis was clever enough to dangle before the emperor the hope that he would help him to fulfil his desires, Leopold did not feel himself at liberty to oppose Louis in his schemes Hence the Dutch found their sole support in the elector of Brandenburg, who had grown up in Holland and whose first wife had been a princess of Orange By cutting the dykes and flooding the country, the Dutch were able with great difficulty to avert the French attack in 1672 At the urgent request of the estates, Leopold determined to send an army under General Montecucoli for the defence of the imperial frontier on the Rhine, but with instructions to maintain the defensive. The empire declared war on France at the same time as Spain. The war was chiefly waged in Belgium and on the Rhine. Louis XIV. allied himself with Sweden, who, at his request, invaded Brandenburg from Pomerania in order to restore the elector Frederick William, who was participating in person in the war against France At the same time, Louis XIV entered into relations with Poland, Turkey and Hungary which was discontented with the Habsburg rule The emperor then found himself threatened in the rear By his victory at Fehrbellin on June 28, 1675, the elector of Brandenburg drove the Swedes out of his territory and occupied nearly the whole of Swedish Pomerania. The French, on the other hand, were for the most part victorious in Belgium and on the Rhine As the war dragged on without any definite decision being reached Louis was able to induce first Holland and then Spain to conclude a separate peace When the emperor saw that he could no longer hope to obtain any success by carrying on hostilities, he concluded the peace of Nijmwegen with France in Feb 1679 The greater part of Alsace and Lorraine, as well as the former Austrian territory of Breisgau, remained in French possession The elector of Brandenburg, who was required by the peace to give up all his acquisitions in Pomerania, was unwilling to subscribe to such terms and for a short time carried on alone a forlorn fight In the following year, however, he too was compelled to conclude peace

In consequence of these events, Louis XIV became convinced that the weakness of the empire was such that he could encroach upon its territory with impunity He established in the French law courts in Metz, Breisach and Besançon, so-called chambers of reunion (*Reunionskammern*) for the purpose of determining what lands had at any former time belonged to the districts which had now been ceded to him As the result of these investigations, he declared that the countship of Mompelgard, the whole of Alsace and certain districts in the Palatine and Trier, belonged by right to France; and he sent his armies to occupy these districts The imperial city of Strasbourg, which was included in these districts, was on Sept 28, 1681, forcibly seized and at once erected into a powerful French fortress The emperor and the *Reichstag* contented themselves with ineffectual protests against these acts of violence

That the emperor did nothing to safeguard the integrity of the empire at this crisis is partly accounted for by the fact that his own immediate territories were menaced by many grave dangers. The Turks in Hungary were planning a desperate attack on Austria, and in the spring of 1683 appeared with a powerful army before the walls of Vienna But the valiant Count Rudiger von Starhemberg managed to defend the city until the arrival of an army under the king of Poland and the electors of Bavaria and Saxony, which defeated the Turks and freed Vienna.

When Louis XIV., on grounds that had no legal justification whatever, sought to bring the Palatinate within his grasp, claiming it as the inheritance of Elizabeth Charlotte, the wife of his younger brother, war once more broke out in the west The French armies invaded the Palatinate, and ravaged it with fire and sword The magnificent palace of the elector Palatine at Heidelberg was destroyed and in face of this outrage the emperor felt impelled to resume the war in alliance with Holland and England. This new war lasted for nine years, inflicted severe losses on the French, but did not result in any decisive victory. Once more Louis was able to sow dissension among his enemies and to isolate Germany, and the emperor was forced to conclude the Peace of Ryswick in 1697, with but small gain to himself. Louis abandoned his claim to the Palatinate, and the districts outside Alsace that had been declared to have once formed part of it. Further he had to restore his duchy to the duke of Lorraine, but he retained the whole of Alsace and also Strasbourg.

Meanwhile the war between the emperor and the Turks continued in the east; two-thirds of Hungary remained in Turkish hands Prince Eugene of Savoy, one of the greatest generals of the age was appointed to command the Austrian army and defeated the Turks in a decisive victory at Zenta (Aug 29, 1697). Prince Eugene invaded Serbia and Bosnia, and forced the Turks to conclude the Peace of Carlowitz on Jan 26, 1699, by which the entire kingdom of Hungary, with the exception of the Banat of Temesvar, was restored to the emperor It was the conquest of Hungary that paved the way to the later Habsburg monarchy and its position as a great Power

The Spanish Partition Treaties.—Shortly after this Charles II of Spain died (Nov 1, 1700), the last Habsburg to occupy the Spanish throne The question of succession, which had already occupied the European diplomats for decades, had now to be settled The claim of the Emperor Leopold was based not only on the fact that he was the nearest male blood-relation of the dead king, but also that his mother and his first wife had been Spanish princesses, and at the time of their marriage it had been expressly agreed that, in event of the failure of a male heir to the Spanish house, their children should be regarded as the heirs But Louis XIV was also the son and husband of Habsburg princesses, who married into the House of France, though it had been stipulated that they should renounce all their rights to the Spanish inheritance Louis, however, declared that this renunciation was invalid because the promised dowries of the princesses had never been paid in full Louis had frequently endeavoured to come to an agreement with Leopold concerning the partition of Spain, but without definite result These projects for a partition had aroused great uneasiness in Spain, and Charles II determined to make a will By his first marriage with the princess Margaret Theresa, Leopold had only one daughter, who was married to the elector Max Emanuel of Bavaria; the only child of this marriage, the crown prince Joseph Ferdinand, then six years of age, was designated in 1698 by Charles II heir to all his possessions, but the young prince died in the following year Then Charles II, under pressure from the French party at the Spanish Court was persuaded shortly before his death to draw up a second will in which he named as his sole heir Philip, duke of Anjou, a grandson of Louis XIV and Maria Theresa of Spain, who was then 17 Acting on this last will, Louis XIV despatched his armies into Spain directly he learnt of Charles's death, and sent his grandson to Madrid where, under the title of Philip V, he assumed the reins of government

The War of the Spanish Succession.—It remained to be seen, however, whether the success of this sudden and violent measure would be lasting First there was the danger that the emperor would refuse to recognize the validity of Charles's will and attempt, if necessary, to support his own claim by force of arms Further, the interests of the other European States were deeply involved in this question England and Holland, old enemies of Louis XIV, had as little desire as the emperor, to see the great Spanish kingdom with Belgium, Naples, Sicily, Milan and the rich Spanish possessions overseas, pass into the hands of the French king, whose power was already a sufficient menace to them William III of Orange, Stadtholder of the Netherlands and, since 1688 also king of England, believed that this must be prevented in the vital interests of both the countries over which he ruled He was the first to stress the theory of a European balance of power, and was the soul of the Great Alliance concluded on Nov. 7, 1701, between the emperor, England and Holland Among his supporters Louis XIV reckoned Hungary, which was anxious to throw off Austrian domination; in England the supporters of

King James II. who had been dethroned in 1688, then very numerous; and a number of German princes, chief of whom was the elector of Bavaria. He possessed a seasoned army led by skilled generals, and already held the greater part of the objects of the dispute. It is true that his finances were in a bad state because the frequent wars of these latter years and the extravagance of his court had involved him in heavy debt Among the allies there existed points of dispute especially after the death of William III (1702) when the close relationship maintained between England and Holland was dissolved and opposition to the war gained strength in England. But they had at the head of their armies two generals of outstanding military ability, Prince Eugène and the duke of Marlborough, whose harmonious cooperation was rarely broken by differences of opinion. In the first years of the war the advantage lay with the French Her position was such that she was able to strike a deadly blow at Austria by a concerted attack from the Rhine and Italy This danger was averted by the union of prince Eugène and Marlborough, and the allied armies won a decisive victory at Hochstadt on Aug 13, 1704. The French general Tallard was taken prisoner and the French army forced to retreat across the Rhine Bavaria, the elector of which was allied with Louis XIV , was occupied by the imperial troops and the elector Max Emanuel was forced to fly to Brussels On May 5, 1705 the emperor Leopold died, and was succeeded by his eldest son, Joseph I , then 27 years old. His arrogant bearing aroused great resentment in Germany, and greatly impeded the prosecution of the war.

Meanwhile a fleet of the maritime Powers attacked Spain The younger brother of the emperor Joseph, the archduke Charles, who was the imperial claimant to the Spanish throne, accompanied this fleet which seized Gibraltar, sailed along the east coast of Spain and effected a landing at Barcelona Catalonia rose in support of the archduke, and by the summer of 1706 he was able to enter Madrid In that year Marlborough gained a great victory over the French at the battle of Ramillies (May 23), and occupied almost the whole of Belgium Eugène took command of the allied forces in Italy, and by his victory at Turin (Sept 7) relieved the army of the duke of Savoy, which had been surrounded and drove the French out of Italy A year later he occupied the kingdom of Naples

The French, after failing in a renewed attempt to cross the Rhine into Suabia, concentrated their main military strength in the Netherlands Eugène hastened thither with the imperial troops and again joined forces with Marlborough After their victory at Oudenarde (June 11, 1708), the Allies captured Lille Louis XIV expressed his readiness to renounce, on behalf of his grandson, all claims to the Spanish throne and to agree to a restoration of the Franco-German frontier to the line laid down in the Peace of Westphalia in 1648. This entailed the restoration of Strasbourg. The Allies, however, thought that he was only playing for time, and demanded that he should place his troops at their disposal to aid in the expulsion of his grandson from Spain When he refused to do this, they broke off negotiations

Once more the Allies were victorious at Malplaquet (Sept 11, 1709), and captured the fortress of Mons Louis again sued for peace, and now declared his willingness to concede to Germany the frontier of 1521, that is to say to relinquish Alsace, Metz, Toul and Verdun He further offered to pay a sum of money to be used in driving his grandson out of Spain. Intoxicated by victory the Allies stood firmly by their former demands, and negotiations once more broke down

A change now occurred in the general political situation which threatened to rob the allies of all the fruits of their victories In England the Tories, who had long considered that the interests of England did not demand a continuance of the war came into power and entered into negotiations with France for a separate peace The other allies, too, were disturbed when on April 17, 1711, the Emperor Joseph I died, and, as he left no son his younger brother Charles was elected emperor If Spain, Austria and the empire were all to be united under one ruler there was danger that such a disproportionate concentration of power in the house of Habsburg would threaten the European balance of power more seriously than the establishment of a second French dynasty in Spain Neither England nor Holland nor Savoy felt disposed to prosecute the war for such an object. Hostilities were suspended and the peace congress assembled at Utrecht in 1712, resulted in the Peace of Utrecht (April 11, 1713) The emperor was awarded only a portion of Lombardy and the Neapolitan mainland no mention was made of a restoration of the old Franco-German frontier The emperor and the *Reichstag* prosecuted the war for some time longer When Landau and Freiburg-im-Breisgau, however, had been captured by the French, they were forced, in the treaties of Rastatt and Baden (March 7 and Sept 7, 1714), to assent to the terms of the Peace of Utrecht. The frontiers of the German empire remained as laid down in the Treaty of Ryswick (1697). The prospect of winning back the old German territories in the south-west, which a few years before had seemed so near realization now completely disappeared Moreover the emperor was forced to agree to the restoration of his territories to the elector of Bavaria Thus the War of the Spanish Succession had overthrown the supremacy enjoyed by France in Europe in the early years of Louis XIV 's reign without yielding any profit to Germany. (*See* SPANISH SUCCESSION, WAR OF THE; UTRECHT, TREATY OF, etc)

The Northern War.—At the same time another long-standing quarrel came to a head in the North and the East The accession to the Swedish throne of the young king Charles XII. (1697) afforded an opportunity for Sweden's enemies to unite in an attempt to oust her from the position of power in which she had been placed during the Thirty Years' War by Gustavus Adolphus. In 1697 the elector Frederick Augustus of Saxony, after his conversion to Catholicism, was elected king of Poland In alliance with Denmark and the Russian tsar, Peter, he began a war in the summer of 1700 which was to last for almost 20 years By the spring of 1706, Charles was in possession of the greater part of Poland and the capital, Warsaw, and, in agreement with a section of the Polish nobility, had set up Stanislaus Leszczynski as king in opposition to Frederick Augustus But Charles conceived the plan of overthrowing his chief enemy by seizing his German lands, and so rendering it impossible for him to receive money and reinforcements from Germany To effect his purpose, he marched through Silesia towards Saxony, occupied a great part of the elector's domains, and established his headquarters during the winter of 1706–07 in Altranstadt, near Leipzig But the peace which he compelled Augustus to sign, and in which the latter renounced his claim to the Polish throne, did not long remain in force In the meanwhile Peter the Great had organized an efficient army with which he threatened to occupy Poland Charles marched to oppose him and was completely defeated at Pultawa (1709) and forced to take refuge in Turkish territory The Swedes were driven from Poland, and their allied enemies invaded Swedish territory on all sides The elector of Brandenburg, who, with the Emperor's consent, had assumed the title of king of Prussia in 1701, also took part in this attack upon his old enemy The Swedish possessions in Germany, Upper Pomerania, Bremen and Verden were seized, and when Charles returned from Turkey he found himself powerless to give a more favourable turn to the war

After Charles had been shot at Frederikshall on the Norwegian frontier, the conclusion of peace was possible Sweden was forced to surrender Bremen and Verden to Hanover, and Upper Pomerania south of the Peene to Prussia Of greater importance as regards the future relations of Germany and Russia was that Estonia, Livonia and Ingermanland fell into the hands of the tsar for Russia gained a firm foothold on the shores of the Baltic and thereby acquired a position that became more and more threatening to Germany The Northern War made an end to Sweden as a Great Power, although she retained the German districts of New Pomerania and Rugen until they were joined to Prussia in 1815

THE 18TH CENTURY

Charles VI.—From his earliest youth, the Emperor Charles VI had been regarded as the future king of Spain and had been brought up in the spirit of Spanish Jesuitism Throughout his life

his dearest wish was to secure as large a share as possible of the Spanish possessions for the house of Habsburg, and Austrian policy became more and more obviously inspired by the desire to govern Italy and extend the Habsburg rule to the lower reaches of the Danube The emperor had little in sympathy with the interests of the rest of Germany which lay, above all, in safeguarding her western and north-eastern frontiers He exercised but limited influence in the empire and the individual States were practically independent There was no common political history in Germany at this period. On the other hand Germany's destiny was deeply influenced in the following decades by international affairs

While prince Eugene was leading the imperial troops to fresh victories in the course of a new war against Turkey (1715–18), and by the Peace of Passarowitz (1718) compelled the Sultan to cede the Banat and the greater part of Serbia and Wallachia, complications arose in Italy mainly caused by the dynastic ambitions of the Spanish queen The lack of a male heir was the source of much anxiety to the emperor He devoted his energies to assuring the succession to his eldest daughter, Maria Theresa, and as his action was contrary to the provisions of earlier compacts between the members of the house of Habsburg, which gave the precedence to the daughters of his eldest brother, he spared no trouble to ensure that, after his death, his wishes respecting the succession would be carried out These wishes he embodied in a special law, the "Pragmatic Sanction," for which he secured the approval of the diets in all the territories of his empire As Charles did not consider this was sufficient security in itself against the probable attempts on the part of the other heirs to secure the throne, he sought to have it guaranteed by the great Powers and approved by the *Reichstag*. The approval of the *Reichstag* was especially difficult to obtain, because two of the most powerful princes in Germany, the electors of Bavaria and Saxony, had married his brother's daughters and so had an immediate personal interest in frustrating the execution of the emperor's wishes In these circumstances, the emperor was particularly anxious to secure the consent of the king of Prussia to his plan King Frederick William was quite willing to fall in with the emperor's wishes but demanded in return his assistance in prosecuting his claim to a part of the inheritance of the duties of Julich and Berg in the Lower Rhine The emperor appeared to assent to his wish and so secured the consent of Prussia to the Pragmatic Sanction by the Treaty of Berlin (Dec 23, 1728). But since it soon appeared that the emperor had made contrary promises to the rival claimants the courts of Vienna and Berlin became estranged, and King Frederick William allied himself with the emperor's enemies

On the death in 1733 of King August the Strong of Poland, who was also elector of Saxony, fresh troubles arose in the east While Austria and Russia declared themselves in favour of the succession of his son August III , a number of Polish nobles, who were in relations with France, chose August the Strong's former opponent, Stanislaus Leszczynski, whose daughter was married to the young French king, Louis XV. Out of this quarrel arose the War of the Polish Succession (1733–35), which was chiefly fought in Italy and the Upper Rhineland and which ended unfavourably for Austria; the emperor being forced in the Peace of Vienna (1738) definitely to abandon Sicily and Naples, which were placed under the rule of one of the young Spanish princes whilst the duchy of Parma was ceded to Austria Of special significance to Germany was the consent of the emperor to the cession of Lorraine This duchy which had long been in the possession of France was made over to Stanislaus Leszczynski, as compensation for his abandonment of all claim to the Polish crown After his death Lorraine was to be restored to France The reigning duke of Lorraine, Francis Stephen, who was married to princess Maria Theresa, was compensated for the loss of his ancestral inheritance by the grand duchy of Tuscany France, in return, recognized the Pragmatic Sanction with the important reservation that she only did so in so far as it did not conflict with established third party rights

In the evening of his days the emperor was once more called upon to engage in war with Turkey—a war that ended disastrously for him. By the Peace of Belgrade (1739), he was forced to restore a great part of his former conquests, and the frontier in Serbia and Wallachia then laid down remained essentially the same until the outbreak of the World War.

The Silesian Wars.—When the Emperor Charles VI died on Oct. 24, 1740, his daughter Maria Theresa at once assumed the reins of government in the countries belonging to the house of Habsburg. The electors of Saxony and Bavaria protested against her accession, and were supported by France who desired to see a partition of the Austrian territories, a still more pressing danger threatened the young princess when the new Prussian king joined her opponents Frederick William I of Prussia had died a few months before the emperor and his son Frederick II thought that by virtue of certain old family compacts he could lay claim to a part of Silesia, namely the duchies of Liegnitz, Brieg, Wohlau and Jagerndorf. These claims had never been recognized by Austria, nor had they ever been completely settled At one time, indeed, compensation had been offered but no final agreement was reached on the matter Frederick now claimed the cession of a portion of Silesia and in return promised the young archduchess his aid against her enemies When Maria Theresa rejected his proposal Frederick determined to occupy the disputed lands by force In Dec 1740 he crossed the Silesian frontier, advanced as far as Breslau, and defeated an advancing Austrian army near Mollwitz on April 10, 1741 As at the same time, the Bavarians supported by a French army, invaded Austria, advanced as far as Linz and even seized Prague with the help of the Saxons, Maria Theresa found herself in an extremely critical situation Finally the German electors, under French and Prussian influence, did not elect as emperor her husband, duke Francis Stephen, but the elector Charles Albert of Bavaria (Jan 24, 1742) He assumed the name of Charles VII , but throughout his three years' reign (1742–45) he never received full recognition in Germany nor succeeded in setting up a working Government When Frederick invaded Moravia in 1742, after he had secured possession of all Silesia, and defeated an Austrian army at Chotusitz, Maria Theresa thought it prudent to open negotiations Her troops had regained Linz, and even invaded Bavaria, but she thought a complete victory over her other enemies impossible, so long as the Prussian army threatened her flank Frederick expressed his readiness to conclude a separate peace England, also at war with France over colonial questions, acted as intermediary and thus the Peace of Breslau (June 11, 1742) was concluded Austria ceded the greater part of Silesia, along with the countship of Glatz, to Prussia; and received only the principalities of Troppau and Teschen In return, Frederick promised his neutrality The first Silesian War, which ended with this peace established the military reputation of Frederick the Great It was the first armed contest between the two greatest German States which had developed out of the old empire and had long regarded each other with common distrust and jealousy

After the withdrawal of Prussia, the struggle for the inheritance of Charles VI continued until the Austrian army captured Prague, freed Bohemia from the invaders, and even captured Munich, the capital of the Bavarian emperor England had also despatched an army to the continent, led by George II in person, which, after a victory at Dettingen in the summer of 1743, advanced from Hanover as far as the Rhine The Austrians, under the leadership of Prince Charles of Lorraine, were advancing from southern Germany with the intention of crossing the Rhine, when Frederick decided to intervene again in the war. He feared that Maria Theresa, after a complete victory over her other enemies (as now seemed possible) would attempt to wrest Silesia back from him Having signed a new alliance with France, Frederick invaded Bohemia and advanced by forced marches by way of Prague to Budweis But as the expected simultaneous advance of the French army did not take place, Frederick found himself forced to retire to Silesia before the oncoming Austrians During the winter the Emperor Charles VII died (Jan 20, 1745), and his son, the Elector Max Joseph, at once made peace with Maria Theresa He received back his ancestral domains in return for the renunciation of all his claims to

the Austrian throne as grandson of the Emperor Joseph I. As the elector of Saxony had already abandoned his claims and made peace with Austria, and as the French were fully occupied with the campaign in Belgium, Frederick found himself alone opposed to the main force of Austria. Strengthened by Saxon troops, the Austrians attacked Silesia in the summer of 1745, but were defeated near Hohenfriedberg on June 4. Once more Frederick was able to invade Bohemia, and by the end of the year a great part of Saxony was in his possession On Dec 15 his chief general, Leopold von Dessau, won a fresh victory over the Austrians and Saxons at Kesselsdorf, near Dresden

The majority of the electors had in the meantime at Frankfurt-on-Main, elected Francis Stephen of Lorraine as emperor. As Francis I. he was the nominal head of the German empire from 1745 to 1765. Maria Theresa, who perceived from the events of the last few years that it would not be so easy to retake Silesia, and who laid great stress on the recognition of her husband as emperor by Frederick, signified her willingness to reopen negotiations On Dec 25, 1745, the Second Silesian War was brought to a close by the Peace of Dresden, by which Frederick retained Silesia and recognized Francis I as emperor.

The War of the Austrian Succession (*q v*) lasted for yet another three years, and was chiefly fought in Belgium Because the French victories on land were more than offset by the English victories at sea, each of the contestants began to doubt the possibility of a decisive victory, and the dispute was finally settled by the Peace of Aix-la-Chapelle (Nov 13, 1748) which recognized Maria Theresa as sole heiress of her father, gave certain frontier districts in Lombardy to Savoy, and the duchy of Parma to prince Philip of Spain

Kaunitz.—Although peace was thus outwardly restored, the tension between Austria and Prussia remained, since Maria Theresa had never abandoned her hopes of regaining Silesia on the first favourable opportunity Her hopes were shared in by her chief minister, count Kaunitz, who looked upon Prussia as the natural enemy of Austria Neither party, however, wished to resume the contest without the help of powerful allies Kaunitz had already established relations with Russia, and his special concern was to induce France to lend her support to his schemes. This was an especially difficult task to accomplish, because for a century and a half Paris had been accustomed to regard Austria as the particular foe of France At the same time the French viewed the growing power of Prussia with dislike and feared that French influence in Western Germany would be prejudiced After laborious negotiations, Kaunitz was successful in winning over the French statesmen from their mistrust of Austria and then in bringing about a defensive alliance between Austria and France. It is possible that the French would not have entered into this alliance, if Frederick the Great had not allied himself with England Frederick, for his part, was convinced that he would again be called upon to defend Silesia from an Austrian attack Since he was himself allied with France, whereas in earlier wars England had supported Austria, he was anxious to attempt to separate England from Austria without imperilling his good relations with France At this time English policy was governed by growing colonial rivalry with France, especially in America. In the autumn of 1755 French and British settlers in North America had already come to blows It was obvious that the mother countries would also become involved in the conflict As it was feared in England that in such an event France would attack Hanover, and, since Austria showed herself unwilling to undertake the protection of Hanover against a French attack, the English Government sought an undertaking to this effect from Prussia. Being a question of a purely defensive agreement Frederick considered that he could enter into it without breaking faith with France On Jan. 16, 1756, Frederick concluded with England the Convention of Westminster the main stipulations of which were that Prussia should help England in the event of an attack on Hanover and that England should support Frederick in the event of an attack on Silesia. When the news of this treaty reached Paris, it was regarded as a defection on the part of Frederick, and on May 1, 1756, the French concluded the defensive alliance with Austria for which Kaunitz had so long laboured

While Kaunitz, with the zealous support of Russia, set to work in Paris to turn this defensive alliance into an offensive alliance, and to secure the consent of France to the complete destruction and partition of Prussia, Frederick the Great learnt of the conclusion of the Versailles Treaty. As at the same moment he received intelligence that Russia was arming on his eastern frontier and from intercepted letters perceived that an attack on Prussia by Austria, Russia and France was being planned for the coming spring, Frederick determined to anticipate the plans of his enemies before their negotiations had been completed Austria having collected a great military force in Bohemia, Frederick enquired of Maria Theresa whether her military preparations were directed against Prussia, and whether she would be ready to give him her assurance that in this and the following year no attack would be made upon him. On receiving an evasive answer Frederick gave the order to his troops to cross the Saxon frontier

The Seven Years' War (1756–63).—Thus began the Seven Years' War (*q v.*), in which Frederick the Great fought against Austria, France, Russia, Saxony, Sweden and the empire. His sole ally was England, whose support consisted mainly in a subsidy of four million talers a year It was only his pre-eminent generalship and his resolute determination, even in the most difficult circumstances, to lose everything rather than to consent to any diminution of his State, which made it possible for him to survive these perilous years

During the autumn of 1756 Frederick occupied Saxony, and after he had first defeated a relieving Austrian army at Lobositz, compelled the Saxon army to surrender at Pirna. In the following year he invaded Bohemia, defeated the Austrians near Prague, and invested the Bohemian capital When, however, he sought to turn back the advancing Austrian army under General Daun, he was himself heavily defeated at Kolin on June 18, 1757, and forced to withdraw from Bohemia At the same time the Russian troops invaded East Prussia, the French attacked Hanover, and the English army that was stationed there to protect the country was put out of action Hanover was occupied by the French A second French army, in conjunction with an imperial army advanced from Thuringia upon Berlin Frederick immediately attacked this army and won a brilliant victory at Rossbach on Nov 5 As the Austrians had in the meantime invaded Silesia and seized Breslau, Frederick hastened thither and recaptured by his victory at Leuthen (Dec 5) the capital of Silesia

The following year saw a dangerous attack on the part of the Russians, who occupied Konigsberg The Austrians advanced to the south-west to join the Russians and besieged Kustrin Frederick, who had again attempted an attack on Moravia, was forced by this to return in order to avert this pressing danger and to prevent a junction of the enemy armies He defeated the Russians at Zorndorf on Aug 25, although himself sustaining very heavy losses The Russian forces now retreated into Pomerania and besieged Kolberg The Austrians, however, had entered Lusatia and, in an attempt to expel them, Frederick was defeated by Daun at Hochkirch, near Bautzen, on Oct 14 Notwithstanding this defeat Frederick was able, on the whole, to maintain himself in Silesia and Saxony, while in the west, duke Ferdinand of Brunswick, who commanded the English and Prussian forces held the line of the Rhine

The year 1759 brought Frederick to the verge of irretrievable disaster Whilst the French advanced in the west as far as the Weser, Frederick, who this time had been unable to prevent a junction of the Austrian and Russian armies, was heavily defeated by them at Kunersdorf on Aug 12 His army seemed to be well-nigh exterminated Frederick himself almost despaired and it was only the bad use made of their victory by his opponents that gave him time to collect his troops again He was indeed, unable to prevent the imperial army from entering Dresden and occupying a part of Saxony But, since in this year, they had not succeeded in completely overpowering Frederick, his enemies began to weaken in their attack The illness of the tsarina Elizabeth hindered the operations of the Russians, since it was a matter of common knowledge that the sympathies of the heir-

apparent were with Frederick Although a Russian advance guard did on one occasion (Oct 1760) reach Berlin, Frederick was able more or less to retain possession of his kingdom. But, in 1761, the Austrians captured Schweidnitz and the Russians Kolberg and it became daily more and more difficult for Frederick to obtain reinforcements and money with which to pursue the war. English financial support was no longer forthcoming after the fall of Pitt's ministry, when the new Government began to negotiate for peace with France No decisive change in the situation took place until the death of the Tsarina Elizabeth of Russia on Jan 5, 1762 The new tsar, Peter III, immediately made peace with Frederick and entered into an alliance with him Although he was murdered a few months later, his successor Catherine II was also of the opinion that neither a strengthening of Austria nor the destruction of Prussia would serve the true interests of Russia She withdrew her military support from Frederick although she did not renew the alliance with Austria Since the conclusion of peace with England, France had lost all interest in the war with Prussia and had withdrawn her troops across the Rhine Hence Maria Theresa found herself deprived of all hope of a decisive victory and compelled to enter into negotiations for peace Peace was signed at Hubertusburg on Feb 15, 1763 Frederick evacuated Saxony but retained Silesia Both parties renounced all claims to a war-indemnity

The importance of the Seven Years' War in the history of Germany lies in the failure of Austria's attempt to destroy Prussia before the power of the latter was consolidated But the hostility between the two greatest German States continued to exist and to influence powerfully the whole future political development of Germany

The Emperor Francis I died (1765) very soon after the conclusion of peace, and was succeeded by his son Joseph II (1765–90) who was appointed by Maria Theresa co-ruler in the Austrian possessions As long as his mother was alive, however, he exercised a very limited influence upon Austrian policy His ambition therefore led him to invest the imperial position with new significance to reform the *Reichshofrat* and the *Reichskammergericht*, and to restore many imperial rights that had fallen into disuse He was a man of quick perception, and steeped in the ideas of the *Aufklärung*, and endeavoured to introduce them into public life A doctrinaire rather than a man of action, Joseph was too ready to seek to enforce his ideas without regard to existing circumstances Frederick the Great said of him that he invariably took the second step before he had taken the first; and from the very first his projects aroused the deep distrust of the German princes Another principal concern of the emperor Joseph was the wish to extend the frontiers of his empire on all sides This was first evident when Polish affairs called for interference on the part of the neighbouring Powers

The First Partition of Poland.—When August III died in 1763, he was succeeded on the throne of Poland by a king of Polish birth, Stanislaus Poniatowski He had many enemies, however, in Poland, and the Russian empress, Catherine II, sought to use these internal disputes to make herself mistress of the whole of Poland This policy affected nearly the interests of the neighbouring German States and, especially, Austria and Prussia Although Frederick the Great believed it to be impossible to check the expansion of Russian influence in Poland, he hoped that at least Austria and Prussia might obtain a share in the spoil When the Emperor Joseph in the course of a personal visit to Frederick at Neisse in 1769 gave expression to his desire for an understanding with his former enemy, a concerted action on the part of Austria and Prussia in the Polish Question seemed to be possible Joseph II devoted all his energy to the task of bringing this about, despite the disapproval of the old empress Maria Theresa, and even took the initiative of occupying Zips

His action led to the first partition of Poland by the Treaty of Aug 5, 1772 Russia received all the land lying to the east of the Dvina and Dnieper; Austria received Eastern Galicia; while Prussia was given the former Polish province of West Prussia, with the exception of Danzig and Thorn, the bishopric of Ermland, and the district of the Netze Though Prussia's share was the smallest, it was of the greatest importance for Prussia in that it restored the territorial unity between East Prussia and the main body of the kingdom. West Prussia had formerly belonged to the Teutonic knights, and was for the most part inhabited by German peasants and townsmen. When the rule of the Teutonic knights came to an end in the 15th century, their lands were lost to Poland.

War of the Bavarian Succession.—Joseph II. had designs on Germany also In 1777 the elector Max Joseph of Bavaria died, and with him the Bavarian branch of the Wittelsbachs came to an end According to the principles of the German law of inheritance, Bavaria fell to the head of the younger branch of the Wittelsbach house, Charles Theodore, the elector Palatine. The emperor, who maintained that he himself had claims on Bavaria, succeeded in forcing the elector Palatine to make a treaty by which the elector, in return for the emperor's recognition of his rights to the remainder of Bavaria, ceded to the latter the district of Lower Bavaria, which was at once taken possession of by Joseph The remaining German princes, especially Frederick the Great, saw a menace to themselves in this extension of the Habsburg power. The emperor's action seemed especially questionable because his claim was entirely unfounded and the heir to the childless elector Charles Theodore, Count Palatine Charles von Zweibrucken, whose assent to these proceedings had not been obtained, had protested to the *Reichstag* against the injury done to his rights When the emperor sought to extend his claim to include Upper Bavaria, and proposed to compensate the elector Palatine with the scattered Austrian possessions in Suabia and the Upper Rhineland, the count Palatine again protested to the *Reichstag* Frederick the Great promised his protection to the Count Palatine Charles, and after he had assured himself of the co-operation of the elector of Saxony, invaded Bohemia in June 1778 The War of the Bavarian Succession came to an end without a decisive battle The Empress Maria Theresa, who from the beginning had disapproved of her son's actions, at once initiated negotiations with Frederick that led to the Peace of Teschen (May 13, 1779) Austria received only a small district in Bavaria, the so-called Innviertel, and renounced all claims to the Bavarian inheritance

The League of Princes.—Empress Maria Theresa died on Nov. 29, 1780 Joseph II now became sole ruler in Austria, Bohemia and Hungary Whilst he sought, by far-reaching laws, to transform these States into a single unitary state under German rule, to free the peasants and to reduce the influence of the Church, he pursued his old schemes in foreign policy He purchased the support of the empress of Russia by promising her his help in forwarding the realization of her Eastern policy, and he resumed afresh his negotiations with the elector Charles Theodore for the cession of the whole of Bavaria to Austria This time he offered him in compensation Belgium and the title of king of Burgundy Charles Theodore was not unwilling to accept the emperor's offer, but once again the Count Palatine Charles raised objections and called upon Frederick the Great for aid Frederick seized the opportunity to put into execution a long cherished plan He had had sufficient experience of the unreliability of foreign alliances, and he now thought to increase the status of Prussia by means of an alliance with the more powerful German princes As these all felt themselves threatened by the emperor's action, Frederick found them more sympathetic to his idea than before On July 23, 1785 the League of German Princes was concluded between Prussia, Saxony and Hanover, to which were later added Saxe-Weimar, Saxe-Gotha, Palatine-Zweibrucken, Brunswick, Baden, Hesse-Cassel, Anhalt, Ansbach, Mecklenburg, the elector of Mainz and some other smaller States. The preservation of the integrity of the imperial constitution was the aim and object of this league When the emperor saw that the majority of the German princes had united to oppose his projects, he was obliged to abandon them

The German League of Princes was an important forerunner of the subsequent development, since this was the first occasion on which an alliance of the majority of the German States under the leadership of Prussia and in opposition to Austria, had been

successfully concluded, yet it was not regarded by Frederick the Great and the majority of its members as a permanent institution. It was called into being by the menace of Joseph II.'s projects for adding to his possessions and lost its significance with the complete abandonment of those projects by Joseph's successors. Of all its members, only Duke Charles August of Saxe-Weimar sought to give it a more far-reaching character. He thought to endow the League with a permanent constitution and to establish a common legal, financial and customs administration, supported by a joint army. The League would then have taken the place in German political life of the old empire now crumbling into ruins. His plans, however, awakened no response in the other members of the League.

The establishment of the League of Princes was the last political act of Frederick the Great He died at Sans Souci on Aug 17, 1786, lonely as he had lived, feared and admired by his contemporaries but not loved The Emperor Joseph II in the last years of his reign threw himself into vast undertakings in the East The war against Turkey into which he entered in alliance with Russia, ended disastrously for Austria and threatened to involve the empire in a European war, when Joseph II died on Feb 20, 1790 As his successor, the Electors chose his younger brother, Leopold II, grandduke of Tuscany, who ruled for only two years A peaceable, prudent and farsighted man, Leopold at once sought to restore peace in the East; to bring about friendly relations with Prussia, to overcome the mistrust aroused in the German princes by the adventurous schemes of his brother; and to quiet the disorder that had arisen within his dominions in consequence of the hasty reforms introduced by Joseph II.

THE REVOLUTIONARY AND NAPOLEONIC PERIODS

After the outbreak of the French revolution, the ideas of Liberty, Equality and Fraternity also became popular among the educated classes in Germany In Germany the proceedings of the first National Assembly were regarded as an attempt to put into practice in political life the great principles of reason, but public opinion was sobered and disillusioned when the Reign of Terror followed and complete anarchy and insecurity of life and property seemed to be the immediate and the inevitable consequences of revolution As yet the lower classes were not sufficiently independent to take a lively interest in these questions Only in the Rhineland, which was soon afterwards invaded by the French, was there any real agitation

There was at first friction between the new rulers in France and the neighbouring German princes when the National Assembly wished to put the decree abolishing feudal rights into practice in Alsace, where many German princes had extensive estates The princes called on the emperor and the empire for help against the execution of the French law. But the farseeing prudent emperor had little desire to be involved for such a cause in a war with France Day by day the bands of French emigrés seeking refuge in Germany grew in number They found asylum at the courts of the west German princes who permitted them to enlist and arm volunteers The French saw in this a threat to their territory and demanded the disbandment of these troops But even this dispute would not have led to an outbreak of war, if it had not been that the course taken by the Revolution and the attempted flight of Louis XVI in 1791 placed the lives of the French royal house in danger Queen Marie Antoinette was the sister of the Emperor Leopold, and long ago she had entreated her brother to support her and her husband But Leopold considered that this would only be possible if concerted action were taken by all the great European Powers He invited the sovereigns of Europe in a circular note of July 6, 1791, to make common cause with him on behalf of the French king and queen His proposal was energetically supported by Frederick William II of Prussia, who met Leopold at Pillnitz on Aug. 27, to discuss what further measures should be taken. The representatives of the French emigrés and especially Count d'Artois, the younger brother of Louis XVI, came to Pillnitz to solicit help They were informed that the German States could only contemplate taking measures which would permit the king to decide as to the acceptance of the new constitution in complete freedom if the non-German Great Powers also promised their support When, however, the National Assembly, after it had completed the drafting of the constitution, set the king at liberty, and when he accepted the constitution without any outward signs of intimidation, Leopold declared in a circular note of Nov 12, addressed to all the Great Powers, that he considered the king's acceptance to have been a voluntary act and that the necessity for intervention by the Great Powers no longer existed

Meanwhile the earlier Declaration of Pillnitz had become known in France through emigrés, and had there aroused fierce resentment In consequence of the threatening speeches delivered in the National Assembly, and the growing influence of the extreme elements, the emperor found it necessary again to contemplate the assembling of a European congress After he had concluded a defensive alliance with the king of Prussia for the maintenance of the integrity of their respective dominions, Leopold despatched a sharply-worded note to the French Government in which he announced that the growing disorder in France and the steadily increasing influence of the war-party, compelled him to take defensive precautions on the frontiers of the empire The Gironde, which had now taken complete control of the Government, demanded that the emperor should cease all military preparations immediately and abandon explicitly the European congress. But when this reply reached Vienna, the Emperor Leopold had just died (March 1, 1792). His son, Francis II, at once returned the answer that he could not grant either request until the complaints of the Alsatian princes had been settled and a Government had been set up in France able and willing to carry out treaty obligations. On receipt of this reply, the French Government declared war on April 20

War with France.—It is therefore not true to say that Prussia and Austria united to make war for the purpose of crushing revolutionary ideas; on the contrary, they desired to avoid war, whilst the Girondists in Paris were loudly demanding it Obviously, when such a war once broke out, it would of necessity be a war for the principles of Government, for the enforcement of the ideas prevailing in the age of absolutism against the new ideas born of the revolution

The Austro-Prussian campaign against France did not begin until the autumn of 1792 From the very outset, its progress was crippled by the fear that the Empress Catherine would seize the opportunity presented by the preoccupation of the allies in France to annex the whole of Poland The chief command was entrusted to the old duke of Brunswick, who increased the resentment of the French by issuing an imprudent and tactless manifesto to his armies But since the French troops were ill-equipped and badly led, the German armies succeeded in capturing Verdun and advancing as far as the passes of the Argonne But here the Duke of Brunswick delayed his attack so long that the French were able to bring up reinforcements for the defence of the passes The bombardment of the Heights of Valmy (Sept 20) had no decisive result Brunswick did not dare to attempt a general assault, or to advance any further since his line of retreats might be threatened Since moreover differences of opinion had meanwhile arisen between the Austrian and Prussian commanders and news had arrived that a Russian army had, in fact, marched into Poland, Frederick William II, who was present with the army in person, decided to order a retreat The Allies' attack on France was thus frustrated As Goethe rightly says Valmy marks the beginning of a new epoch in history

While it was yet winter the French took the offensive, and occupied Speyer, Worms and Mainz, but failed to obtain more than a temporary grip upon Frankfurt-on-Main Wherever the French troops came they set up Jacobin clubs and sought to win over the population to revolutionary ideas In this they were at first successful; but it was soon clear that the Paris Government was more concerned in plundering the financial resources of the occupied districts than in their liberation As soon as the inhabitants realized this public opinion turned against the French The threatening advance of the French on the Rhine again forced the two German Powers to take vigorous steps During 1793 the

French were again driven out of Belgium, the greater part of which they had occupied Mainz was recaptured and the German troops entered Alsace It was not until the following year that the French were able by their victory at Fleurus to reconquer Belgium, to regain possession of Alsace, and to advance on the Lower Rhine even as far as Aix-la-Chapelle and Cologne They were able to do this chiefly because Prussia had virtually retired from the war because Polish affairs demanded her whole attention

The Second and Third Partitions of Poland.—In the autumn of 1792 negotiations were initiated between Russia and Prussia for a new partition of Poland. On Jan. 23, 1793 a treaty was signed by which Prussia obtained Danzig, Thorn, Posen and an important share of Poland, Russia receiving the greater part of Lithuania. Austria obtained nothing but was promised assistance in reconquering Belgium The Emperor Francis felt that he had been cheated, and his distrust of Prussia steadily increased from that time Of the former Polish kingdom, only a small and unimportant part remained in existence The opposition displayed by the Poles to the occupation of the partitioned districts was forcibly crushed by Russia and Prussia Both these States henceforth believed that the only security against a repetition of such occurrences lay in a complete partition of Poland But this time Austria had to be given a share of the plunder, and, after lengthy negotiations, the Third Partition Treaty was signed, in Aug. 1795 Prussia obtained the Polish capital, Warsaw with the district up to the Bug and Memel, Austria got West Galicia and Cracow; and Russia received all eastern Poland together with Courland The treaty was immediately put into force, and thereby the old Polish kingdom erased from the map of Europe without any attempt having been made to consult the wishes of the inhabitants. The partition was a simple act of violence characteristic of the *Kabinetspolitik* of the 18th century

Basle, Campo Formio and Lunéville.—Shortly before this Frederick William of Prussia had signed at Basle (April 5, 1795) a separate peace with France in order to leave him free to deal with affairs in the East By this treaty the left bank of the Rhine was given over to France, while Frederick William reserved the right to demand in compensation for Prussia's possessions that North Germany, north of a line drawn from the Rhine to Silesia, should be declared neutral, the French troops were not to enter this area, in return for which Prussia guaranteed to use her influence to prevent the North German princes from supporting the emperor against France. Thus Prussia once more resumed the anti-Austrian policy which she had for some years abandoned to make common cause with Austria against France

Austria continued to carry on the war, with the financial support of England, for a further two years until she was compelled, as a result of Napoleon's masterly Italian campaign, to conclude the Peace of Campo Formio (Oct 1797) The emperor was forced to surrender Lombardy and Belgium to France and received in return Venetia, Istria and Dalmatia He was also forced to agree to the cession of the left bank of the Rhine to France The German princes who suffered a loss of territory in consequence of this cession were to be compensated on the German right bank of the Rhine, and their claims were to be dealt with individually by a congress which was to meet at Rastadt

This congress actually met But before it had completed its labours, war had broken out anew On the death of the Empress Catherine II (1796) her son Paul I had succeeded to the throne; he was a bitter enemy of the revolution Since Austria, too was eager to throw off the hard terms of the treaty of Campo Formio, the English minister, Pitt, was able to build up a new alliance against France. The greatest of the French generals, Bonaparte, had embarked on his expedition to Egypt, and the moment therefore seemed specially favourable for a renewal of the war Under the leadership of the Russian General Suvarov, the allied army drove the French out of Italy in 1799; but an attempt to expel them from Switzerland miscarried. Before Suvarov had arrived with Russian reinforcements, the Austrian army had been defeated near Zurich. The French were also victorious over the English troops in the Netherlands, and, when Napoleon returned from Egypt in the autumn of 1799 and took over the supreme command, the French armies again resumed the offensive By their victory at Marengo (June 14, 1800), they won back Italy They also advanced victoriously into southern Germany. Under these circumstances, the allies decided to treat for peace with Bonaparte, who had in the meantime become head of the French republic as first consul By the Peace of Lunéville (Feb 9, 1801) the cession of the left bank of the Rhine to France was confirmed Peace between France and England was signed in the following year at Amiens

Napoleon and the German Princes.—Negotiations now began in Germany for the compensation of the German princes who had incurred losses on the left bank of the Rhine The *Reichstag* appointed a special commission for this purpose, but the settlement really lay in the hands of the great Powers, especially France. Napoleon came to an understanding with Russia and Prussia to divide up the ecclesiastical states and the majority of the imperial cities among the injured princes Bavaria, Wurttemberg, Baden and Hesse were won over by promises of especially large compensation, finally, Austria was drawn in, since although she was reluctant to assent to such a great diminution in the Catholic elements in the *Reichstag* she gave up her opposition as unavailing On Feb 25, 1803 the results of the negotiations were embodied in the final decision of the commission (*Reichsdeputationhauptschluss*) 112 states were apportioned, out of which in the first place certain foreign princes who had sustained losses elsewhere, had to be compensated Thus the hereditary Stadholder of the Netherlands who had been driven from his dominions, was given the abbacy of Fulda and certain adjoining districts; the duke of Modena the Breisgau, and the grand duke of Tuscany, the archbishopric of Salzburg Prussia was indemnified by the bishoprics of Munster, Paderborn and Hildesheim in addition to Erfurt and a number of imperial cities in central Germany, Bavaria received the bishoprics of Wurzburg, Bamberg, Augsburg and Freising with a number of South German imperial cities, Wurttemberg, Baden, Hanover and Oldenburg were similarly greatly increased in area The map of Germany was entirely altered by these political changes which marked only the beginning of a transformation that was to be carried still further three years later

The Confederation of the Rhine and the Fall of the Empire.—Meanwhile war had again broken out between France and England Russia and Austria made common cause with England, Prussia remained neutral Napoleon's great victory at Austerlitz on Dec 2, 1805 decided the war in his favour The tsar withdrew to Russia, and Prussia, which in consequence of a violation of its territory by French troops was on the point of declaring war on France, again entered into an understanding with the emperor Austria, however, was forced to sign the unfavourable Peace of Pressburg on Dec 26, 1805, to surrender Venetia to the kingdom of Italy recently founded by Napoleon, Tirol to Bavaria, and her remaining Suabian lands to Wurttemberg and Baden As compensation, she received only the archbishopric of Salzburg; its former possessor, the grand-duke of Tuscany, being compensated by Würzburg The emperor was also forced to recognize the elevation of Bavaria and Württemberg to the status of kingdoms Napoleon set up in the Rhineland a new grand-duchy of Berg for his brother-in-law General Murat

Napoleon now resolved to unite the States which he had created, or enlarged, in a permanent confederation, and on July 12, 1806 he founded the Confederation of the Rhine, which, apart from some small states, included Bavaria, Wurttemberg, Baden, Hesse-Darmstadt, Nassau and Berg The territories of the counts and knights of the empire, which lay between these states, were divided up among them. Thus, the boundaries of the South German States were laid down by Napoleon much as they exist in the 20th century Their rulers feared therefore lest Napoleon's defeat would involve them in the loss of all that they had gained The States of the Confederation of the Rhine remained independent for internal administration, but could not pursue an independent foreign policy and were required to place their troops at any time at the disposal of Napoleon, who had been nominated

the official protector of the Confederation. The members of the Confederation informed the emperor and the *Reichstag* that they regarded themselves as having ceased to be members of the empire, and that this had ceased to exist (Aug 1, 1806). The emperor therefore laid aside the German Imperial crown on Aug. 6, having already assumed the title of emperor of Austria in 1804 The old German empire, in existence for almost 1,000 years, wholly disappeared, and the complete independence of the individual States which had grown up on its territory was legally recognized. Germany became a geographical expression, and lacked any political unity

Napoleon's War with Prussia.—Napoleon now thought that his day of reckoning with Prussia had come. Thanks to his too cautious and wavering policy, Frederick William III found himself without support before the might of the French emperor Frederick William was indeed able to conclude a defensive alliance with Russia, when Napoleon's threatening speeches left no doubt as to his intentions, but, except for Russia, Prussia had as supporters only electoral Saxony and certain small North German States. When Napoleon occupied certain Prussian districts on the Rhine in order to hand them over to the grand-duchy of Berg, and when he demanded that Prussia should recognize as valid this act of violence and completely disarm, Frederick William replied with an ultimatum in which he required Napoleon to evacuate Southern Germany As Napoleon naturally refused to comply with this demand, war broke out between France and Prussia in Oct 1806

The defeat sustained by the Prussian armies at Jena and Auerstadt on Oct 14, had in fact already decided the fate of the Prussian kingdom Napoleon entered Berlin in triumph; Frederick William was compelled to fly to Konigsberg The whole of northern Germany was occupied by the French, and only a few Prussian fortresses put up a successful resistance The elector of Saxony made peace with Napoleon and entered the Confederation of the Rhine in return for the conferment of the royal title If the tsar had not at this moment come to her aid, Prussia would have been wholly destroyed The bloody contests on the battlefields of West and East Prussia during the early months of 1807 failed to bring about a decisive victory Napoleon therefore thought the moment favourable to enter into peace negotiations with the tsar, which resulted in the Peace of Tilsit (July 7, 1807) Although Prussia continued to exist as a kingdom, she was forced to cede her entire possessions west of the Elbe in addition to the greater part of her acquisitions in the last partition of Poland A vast war indemnity was demanded from her, and, until it had been paid in full, she was required to consent to the occupation of her most important fortresses by French troops and to undertake not to maintain an army of more than 42,000 men Out of the territory between the Elbe and the Weser ceded by Prussia Napoleon created the kingdom of Westphalia, with which he incorporated the territory of the elector of Hesse-Cassel, who had been dispossessed He made his brother, Jerome, king

Germany Under Napoleon.—While the attention of Napoleon was fully engaged in the south during the next few years in dealing with the revolt of the Spaniards, Austria made another attempt in 1809 to regain her old position. As Russia refused her aid, and Prussia, after her defeat, was unable to help, the war once more ended in the total defeat of Austria (Wagram, July 6, 1809) The Peace of Vienna (Oct 14) deprived Austria of Salzburg, Galicia, and Istria Napoleon erected a grand-duchy of Warsaw out of the former Polish possessions of Austria and Prussia, and made the king of Saxony grand-duke, whilst Dalmatia (already ceded by the Treaty of Pressburg) and Istria were united to France under the name of the Illyrian Provinces

Although he was victor in this war, Napoleon saw with anxiety the excitement these events aroused in the whole of Germany. Bodies of volunteers were formed in various districts to offer their assistance to Austria—such as those organized by Major von Schill and Duke Frederick William of Brunswick. Despite the fact that these movements met with no success, Napoleon deemed it necessary to unite the north of Germany still more closely with France, and, in 1810, with the exception of Holland, he annexed all the German districts lying northwest of a line drawn from Cologne to Lubeck and formed them into departments after the French model He had now attained to the zenith of his power; while his marriage with the daughter of the Emperor Francis had brought his dynasty within the circle of the ancient ruling houses of Europe But a change came over the scene with his Russian campaign in 1812, in which the French army was almost entirely destroyed, a miserable remnant alone surviving to reach Germany in the winter

The War of Liberation.—It was only natural that Germany should seek to utilize Napoleon's heavy defeat to shake off his rule; but there was wanting a single directing will in a country that was governed in part by princes that were vassals of France and in part occupied by French garrisons The population of North Germany, where the rule of the foreigner had been felt most strongly and oppressively, was filled with a wild hatred against the French, in the south, where native princes still ruled and no foreign troops or officials had penetrated, emotions were less violent For the first time the educated classes in Germany became inspired by a feeling of world-citizenship and learnt to understand the importance of a national state in the common life of a people The rulers of the greater States however, still hesitated to come to a definite decision The Emperor Francis did not wish to fight against his son-in-law, and Frederick William of Prussia feared that he might lose the rest of his kingdom if the new war should prove unsuccessful Only when the Russians seemed determined to pursue their fight with Napoleon on German soil, were the German princes forced to decide on which side they would fight At Napoleon's bidding, Austria and Prussia had been forced to send reinforcements to help him against Russia The commander of the Prussian contingent, General York, acting on his own responsibility, concluded a treaty of neutrality with the commander of the Russian forces opposing him But it was only under pressure from the Emperor Alexander of Russia that Frederick William finally decided to address from Breslau the "Appeal to my People" (*Aufruf an mein Volk*) in which he declared war against France This proclamation gave the signal for a general rising in Northern Germany against Napoleon Volunteers enthusiastically rushed to arms, and the Russian and Prussian troops were already on the Saxon frontier while Austria still remained neutral

Napoleon hastened to the defence of his German allies, defeated the Russians and Prussians at Grossgorschen and Bautzen, and forced them to retreat to Silesia Feeling himself unable to prosecute the campaign to a final victory Napoleon concluded an armistice during which peace negotiations were opened at Prague through the intermediary of Austria Napoleon, however, was unwilling to surrender any of his conquests, and so, after much hesitation the Emperor Francis finally made common cause with the allies and declared war on France on Aug 12, 1813 Since England gave financial support to the allies, and the Spaniards, in conjunction with an English army, advanced from the south against France, Napoleon found himself opposed by almost the whole of Europe After many changes of fortune, the campaign in Germany finally ended in the defeat of Napoleon at the "Battle of the Nations" at Leipzig (Oct 16–19, 1813) The French army had to retreat over the Rhine, the allied forces followed them slowly; on New Year's Eve 1814, they crossed the Rhine and advanced into northern France By the end of March 1814 the allies were in possession of Paris Napoleon was compelled to abdicate his throne and appeal to the mercy of his enemies He was banished to the island of Elba The house of Bourbon was restored to power, and, by the First Treaty of Paris, France was forced to abandon all the conquests she had made since 1792. (*See* also NAPOLEONIC CAMPAIGNS, etc)

The Reconstruction of Germany.—With the removal of the foreign rule of the French the difficult question of Germany's future organization arose. Austrian policy, now inspired by Metternich, aimed at preventing Prussia from becoming too powerful and desired to draw to itself the German princes who had been allied with Napoleon The Emperor Francis signed the Treaty of

Ried with the king of Bavaria, by which the latter was assured of full sovereign rights in his former dominions, and similar treaties were concluded with Wurttemberg, Baden and the other states in the former Confederation of the Rhine. Thus it was no longer possible to regard these States as captured districts to be divided up among the victors In northern Germany Hanover, whose ruler was the king of England, also remained intact Moreover it seemed unjust to exclude from their territories the princes whom Napoleon had exiled whilst preserving the vassal states which he had created Under these circumstances it became excessively difficult to find a means of giving expression to the political unity of Germany.

At the Congress of Vienna, which sat from Sept. 1814 to June 1815, the German question was one of the most difficult of the problems under consideration Finally it was agreed that Austria should recover her former possessions in Germany, with the exception of the scattered territories in Suabia, and in addition Salzburg, Venetia, Milan and Dalmatia. In return she was forced to abandon Belgium and hand over to Russia all her Polish acquisitions with the exception of Galicia Prussia obtained in eastern Germany only West Prussia and Posen, but received as compensation for the rest of Poland (given to Russia) Westphalia, the Rhine province and the former Swedish province of Upper Pomerania, in addition to a considerable portion of the Saxon electorate She renounced the South German districts of Anspach and Bayreuth, which were given to Bavaria together with Wurzburg and the Palatinate lands lying on the left bank of the Rhine The other territorial changes were of less moment There now remained in Germany 39 different States, of which four were the free cities of Hamburg, Bremen, Lubeck and Frankfurt the remainder possessed monarchical constitutions The idea of a restoration of the empire was abandoned, and the 39 states formed a union of which the constitution was laid down in the Federal Act of June 8, 1815. The common organ of the Confederation was the diet at Frankfurt-on-Main of which Austria was given the presidency. The organization of a federal army and the construction of a number of federal fortresses was also contemplated The chief aim of the Confederation was the common defence of the federal territory against foreign attack whilst the individual States retained full sovereignty in their internal affairs. Even the establishment of a supreme court of justice for the Confederation proved impossible As any change in these basic principles could only be effected by an unanimous vote, an extension of the competence of the Confederation was practically impossible The Prussian provinces of Prussia and Posen, and the Austrian territories in Galicia, Hungary, Milan, Venetia and Dalmatia, were not included in the Confederation The Confederation could at the most prevent war between the German States and if necessary ward off foreign attack upon its territory, but it could never establish the principle of a German political entity

Whilst the congress was sitting at Vienna, Napoleon escaped from Elba to France and once more sought to win back his former empire This danger forced the States which had up to that time been allies to hasten on their union to prepare themselves for common defence Napoleon's defeat at Waterloo and his imprisonment on St Helena set this new order of things on a firm basis By the Second Peace of Paris (Nov. 20, 1815) France was compelled to cede Saarlouis and Saarbrücken to Prussia and Landau to Bavaria; but she retained possession of Alsace and Lorraine

THE GROWTH OF PRUSSIA

After the restoration of peace the German Governments endeavoured to restore absolutism as far as possible and to efface the effects of the French Revolution in this Austria took the lead Prince Metternich who, as chancellor, was the leader of Austria, was the real exponent of reactionary principles In his eyes the maintenance of monarchical authority was essential to political stability He was therefore an enemy to all liberal and democratic ideas Moreover in the conception of nationality he perceived a present danger to the stability of Austro-Hungary At the moment of his accession to power the various peoples in the Danubian monarchy were striving for autonomy and even questioning the further existence of the Habsburg rule A man of unusual ability, great diplomatic skill and inflexible will power, Metternich was able to persuade the other princes to accept his ideas. His programme was indeed, purely negative and ultimately amounted to no more than the retention of existing institutions no matter how outworn they might be

Reaction.—Prussia had no cause to oppose national and liberal claims But Frederick William's dislike for everything that reminded him of Jacobinism made him willing to listen to Metternich's proposals Then, too, there was the instinctive dislike of the nobility living east of the Elbe, with whom the Prussian kingdom was in very close relations, to every concession to liberalism Only the desperate state of affairs after the Prussian defeat at Jena had induced the king and the nobles to allow reforms to be introduced into the political life of the State For these reforms Hardenberg and Stein had fought with the object of interesting the nation in public affairs and securing their co-operation in the work of government Once the danger had passed, the reforms fell into abeyance The freedom accorded to the peasants and the autonomy granted to the towns did, indeed, remain, but the idea of completing the work through the introduction of autonomy into the provincial administrations and through the creation of a popular representation, as had been intended by Stein, was bitterly opposed by the king, and Hardenberg was too old and too yielding to oppose him energetically. But the reforms that had been effected in the very foundations of the Prussian State had introduced an element of liberty that was capable of further development On the outbreak of the War of Liberation the king had pledged his word that for the future he would not raise new taxes nor loans without the assent of the estates The natural result of his promise would have been to revive the diet Hardenberg indeed sought to revive it, but the king invariably postponed the fulfilment of his request, and, after Hardenberg's death, the influence of Metternich was so strong that the idea was wholly abandoned, it was considered sufficient to create in 1823 provincial diets in each individual province of the monarchy, who however, could deal only with provincial affairs and whose deliberations might not be published By rigid economy, the king was up to the time of his death able to avoid the necessity for new taxes or loans and thus evade the fulfilment of his promise

A complete return to absolutism in the South German states, where many institutions from France had been introduced in the days of the Confederation of the Rhine, appeared impossible Bavaria and Baden received constitutions in 1818, and Wurttemberg in 1819 A general assembly had been instituted consisting of two chambers, the first chamber was mainly composed of the royal princes and great territorial nobility, the second chamber too, was on a very restricted franchise based on a tax qualification favouring the owners of landed estates, the lower classes in the community thus being wholly unrepresented The assent of the diet was necessary in future for all legislation, yet this assent was only required for the imposition of new taxes whilst existing taxes continued to be levied without special consent It had, therefore, only limited control of the budget. The ministers depended solely upon the pleasure of the king and could only be impeached in cases where it was proved that an infringement of the constitution had taken place Similar constitutions were introduced in Nassau and Saxe-Weimar But in the remaining German states absolutism prevailed

The great German States were displeased with what they regarded as too far-reaching concessions on the part of the South German princes They seized the opportunity presented to them by the manifestation of liberal tendencies at the festival on the Wartburg at which the German students celebrated the tercentenary of the Reformation (1817) and the murder of the Russian spy and popular novelist Kotzebue, to summon the representatives of the greater German States to a conference at Carlsbad for the purpose of consulting upon new measures against the revolutionary spirit manifested in these occurrences This resulted in the Carlsbad Decrees establishing a censorship of books and newspapers and a drastic supervision of the universities The decrees were adopted by the diet under pressure from the greater States,

and a resolution passed declaring that no German prince had the right to make concessions to his subjects that involved an infringement of his sovereignty. These decrees were also embodied in the final Act of the Vienna Congress in 1820 and thereby became a fundamental law of the German Confederation At the same time a central commission was set up in Mainz to detect and suppress all democratic movements.

In foreign policy Prussia and Austria were also of one mind in the following years Their object was to support the cause of established authority throughout the world and to combat the further dissemination of revolutionary ideas. In this they were in full agreement with the Tsar Alexander, and in the Holy Alliance (*q v*), which was concluded in 1815 between the rulers of Austria, Prussia and Russia, their ideas were given very clear expression The allied powers made common cause against the revolutionary movements in Italy and Spain, and at the congresses held at Aix-la-Chapelle, Troppau, Laibach and Verona (1818–23 *qq v*) the measures to be taken were discussed and determined Only when differences of opinion arose between Austria and Russia at the time of the Greek revolt against Turkey, was the Holy Alliance loosened and ultimately dissolved, and for long afterwards its renewal was one of the basic principles of the policy pursued by the rulers of the three Eastern Powers.

1830.—For a decade after 1815 Germany enjoyed outward peace and internal order. Those elements which were striving for a more liberal form of constitution and stronger national unity did not dare openly to reveal their aims oppressed as they were by police supervision and continual persecution After the great upheaval of the War of Liberation the mass of the population sank back into their old indifference Even the July Revolution of 1830 in Paris had no important effect in Germany The sole result of the small risings that broke out here and there throughout the country was the introduction of constitutional government in a few more of the small States Saxony, Hanover and the electorate of Hesse received constitutions that differed but little from those already in operation in the South German States. Duke Charles of Brunswick, who was a violent despot, was driven out of his dominions, and his brother William became duke in his stead Both the great German Powers remained undisturbed by the agitation, and under their influence the *Bundestag* at Frankfurt laid upon the individual States the duty of supporting each other against rebellious movements, and decreed that no *Landtag* had the right to refuse taxes to the ruler Political associations and meetings were forbidden, the police system further developed, and the freedom of the Press still more curtailed. No printed matter of less than 20 pages could be published without the permission of the police When the elector of Hesse withdrew the constitution which had recently been granted the *Bundestag*, to which the Hessian diet had appealed for protection, refused to intervene against this flagrant infringement of an established right by a German prince A similar situation arose a few years later in Hanover After the death of William IV of England (1837), the personal union between Hanover and England was dissolved in consequence of the existence of a different law of succession in each kingdom Whilst William was succeeded upon the throne of England by his niece Victoria, his successor in Hanover was his brother Ernest Augustus The latter arbitrarily set aside the constitution granted by his brother and introduced another which gave to the *Landtag* considerably restricted powers When seven professors of the university of Gottingen refused to take the oath to the new constitution because they deemed themselves bound by their oath to the former, they were deprived of their professorships Against all these violations of the law no protection was to be found in the *Bundestag*. The increasing bitterness of the population did indeed find expression from time to time in speeches like those held on the occasion of the Hambacher Festival in 1832 and in the quickly suppressed rising at Frankfurt against the *Bundestag* (1833). The only result of these unsuccessful efforts at revolt was the tightening up of police supervision, they did nothing to remedy the state of affairs

While thus political affairs were in a state of complete paralysis, in intellectual life new forces were beginning to appear and found expression in the writings of the so-called "Young Germany" group Heine, Borne, Gutzkow, and Laube were the literary protagonists of the younger generation who demanded greater intellectual and political liberty. Their writings, which were condemned by the *Bundestag* as dangerous to the State, nevertheless enjoyed a wide circulation and influenced to a steadily increasing degree the ideas of the educated classes A new energy also became manifest in the sphere of economics, and a great step forward was taken with the founding of the German Zollverein in 1834.

The Zollverein.—By the Customs Law of 1818 Prussia had already removed the customs tariff between the individual provinces; stopped the levying of taxes on the frontier, introduced a simple system of calculation based on the weight, and, finally, had removed or lowered the customs duties on many classes of goods The inclusion within the Prussian State of many small political entities rendered it impossible to achieve a rational organization of the customs service unless these entities accepted that system This was first done by Schwarzburg and Anhalt, but in 1828 one of the greater States, Hesse-Darmstadt, joined the system Hesse-Darmstadt adopted the Prussian customs tariff, the revenue was to be paid into a common treasury and subsequently divided between the two States in proportion to their respective populations Shortly afterwards Bavaria and Wurttemberg entered into a customs union Prussia entered into negotiations with them also and the central German States, fearing that an agreement between North and South Germany would be reached over their heads, felt compelled to join the union After Jan 1, 1834, with the exception of Austria, Hanover, Oldenburg and the three Hansa cities, Germany formed an economic entity Internal communication was thereby immensely simplified, the price of goods lowered and a greater uniformity in prices achieved, and consumption and production stimulated The introduction of a uniform system of weights, measures and currency was the natural consequence of this customs union At first the establishment of the customs union exercised no important influence on political life The States that formed the union under the leadership of Prussia felt no obligation to unite themselves with her in political questions The existence of the customs union did not prevent the economically allied States in 1848 and 1866 from engaging in political and military strife with one another, and it was not until later that Bismarck was able to utilize the union for the furtherance of his schemes for national unity Yet it was not without importance for the future overcoming of provincial differences that from this time forward at least a greater part of Germany formed an economic entity The desire to form the German States again into a political entity was confined to the intellectual leaders of the middle classes and only occasionally found literary expression In this connection the most important publication was *Briefwechsel zweier Deutscher* by Paul Pfizer of Wurttemberg (1831) in which, for the first time, expression was given by a South German to the belief that such a union could only be initiated by Prussia, since Austria had ever since the Reformation been so estranged from German life and thought she was no longer in a position to become the leading power in Germany

Frederick William IV.—In view of the predominating influence which Austria and Prussia possessed over Germany's destiny, it was of great importance for future developments that in both States there occurred, at this time, a change of rulers On March 2, 1835 the Emperor Francis I of Austria died, and was succeeded by his mentally feeble son Ferdinand The actual Government was carried on by a state council composed of the brother and uncle of the emperor together with Prince Metternich and count Kolowrat As Metternich remained the guiding spirit of the administration, little real change took place in the policy of Austria Of far greater importance was the change of ruler in Prussia. Frederick William III died on June 7, 1840, after a reign of 43 years He was succeeded by his eldest son Frederick William IV who was then 45 years old. A man of unusual ability and many-sided interests, he was both a brilliant orator and an original thinker, but he was less suited to the practical duties of a statesman Frederick William IV was steeped in the spirit

of that romanticism which in his youth had played the leading rôle in the intellectual life of Germany. As a fervent Christian, he regarded the execution of his kingly office as a religious duty, and believed it to be his duty to make the principles of Christianity a factor in politics He regarded himself as the divinely appointed father and guardian of his people, and he saw in the desires and ideals of democracy and liberalism a revolt against God, an attempt on the part of mankind to substitute human intelligence for the divine laws as the highest guiding principle in the settlement of all national problems His ideal was the old German *Standestaat* He hated France as a source of godless revolutionary ideas, and considered that in foreign policy also the conservative States based on the old divinely appointed order must hold together in opposing revolutionary tendencies He was indeed the embodiment of the basic principles of the Holy Alliance of 1815. He desired it is true to introduce certain reforms into Germany, for he sympathized with the national currents of feeling and wished to satisfy them; but even in this the existing order must be maintained in principle. Any diminution of the sovereign rights of the German princes seemed in his eyes to be a blow directed against the divine principle of legitimacy, and he hoped to achieve the necessary unity by means of voluntary cooperation on the part of the princes, under the moral leadership of Austria and Prussia

His attempt to organize Prussia in accordance with his ideals culminated in the summoning of a national parliament (1847) The members of all the provincial diets were to assemble at Berlin in order to deliberate with the king on affairs of State, when called upon by him to do so The final decision of all matters remained in the King's hands, and the *Landtag* was to have no definite rights nor any claim to be summoned at any regular intervals. In the speech from the throne with which Frederick William IV opened the deliberations he declared that no power on earth would induce him in any circumstances to change the natural relation between prince and people into a conventional and constitutional one and he would never consent that "a written document should, like a second Providence, intervene between God in Heaven and this land, to rule us with its paragraphs and replace our ancient holy loyalty" The *Landtag,* however, refused to play this rôle. When the King desired its consent to a loan for the construction of a railway between Berlin and Konigsberg, the *Landtag* declared that, in accordance with the promise made by the late king, the true diets must be summoned for this purpose It did not regard itself as the true diet because it had never been given the right to be summoned periodically A number of representatives of the middle classes in the Rhineland like Hansemann, Camphausen, Mevissen and Beckerath came into prominence in the *Landtag* as the spokesmen of liberal aspirations As the king refused to yield to these demands the assembly was dissolved without coming to any definite conclusion

The First Political Parties.—Whilst Frederick William's political experiments in Prussia were unsuccessful a strong political agitation arose throughout Germany The relaxation of the censorship had led to the strengthening of the desire for a freer political order and a closer alliance of the German States In the parliaments of the individual States also these desires found vigorous expression Political parties were gradually formed uniting groups of similar views in the different States It is true that they still lacked organization and a definite aim When in 1840 the international tension rendered the outbreak of war between France and the German great Powers a possibility, a strong national feeling was aroused in the people This again made itself manifest in 1846 when the king of Denmark sought to include the German inhabitants of Schleswig and Holstein within the frontiers of the Danish State The diets of Holstein, which was a member of the German Confederation, appealed for help to the *Bundestag* at Frankfurt. The *Bundestag,* however, contented itself with an expression of its belief that the king of Denmark would respect the rights of the Confederation and of the Holstein diets. It was everywhere felt that this supreme organ of the Confederation was not really capable of representing threatened German interests

Feeling was further excited by the appearance of new revolutionary movements in France, Italy and Switzerland. In Sept. 1847 the leaders of the democratic groups in the various German States met at Offenburg and drew up a programme of which the chief points were. entire liberty of thought and association; universal and equal suffrage; disbandment of the standing army and the introduction of a militia, a progressive income tax; trial by jury in all cases of offences against the Press laws; abolition of all class privileges; comfort, education for all; equalization of the disproportionate conditions existing between capital and labour, ministerial responsibility and the assembling of a German parliament. Behind, and inspiring the entire programme, lay the ideal of a German united republic In October the leaders of the moderate Liberals held a conference in Heppenheim at which they also demanded freedom of the Press, abolition of the feudal burdens, wider autonomy, an improvement in the system of taxation, and a closer union of the German States. The liberal ideal was the establishment of a constitutional federal state with monarchical rule in the individual States which should also be administered constitutionally In Feb 1848, in the diets of Baden and Hesse, the liberal representatives Bassermann and Heinrich von Gagern proposed the summoning of a German Parliament

The Revolution of 1848.—Feeling was thus already excited in Germany at the moment when the news arrived of the success of the February Revolution in Paris and gave the signal for action in Germany The movement first affected the smaller states in south-western Germany Rioting broke out everywhere, and the Governments, taken by surprise, at once yielded to the demands which were put forward by the people's assemblies They appointed liberal ministers and promised freedom of the Press and a constitution Within a few weeks the old ministries had been overthrown in Baden, Wurttemberg, Bavaria, Hanover, Brunswick, Hesse, Nassau, Thuringia and Saxony, and a new order seemed about to begin A conference of the Liberals met at Heidelberg on March 5, and demanded the immediate convocation of a German parliament The terrified *Bundestag* agreed to this demand and requested the German governments to send trustworthy councillors to Frankfurt to draft a constitution for Germany The success thus achieved, however, could only prove of more than temporary character in the event of the overthrow of the old order in both the great German States

In Vienna the Government did not dare to put up any real opposition to the demands of a population which was daily becoming more incensed Metternich was forced to resign and leave Vienna A national guard was organized and the summoning of a *Reichstag* conceded (March 13) The Hungarians, Bohemians, Southern Slavs and Italians in Lombardy and Venetia, simultaneously demanded autonomy and the granting of constitutions for their provinces It seemed as though the Danubian monarchy was about to be broken up into a series of separate states

On the approach of the revolution Frederick William IV had sought to pacify his subjects by certain concessions By the decree of March 14, he once more summoned the united *Landtag,* to which he now conceded the right of periodic assembly, and announced his readiness to collaborate in reconstructing the German Confederation He hoped thereby not only to retain his own position, but to be able to support the other States in combating the spread of revolutionary ideas But with the arrival in Berlin of the news of the occurrences in Vienna open revolt broke out Although the troops were victorious in the street-fighting of March 18, the self-confidence and determination of the king was shattered by the unexpected conduct of his "dear Berliners" At the request of a deputation which promised to remove the barricades, the king ordered the troops to evacuate their position thereby at once losing control of the situation so completely that the troops, which had at first been concentrated on the square in front of the palace, retired to their barracks The moment the troops disappeared a vast throng of people advanced before the palace, bearing with them the bodies of those killed in the defence of the barricades, and forced the king to uncover before the corpses A citizen guard was then organized, and assumed sentry duty in the palace, while the troops received orders to retire from Berlin

Thus the Revolution triumphed in Berlin also. The king prom-

ised to grant a constitution to Prussia to be drawn up by a National Assembly. On March 21, displaying the black-red-gold colours, the King went in procession through Berlin and announced that in these critical days he would assume the leadership of the German people and that Prussia in future would become part of Germany. The King himself never thought to strive in alliance with the Revolution for the overthrow of the individual States or their subjection to Prussia. But he had let himself be swept away by the tide of popular feeling and, from the moment he regained in some measure his self-confidence, he sought to avoid the consequences arising out of the concessions he had made in a time of excitement and danger. The new liberal ministry was headed by Camphausen, who had been one of the leaders of the opposition in the united *Landtag*

The fall of the old regime in the separate States was to be followed by a political re-organization of Germany A preliminary parliament met at Frankfurt and again demanded that a German National Assembly should be elected on a universal suffrage for the purpose of determining the future constitution of Germany The *Bundestag* hastened to organize the elections, but, as the democratic leaders in South Germany feared lest in the new parliament the moderate Liberals would be in the majority, they attempted to bring about the immediate establishment of a German republic by means of a great upheaval of the masses Their attempt met with little support, and the volunteer bands of peasants that they had assembled were easily dispersed by the troops of the South German Governments

The Frankfurt Parliament.—With the failure of the Governments in the course of the ensuing weeks to come to an agreement on the re-organization of Germany, the German parliament which assembled on May 18, in the church of St Paul in Frankfurt was given the task of determining the basic principles of a German constitution Heinrich von Gagern was elected president, and he induced the assembly on June 24, to set up a provisional central authority for Germany with an imperial regent (*Reichsverweser*) elected by parliament. The parliament elected archduke John of Austria, an uncle of the Emperor Ferdinand, whose election was recognized by the Governments The *Bundestag* now declared that its work had come to an end, and demanded that its authority should be handed over to the regent He, however, was never able to establish any real Government His attempt to place the troops of the separate states under his command was defeated In foreign politics, the two great German Powers refused to be influenced by Frankfurt, this was most clearly seen in the Schleswig-Holstein Question (*q v*)

In March 1848 Frederick VII of Denmark attempted to include the whole of Schleswig within his kingdom The inhabitants of Schleswig-Holstein protested against such a violation of their traditional rights and at the outset found support in Prussia and the National Assembly at Frankfurt. The Prussian general Wrangel, who was appointed to the chief command of the army of the Confederation, occupied Schleswig-Holstein and advanced into Jutland But when England and Russia seemed ready to support Denmark, Frederick William IV, who had long had scruples about supporting revolutionary subjects against their legitimate sovereign, entered into negotiations with Denmark, without consulting the Frankfurt government, and signed the Treaty of Malmo (Aug 26) By this treaty, it was agreed that the duchies should be evacuated by both German and Danish troops and the administration provisionally entrusted to a mixed commission of Germans and Danes.

The majority of the National Assembly were disposed to criticize sharply Prussia's arbitrary action; they determined to invalidate all measures taken in the execution of the treaty. When, however, the Frankfurt ministry found itself unable to bring Prussia to heel, the minister-president, prince von Leiningen, resigned and was succeeded by the Austrian, von Schmerling The national assembly was finally compelled to ratify the Treaty of Malmo because a breach with Prussia would have rendered the drafting of a constitution impossible The attitude of the national assembly was taken by the democrats for weakness They organized a rebellion in Frankfurt The ministers and the national assembly summoned to its aid the Austrian and Prussian troops from the federal fortress of Mainz After fierce street fighting in the course of which two members of the assembly lost their lives, the troops crushed the rising (Sept. 18) In consequence of having yielded to the pressure of the Governments, and of having even invited their help against the people, the assembly in great measure lost its former popularity

As time went on the difference between the parties in the assembly became more and more accentuated Whilst the democrats desired a united German republic, or at the most the establishment of an empire that should be wholly dependent upon parliament, the liberal majority wished to set up an hereditary empire alongside and above, the separate States In addition to the question of the form the State should take there was the equally important question as to whether the German possessions of Austria should belong to the new *Reich*. After the Austrian Government had suppressed the nationalist movement in Bohemia by seizing Prague, and also re-established order to some extent in Vienna, they had summoned an Austrian National Assembly to draw up a constitution for Austria A complete collapse of the Austrian monarchy, which had seemed imminent in the spring, was no longer to be feared That the emperor of Austria would consent to be subjected to the authority of a German emperor seemed no less improbable, while, if this dignity were to be conferred upon him, there was danger that the interests of the numerous non-German peoples within Austria would receive greater consideration than those of Germany Moreover it was doubtful whether Prussia would obey the dictates of an Austrian emperor If, however, the highest dignity were conferred upon the king of Prussia, German Austria would most certainly refuse to be included within the new empire Nevertheless the constitution in its final form favoured the latter solution of the problem, by declaring that in the future no part of the German empire could be joined with non-German lands to form a State The assembly then proceeded to lay down the fundamental rights of the German peoples and to declare that in future the army, foreign policy, economic affairs, posts and general legislation were matters for decision by the empire alone The more difficult question of the election of an hereditary emperor and the definition of his rights in regard to the parliament, was further postponed since there was no prospect of an agreement between the parties

Meanwhile the greater German States had recovered from the blow they had sustained in the spring On Oct 31 Vienna which had once more revolted was captured by Prince Windischgratz; the Austrian parliament was transferred to the little Moravian town of Kremsier The Emperor Ferdinand was persuaded to abdicate on Dec 2, and his nephew, Francis Joseph, who succeeded him appointed as minister-president Prince Felix Schwarzenberg, a man of ruthless will-power and strongly absolutist tendencies

The liberal ministry of Camphausen in Prussia was also dismissed during the summer, and, after various attempts to form a ministry that would be able to reach an agreement with the national assembly in Berlin over the question of the future constitution of Prussia had failed, the king entrusted Count Brandenburg with the task of forming a conservative official ministry The attempt on the part of the Berlin parliament to gain control over the army no less than its openly-avowed desire to base the constitution on democratic principles, had convinced the king of the impossibility of coming to an agreement with the assembly When the parliament resolved to remove the words "by God's grace" from the royal title, and to abolish the nobility, the king felt it impossible to carry on further negotiations He assembled 50,000 men under General Wrangel near Berlin, and informed the assembly on Nov 9, through Count Brandenburg, that they were adjourned until Nov 27, and would re-assemble in Brandenburg-on-the-Havel The parliament building was closed and occupied by Wrangel's troops When the king found that these measures did not arouse any serious opposition in the country, he determined to proceed still further So few representatives appeared at Brandenburg that no quorum could be obtained, it was therefore dissolved and the king immediately promulgated a constitution for Prussia (Dec 5) The task of revising and deliberating upon this

constitution was entrusted to a new parliament of two chambers. The constitution, indeed, contained far more concessions to liberal wishes than the king in the depths of his heart considered right; but his ministers had firmly insisted that the concessions promised in March should be carried out, at least to some extent Henceforth the rulers of Austria and Prussia were once more in full possession of their power, and it was therefore doubtful whether they would now suffer the national assembly in Frankfurt to draw up laws assigning to them their future position in Germany. Both Vienna and Berlin sharply repulsed all attempts of the national assembly and the regent to interfere in their internal dissensions The Austrian Government had even gone so far as to shoot two members of the Frankfurt parliament, who had taken part in the October Revolution, despite the fact that their parliamentary immunity was guaranteed in a law that had been recognized by that Government. Since the Frankfurt parliament had no means of compelling the obedience of the more powerful States to its decrees, the majority in the parliament, which had day by day come into closer union with the so-called "Hereditary Emperor Party" and moved further away from the party that favoured what was known as the "Small Germany" solution recognized that their task could only be achieved by gaining the agreement and help of the king of Prussia

But Frederick William IV 's whole view of life prohibited him from accepting the imperial crown from the hands of an elective assembly without the approval, or even against the will, of the other German princes At the same time he also believed a reform of the existing conditions in Germany to be necessary, and, before making any decisive move, he wished to come to an understanding with Austria over the reconstitution of Germany. This proved more difficult than he had anticipated Prince Schwarzenberg would have greatly preferred to dissolve the Frankfurt national assembly by force and to have set up a new German Confederation to include the whole Danubian monarchy. At its head there was to be a college of kings composed of the rulers of the six greatest German States —Austria, Prussia, Bavaria, Wurttemberg, Saxony and Hanover. The smaller states were to be entirely subjected to their authority. This would not have achieved the unification of Germany and would only have met liberal aspirations to a very limited extent. His main design was to diminish Prussia's influence by a constitution of this kind. For this very reason Frederick William IV refused to accept this plan. if it was contrary to his principles to increase the power of Prussia at the expense of the other German States with the help of the Revolution, he was no less determined not to permit Prussia to suffer any curtailment of her power

These differences of opinion between the Austrian and Prussian monarchs awoke in Ludolf Camphausen, who on his retirement from office had become Prussian representative in the central Government in Frankfurt, the hope that it might yet be possible to bring about an understanding between Frederick William and the Frankfurt parliament. He used the influence accruing to him from his position to pursue a policy of reconciliation and mediation But every attempt at reconciliation was doomed to failure, in consequence of the sharp contrast between the desires of the majority in the parliament and the personal disposition and sentiments of the king

In Frankfurt the Small Germany policy gained a complete victory when Schwarzenberg established (March 4, 1849) a joint constitution for Austria-Hungary, which was to serve as the basis for a closer union of the Habsburg State At the same time he informed the national assembly that Austria could not permit her German provinces to break away from their close union with the rest of the monarchy, and could only recognize a constitution for Germany which would permit her to enter the confederation without sacrificing her own new constitution. The party in Frankfurt which had worked for the inclusion of German Austria within the new empire, felt itself mortally injured by this declaration by the Austrian minister-president; and it was forced to recognize that in face of such a policy on the part of the Austrian Government its object was rendered unattainable.

The German Constitution of 1849.—After the results of the debates on the first reading of the German constitution had been communicated to the German Governments in order to enable them to bring forward their amendments, the second reading was concluded in the national assembly on March 27, 1849 Thanks to the mediating influence of Camphausen, agreement was reached between Prussia and 28 smaller German States over a number of amendments. But little regard was paid to these amendments in the course of the second reading, and others were even adopted that were excessively unwelcome to these States, as, for example, the omission of the *Reichsrat* which was to have been composed of representatives of the different Governments and to have been endowed with definite rights alongside the supreme head of the empire The Liberals, indeed, would gladly have met the wishes of the governments, but, in order to carry the constitution, they were obliged to rely upon the votes of the democrats to whom they were forced to concede universal suffrage, a large diminution in the rights of the emperor, and the abolition of the *Reichsrat*

The parliament finally resolved on the establishment at the head of the empire of an hereditary "Emperor of the Germans" who should reside at the seat of the imperial Government. that seat to be determined by special decree The emperor was to receive a civil list and to have the right to dissolve the second chamber and to veto the laws passed by the parliament Should, however, the parliament pass a law at three succeeding sessions, it became operative without the assent of the emperor Alterations in the constitution might be effected in the same manner, only in this instance a two-thirds majority in both houses was required Thus no room for doubt was left that the final decisive authority rested in the parliament.

The executive authority of the emperor was to be exercised through ministers responsible to the parliament The parliament was to consist of an upper house (*Staatenhaus*) and a lower house (*Volkshaus*) The members of the first house were to be chosen half by the Governments and half by the lower houses in the separate states The members of the second house were to be elected on a universal, equal, secret and direct ballot of the entire population in such a manner that there should be one representative for every 50,000 of the population

The *Reich* alone was to have charge of foreign policy, the army, and the regulation of economic questions The separate States were no longer to maintain a separate and individual diplomatic representation Customs and indirect taxation were to belong exclusively to the *Reich* and, if these did not suffice to defray expenses, the balance was to be obtained by contributions from the separate States The *Reich* was also to have the right to levy direct taxes on the entire population In all matters of finance the *Volkshaus* was the deciding body while to the *Staatenhaus* was merely accorded the right of proffering advice in such matters To achieve unity in judicial matters an imperial supreme court of justice was to be established to determine the disputes between the different States or between the Governments and the parliamentary bodies

The States thus retained only their own administrative system, the jurisdiction in the lower courts and the care of spiritual matters, particularly religion and education But in all these matters they were compelled to conform their actions to the general principles laid down in the Constitution, in which it was expressly declared that in all circumstances the law of the *Reich* had precedence over the law of the individual states

The Constitution was adopted in this form on March 27, and on the following day the election of an emperor was held in which 290 votes were cast for Frederick William of Prussia whilst the remaining 248 representatives abstained from voting The formal unanimous election followed, and, amidst the pealing of bells and the thunder of cannon, the result was announced to the people A deputation of 32 members under the leadership of Edward Simson, the president of the national assembly, was sent to Berlin to announce the result of the election to the King

Frederick William could now no longer assume an impersonal attitude Up to the last moment his ministers sought to persuade him to accept the throne conditionally upon his election being confirmed by the German princes and with certain reservations

affecting the Constitution. If he had followed their advice, Frederick William's position would have been at variance with all his principles. Hence when on April 3, 1849, he received the deputation in a formal audience, he contented himself with saying that he was unable to come to a decision until he had received the assent of the German princes and free cities, and that the Governments in general had still to consider whether the constitution was likely to realise the hopes of the fatherland He added that he would never be found wanting should Germany need Prussia's shield and sword against enemies at home or abroad. These words appeared to amount to a postponement of a decision but the parliament could scarcely regard them as other than a refusal, since the completed constitution was spoken of as though it were only a draft awaiting alteration and acceptance at the hands of the German princes. Nevertheless Camphausen did not yet regard the situation as irretrievably lost for he hoped that if it proved possible to gain the assent of the other Governments, naturally with the exception of Austria, the king would still accept the crown And he was successful in inducing the 28 smaller States, which had already made a common declaration on the subject, to unite in an unqualified acceptance of the constitution and the election of the emperor Only Bavaria, Wurttemberg, Saxony and Hanover still hesitated But in view of the strong public opinion existing in the parliaments and among the inhabitants of these states in favour of an acceptance of the constitution, it did not seem likely that their rulers, willingly or unwillingly, would hesitate to give their assent also, in event of Prussia's still maintaining a reticent attitude, because not one of them would be willing to incur the blame of having nullified the work of unification by a refusal Frederick William IV, however, would not accept such a solution. He considered that the assent of the princes obtained in this way through fear of public opinion was worthless Apart from this it seemed very questionable whether alterations of any consequence could be made in the constitution once it had received the assent of all the Governments Hence Frederick William IV decided to announce through Count Brandenburg in the second chamber of the Prussian parliament on April 21, that Prussia could not accept the constitution as it stood

Thus the work of unification of the Frankfurt parliament was finally frustrated Camphausen resigned The German Governments announced that the mandate of the national assembly had expired, and summoned their deputies to leave Frankfurt The majority obeyed these orders; a minority remained however, in Frankfurt, the so-called "Rump parliament," mainly composed of South German democrats, and sought to hold further sessions and to arouse public support for the constitution against the Governments Since the municipality of Frankfurt forbade any further deliberations within its walls, the Rump parliament removed to Stuttgart But the Wurttemberg Government ordered its troops to occupy the building in which the Rump was meeting on June 18, and prevented any further sessions Only in south-western Germany and the kingdom of Saxony did the summons to assist in the execution of the imperial constitution by force meet with a response from a section of the populace For a time Dresden was in the hands of the rebels, and the Saxon troops were only able to subdue the rising with the help of Prussian regiments At the request of the South German Governments, a Prussian army under the command of the king's brother, Prince William was despatched thither and quickly recaptured the fortress of Rastatt which had fallen into the hands of the rebels and speedily dispersed the ill-armed and badly led revolutionaries

This first attempt to unite Germany under a constitution based on principles of liberty failed chiefly because the vast bulk of the population were still indifferent to the great political issues When the Governments of the individual States recovered from the first shock they set to work to put down firmly all hostile attempts As a result of Frederick William's refusal of the imperial throne, the alliance between Prussia and the German union movement, which alone afforded the possibility of establishing a new political order in Germany, was for the time being dissolved

The Prussian Union.—After the failure of the attempt to achieve the unity of Germany through a great national movement, Frederick William IV. desired, with the help of the Governments, to bring it about in another form than that striven for by the Frankfurt parliament His most important adviser in this task was General von Radowitz, and the object for which both now began to work in common was the establishment of a more extensive confederation to include the whole Danubian monarchy and within this a lesser confederation of the remaining States under the leadership of Prussia. From the outset it was extremely questionable whether the emperor of Austria and the remaining German princes, when they had been delivered from their fear of revolution, would entertain such a plan, and, Frederick William insisted that their assent must be wholly voluntary

A conference of the representatives of the greater German Powers was summoned at Potsdam Since the revolution in Saxony and South Germany had not yet been fully crushed, at least a few of these states displayed a willingness to comply with the wishes of Prussia The Alliance of the Three Kings (*Dreikonigsbundnis*) was concluded on May 26, 1849, between Prussia, Saxony and Hanover having for its object the foundation of a still closer union A diet was to meet at Erfurt to draw up the constitution; it was to be elected solely by the inhabitants of those states which were to be members of the Confederation Nevertheless both Saxony and Hanover made the ominous reservation that they should only be obliged to participate if all the German States, with the exception of Austria, entered the narrower Confederation

Most of the smaller States joined the smaller confederation within a short time; but Bavaria and Wurttemberg refused, and Prince Schwarzenberg very clearly intimated from Vienna that he would look upon the conclusion of such treaties as a blow directed against the foundations of the still existing German Confederation When, nevertheless, the majority of the Governments of the States in the narrower confederation decided to hold elections for a confederation diet, Saxony and Hanover announced their withdrawal on the ground of their former reservations. Saxony in collaboration with Bavaria and Wurttemberg, entered into close relations with Austria in return for her promise of protection

The elections for a confederation diet were held in the rest of the German States, and the diet itself assembled at Erfurt on March 20, 1850 A constitution for this narrower confederation was passed on April 29, which greatly differed from the constitution drawn up by the Frankfurt diet, but reproduced to a large extent the ideas of the king of Prussia and the Conservatives Whilst Frederick William IV was still hesitating as to whether he should now regard the narrower confederation as definitely constituted, Schwarzenberg took the offensive

Austria had in the meantime with Russian help completely broken the dangerous revolt in Hungary, and also re-established her authority in Italy. Thus her hands were free to take action in Germany Austria demanded that all the German States should send representatives to Frankfurt where the confederation diet was to re-assemble under the presidency of Austria If Prussia remained faithful to the lesser confederation, war between her and Austria might easily break out; and both States therefore sought to ascertain what would be the attitude of the tsar in such an event Frederick William IV restored Schleswig-Holstein to Denmark in order to gain the tsar's support Nicholas I., however who looked upon himself as the champion of conservatism in Europe, disliked the concessions which the Prussian king had made to the Liberals in Prussia and in the lesser confederation, and definitely took the side of Austria Austria began to make preparations for war and re-opened the sittings of the *Bundestag* with as many of the representatives of the German States as had already arrived in Frankfurt A constitutional dispute arose in Hesse between the elector and the *Landtag*, and the elector, who thought he would receive greater support from Austria than from Prussia left the union and appealed for help to the *Bundestag* The *Bundestag* resolved to send Bavarian troops to his aid. But Prussia contested his right to secede from the union, and, on the ground that in virtue of former treaties she possessed the right to occupy with her army the great military roads that crossed the

electorate, simultaneously despatched her troops into the country. Once again both sides sought to gain the support of the Tsar. The Prussian minister-president, Count Brandenburg, as well as the Emperor Francis Joseph, and Schwarzenberg, visited the Tsar at Warsaw. Nicholas pursued a policy of mediation but he let them clearly understand that in the German question his sympathies were with Austria At Radowitz's suggestion general mobilization was ordered in Prussia, although the king still hesitated to take up arms against Austria. Frederick William IV next resolved to dismiss Radowitz, and after the death of Count Brandenburg who had died shortly after his return from Warsaw, to entrust the formation of a ministry to Freiherr Otto von Manteuffel, who as a strong Conservative was strongly opposed to a war against Austria Manteuffel was sent to Olmütz to enter into direct negotiations with Schwarzenberg and, as in the neighbourhood of Bronzell small encounters had already taken place between the Prussian and Bavarian troops, it was agreed that, until the conclusion of the negotiations, the troops on both sides should refrain from advancing

On Nov 29, 1850 the Convention of Olmutz was signed Prussia opened the way to Cassel to the troops of the Confederation, in Holstein joint commissioners were appointed by Austria and Prussia; the future constitution of Germany was to be discussed in open conferences to which all the German States were to be invited to send representatives Prussia also agreed to abandon her mobilization while Austria promised that as soon as this was done she would also disarm

The conferences began at Dresden in December and lasted until March 1851 They proved fruitless, and there remained no other alternative than to bring the old Confederation once more into force and to summon the confederation diet in its old form at Frankfurt Thus the Prussian union was completely shattered.

The Political Reaction.—Although the great movement for the unification of Germany in accordance with liberal principles seemed thus to be retarded, yet it had not failed of result All its supporters had before them in the constitution drafted by the Frankfurt diet a common programme that would never again be forgotten Moreover, if the majority of the concessions which had been granted by the Governments in the spring of 1848 had been erased from the constitutions of the individual states, there still remained in Bavaria and Wurttemberg certain small extensions of parliamentary rights Austria alone fully re-established absolutism The constitution for the whole Danubian monarchy which had been proclaimed in March 1849 was withdrawn in 1851. In Prussia a fresh dissolution of the second chamber and the proclamation of a new electoral law were necessary before an agreement could be achieved between the Government and the diet regarding the constitution The oath to the new constitution was finally taken by the king on Feb 4, 1850 A sufficient guarantee for the retention of the majority in the second chamber by the Conservatives, was believed to have been found in the introduction of the Three Class franchise The upper chamber was converted in 1854 at the king's desire into the *Herrenhaus* composed solely of the hereditary nobility and of life members chosen by the king in addition to representatives of the universities and corporations of the greater towns Manteuffel, who remained at the head of the ministry, endeavoured as far as was compatible with the new constitution, to restore the old bureaucratic system of government

The example of the two great Powers was followed by the smaller States At their request the *Bundestag* appointed a committee to see that no laws or institutions endangering the order and peace of the Confederation, should continue to exist in any State; and the committee took upon itself far-reaching powers of interference with the constitutional rights of the individual States The committee also introduced new restrictions upon the liberty of the Press and forbade political bodies to form associations with one another

The sole important advance made in these years was in the sphere of political economy Hanover, Oldenburg and the Hansa towns were induced to enter the *Zollverein* which, after 1854, included the whole of Germany with the exception of Austria. Thus all plans for the reform of the Confederation introduced by the central States were wrecked by the opposition of the great German Powers to any extension of the competence of the Confederation, because in the diet they might be outvoted at any time by the smaller States All this passed over the heads of the populace. deep despondency had replaced enthusiasm. The most fearless champions of the liberal and national movements were forced to fly from Germany to avoid persecution Karl Schurz fled to America, and Karl Marx and Lothar Bucher sought safety in England Those who remained at home could only keep silence and place their hopes in the future

While political life was thus brought to a standstill, vast changes were occurring in the economic life of Germany Industry prospered, factories increased, and Germany began gradually to lose its character of a purely agrarian country A network of railways was constructed of which only the first beginnings had been made in 1848, and from 1850 to 1860 the mileage was almost doubled A quantity of new limited companies and banks were founded, foreign trade increased, and the great industrial districts which were later to be the nerve-centres of German industrial life began to make their appearance the great iron and coal fields in the Rhineland and Westphalia, the Saar and Upper Silesian coalfields, and the great textile industry in Saxony. As had already been the case in Western Europe, so now in Germany, great armies of workmen began to be formed in the industrial districts who in the succeeding decades provided the Government with fresh problems

At this time Germany as a whole played little or no part in foreign politics Austria and Prussia pursued their own individual policies that were not infrequently diametrically opposed to one another On the outbreak of the Crimean War (1854) the German States remained neutral Although they concluded a defensive alliance among themselves (April 20, 1854), they soon came into conflict with each other, for Austria, wishing to see Russian influence in the East curtailed, entered into closer relations with the Western Powers, whilst Frederick William IV, in conformity with the old traditional policy of Prussia, inclined towards Russia Hence once more relations between Prussia and Austria underwent a change for the worse The authority of Prussia had sunk very low since the conclusion of the Olmutz Treaty and the failure of her plans for a union of the German states At first the Powers contemplated excluding Prussia from the Paris Congress which ended the Crimean War When a rebellion of Prussian sympathisers broke forth in 1856 in the little principality of Neuchatel, which had formerly belonged to Prussia but had been incorporated in the Swiss Confederation after 1848, Frederick William was only enabled to secure an amnesty for the rebels through the intermediary of the French emperor; and in return was forced finally to abandon all claim to Neuchatel

The Prussian Regency.—In the autumn of 1857 the mental condition of Frederick William IV made it necessary to appoint a substitute, and since he was childless, his brother Prince William, in accordance with the constitution, took over the regency on Oct. 26, 1858 As a younger son, Prince William had been destined for a military career and had rarely come into contact with politics Like his brother, he was a Conservative, but he did not share his doctrinairism and sentimental policy As a moderate and practical man, his first thought was always to take into consideration the actual state of things in so far as his fundamental principles would permit A brief sojourn in England in the spring of 1848 had given him a greater understanding of parliamentary procedure He had also a far stronger sense of the real interests of Prussia than his brother He had strongly disapproved of Prussia's yielding to Austria at Olmutz and had ever since been in opposition to the foreign and home policy of the king He further disapproved of the one-sided conservative party system existing under the ministry of Manteuffel, and at once constructed a new ministry, under the joint leadership of Prince Karl Anton of Hohenzollern-Sigmaringen and Rudolf von Auerswald Some Liberal members were also included in the Cabinet. His idea was to unite all elements which were prepared to collaborate for the good of the country in a policy which, although resting on conservative principles, was not to be the mere expression of exclusively con-

servative-party interests In his speech to the new ministry on Nov 8, 1858 he declared that a prudent and considered policy must be followed if the position of Prussia in Germany was to be improved He summarized this policy in the words. "Prussia must make moral conquests in Germany"

Since the new government refrained from influencing the elections, these resulted in a great increase in the Liberal representation in the Prussian house of deputies All over Germany these events were hailed as the precursors of a new era in Prussia that would afford greater opportunity for the rightful demands of Liberalism. In Bavaria and Baden too this led to the Government adopting a different attitude towards the parliaments Soon after William became regent, war broke out between Austria, France and Sardinia (1859) Austria looked upon it as Prussia's obvious duty to support her in this conflict, but the prince regent was only prepared to open hostilities if he were given the sole command of the German troops opposing France on the Rhine As Austria refused this, no agreement was reached For Prussia in truth had no obligation to intervene, since Lombardy and Venetia did not belong to the German Confederation. After the defeat of the Austrian army at Magenta (June 4, 1859), the Emperor Francis Joseph signified his willingness to comply with Prussian demands, and the prince regent ordered the mobilization of six army corps But before Prussia had intervened the Austrians had sustained a second severe reverse at Solferino (June 24) When the Emperor Napoleon offered her peace in exchange for the cession of Lombardy and surrender of the Austrian possessions in Italy, Austria agreed to his terms because she feared that if Prussia were victorious on the Rhine her influence in Germany would become predominant But it was completely false to declare as did the Emperor Francis Joseph in a manifesto, that Austria had been forced to sign the peace because she had been left in the lurch by her natural allies Peace was made rather to prevent Prussia from appearing as the saviour of Austria

Public opinion in Germany was deeply stirred by the war and the resultant unification of Italy On August 14, 1859 there assembled for the first time since the revolution a vast gathering of men to demand the unification of Germany on a liberal basis Four weeks later the German National Union (*Deutscher Nationalverein*) was founded to establish a German Federal State on the basis of the imperial constitution of 1849 Notwithstanding minor persecutions by the governments, the Union developed a powerful propaganda in the course of the next few years Its supporters were chiefly to be found in the upper ranks of the middle classes, and as yet the mass of the population took no part in its work The German Governments under pressure from the growing national feeling once more considered the possibility of a reform of the Confederation While the prince regent thought that a reform of the military constitution of the Confederation was most necessary, Austria was opposed to it as giving Prussia the command over the greater part of Germany's military resources in event of war.

The Constitutional Conflict in Prussia.—For a long time past the prince regent had been convinced of the necessity for a fundamental reform of the Prussian military system He wished to introduce universal compulsory military service and to raise the yearly number of recruits from 38 000 to 63,000, while for the purpose of training these recruits the number of regiments in existence would have to be increased by 49 Moreover, the *Landwehr* was to be brought into closer relation with the standing army These reforms would entail increased expenditure amounting to 10 million thalers yearly With the assistance of the minister for war, von Roon, a definite programme was drawn up and laid before parliament (Feb 1860) The majority in the parliament were prepared to agree to an enlargement of the army, but demanded that the period of service should be reduced to two years and the independence of the *Landwehr* maintained Although the prince regent did not wish to agree to these conditions, the Parliament provisionally voted the sums demanded The new regiments were formed and the reform of the army carried out Then William, who had become king on the death of his brother (Jan. 2, 1861), again laid the bill for army reform before a newly-elected parliament to receive its final assent Once more the same counter demands were put forward; but when Roon on behalf of the king declared (March 5, 1862) that it was impossible to concede the two years' service, the house of deputies threw out *in toto* the increase demanded for military purposes The king had therefore either to cancel arrangements already made or to fight out the battle with the parliament Five members of the ministry believing that surrender was unavoidable, handed in their resignations The dissolution of the parliament brought about no change in its composition The new parliament also refused to agree to the demands of the Government, and declared that, if the king still persisted in levying unauthorized taxes for the carrying out of his programme of military reform, he placed himself in opposition to the Constitution and broke the oath which he had sworn to it The obvious duty—so it seemed—of the king was to summon a ministry having the confidence of the parliament and to put forward a budget in accordance with their views The majority in the ministry were also of this opinion

But the king was convinced that the choice of ministers was an inviolable royal prerogative, and that the conditions which the parliament sought to introduce into its assent to the military programme and military budget, were unacceptable in the interest of the maintenance of an efficient army If he should prove unable to find ministers ready to support him in his fight against parliament, he would abdicate In searching for men of this character von Roon, the minister for war, hit upon Bismarck, who had represented Prussia as ambassador to the *Bundestag* at Frankfurt, and then at St Petersburg and Paris Von Roon had already assured himself of Bismarck's readiness to serve, and now persuaded him to come to Berlin The decisive interviews between the king and Bismarck took place on Sept 22 and 23, 1862 in the park at Babelsberg Bismarck expressed his willingness to prosecute the struggle with the parliament in defence of the royal prerogative, but refused to lay down a detailed home and foreign policy for the future After some indecision, the king resolved to nominate him minister-president on Sept 23

Bismarck.—From the outset, Bismarck's aim was the unification of non-Austrian Germany under the leadership of Prussia His experiences in Frankfurt had convinced him that Austria would never consent to accord Prussia a position of equality with herself in German affairs and that therefore there would not be room for Austria and Prussia in a political organization of Germany He was convinced that the solution for which he strove could only be attained through an armed conflict with Austria Yet none knew better than he how difficult it would be to induce the king, now nearly 70 years old, whose love of peace caused him to oppose himself to every forcible solution, to give his consent to such a policy The king himself was aware of this antagonism and therefore hesitated to appoint Bismarck head of the Government. He realized Bismarck's extraordinary political capacity, but also his passionate and ruthless temperament In practice, Bismarck was able, once he had taken over the direction of affairs, to lead the king step by step in the direction which he considered right

An understanding with the parliament over the military budget of 1862 was clearly impossible The house of deputies maintained their previous position whilst the *Herrenhaus* rejected the budget as received from the lower house and assented to the demands of the Government Bismarck now declared that, since the two houses who had equal rights had been unable to reach an agreement, a valid money bill could not come into force As the constitution had not made any provision for such an event, and as it was impossible for the business of the State to stand still, the Government were compelled provisionally to carry on the administration without a proper legal budget, to continue to levy taxes, and to continue the necessary expenditure The house of deputies declared that such a proceeding was unconstitutional and that there existed no further means of attaining to an agreement with the ministry. The king replied to this declaration with a message in which he gave expression to his unalterable trust in his ministers and designated as unconstitutional the attempt of the house of deputies to increase its authority The struggle was still further

embittered by the restrictions placed by Bismarck on the liberty of the Press and by his dismissal of liberal officials.

Upon Liberal opinion throughout Germany this intensification of the constitutional struggle reacted in a sense unfavourable to Prussia. Bismarck was looked upon as desiring to restore absolutism and as lacking all understanding of the desires and demands of the age. This view was false because Bismarck did not wish to set aside the constitution, he wished to interpret it in the sense which seemed right to himself and the king But doubtless this feeling amongst the Liberals gave rise to extraordinary difficulties in carrying out Bismarck's German policy; for it was the Liberals themselves who had founded the National Union and who strove for the establishment of a small Germany under Prussian leadership. Nevertheless Bismarck was compelled to repel these natural allies since, unless he successfully carried through the fight for the constitution in Prussia to the bitter end, he could not retain the king's confidence and the direction of Prussian policy.

It is comprehensible that Austria should have sought to take advantage of this situation The emperor Francis Joseph invited all the German princes to come in person to Frankfurt on Aug 18, 1863, to confer upon a reform of the German Confederation. His plan was to place a directory of five persons at the head of the Confederation and next to them, an assembly of delegates elected from the diets of the separate states endowed solely with advisory powers Bismarck persuaded the king to absent himself from this conference but the remaining princes assembled at Frankfurt, where the majority adopted the Austrian proposal, on the understanding that their agreement would only remain in force until Prussia had announced what her definite attitude was to be Thereupon Bismarck replied that Prussia must demand as preliminary conditions to any reform, the alternation of the presidency of the Confederation between Austria and Prussia; a recognition of the right of Prussia to veto any declaration of war involving the Confederation, and the summoning of a German parliament elected on a general suffrage By her refusal to accept these terms, Austria completely destroyed any hope of success that remained for her project of reform

Schleswig-Holstein.—The insecure state of affairs in the duchies of Schleswig and Holstein led to the next step in this development After the revolution of 1848 the European Powers assembled in conference in London to settle this difficult question. The result of their labours was the London Protocol of May 8, 1852 which was signed by all the great Powers The Powers agreed that on the failure of the male line of the Danish royal house, the house of Holstein-Glucksburg, to whom the throne of Denmark passed, should also rule over the duchies although, in accordance with the German law of inheritance, these should pass to the house of Holstein-Augustenburg Austria and Prussia added the proviso that the duchies should enjoy an autonomous administration and constitution within the Danish State, and that terms must be arranged with the duke of Augustenburg to induce him to renounce his claims It was not until Denmark had promised the duchies their own autonomous administration and diets, and Duke Christian of Augustenburg had announced his intention of refraining from creating any difficulties in the matter of the succession, in return for the payment of compensation for the territories thus taken from him by Denmark, that the two German Powers signed the London Protocol But when the Danish king sought to escape from the fulfilment of his treaty obligations, and to introduce Danish administration into the duchies, the Holstein *Landtag* appealed for help to the Confederation In Feb 1858 the *Bundestag* decided that the Danish constitution was not valid in Holstein The king of Denmark, threatened by the Confederation, exempted Holstein from this constitution without, however, granting the duchy a new one Austria and Prussia thereupon demanded that Denmark should carry out her treaty obligations in their entirety, and the Confederation again threatening sanctions, called upon the king to grant a new constitution in accordance with the provisions of the treaty of 1852 Since Denmark hesitated, Hanover and Saxony were instructed to enforce a federal execution

At this moment Frederick VII of Denmark died (Nov 15, 1863) and with his death the male line of the Danish royal house came to an end Duke Christian of Glücksburg at once ascended the throne of Denmark and Schleswig-Holstein, as Christian IX., in accordance with the provisions of the London Protocol Under the pressure of public opinion in Denmark he granted a new constitution that effected the complete incorporation of the duchy of Schleswig within the Danish kingdom At the same time Prince Frederick of Augustenburg announced that he did not recognize his father's renunciation, and that therefore he looked upon himself as the rightful heir to the duchies of Schleswig and Holstein He assumed the style of Frederick VIII and found many supporters in the duchies, since the German population ardently desired separation from Denmark From a legal standpoint the prince's actions could not be sustained because his father was still alive and bound by his pledge. Moreover, the fact that the father renounced his own personal claims in favour of his son, was only capable of being interpreted as an attempt to evade the fulfilment of the obligations he had taken upon himself

In consequence of the growing tension, Austria and Prussia came to an agreement upon a plan of joint action (Jan 16, 1864) They agreed that, in event of Denmark refusing the demand for a constitution, they would declare war upon her, and regulate the future relations of the duchies with Denmark only by joint agreement From the outset Bismarck's intention was to bring the duchies into close union with Prussia in some form or other, if they were separated from Denmark, whilst Count Rechberg, as the inspirer of Austrian policy, wished to compel the Danish king to carry through a purely personal union of the duchies with the Danish crown When Denmark rejected the ultimatum presented to her by the German Powers, Austrian and Prussian troops, under General Wrangel, invaded the duchies After the storming of the fortifications at Düppel, and the advance of German troops into Jutland, Denmark decided to invite the mediation of the other Powers Through their intervention an armistice was agreed to, and a conference held in London from April 25 to June 25 for the purpose of effecting a peace. In order to conciliate Austria Bismarck announced his willingness to accept her solution of a personal union, but Denmark refused to accept the Austrian proposal and relied for support on the non-German great Powers Thereupon the German Powers proposed the complete separation of the duchies from Denmark, and their erection into an independent State under the Prince of Augustenburg This was immediately rejected by Denmark Austria and Prussia then declared that every hope of further negotiation was at an end, and the London Conference broke up without any result The war was resumed, and the German army, having forced the passage to Alsen, advanced to the northernmost point of Jutland When they appeared to be preparing to invade Funen, and all hopes of foreign support had vanished, Denmark determined to sue for peace.

The Treaty of Gastein.—Peace was signed at Vienna on Oct 30, 1864 and Denmark was forced to cede the two duchies up to the river Konigsau, to Prussia and Austria While these two German districts were thus completely set free from Danish rule, it was as yet uncertain what was to be done with them A joint Austro-Prussian administration was at first established Austria, however, was resolved that in no case should these lands become Prussian, and therefore inclined more and more towards the recognition of the Prince of Augustenburg as duke of Schleswig-Holstein; a solution which was also favoured by the majority of the other German States and public opinion throughout Germany But Bismarck was determined not to agree to this, since a personal interview in the previous summer with Prince Frederick had shown him unwilling to make those concessions to Prussia which Bismarck thought it necessary to demand These included the placing of the Schleswig-Holstein troops under Prussian command; the control by Prussia of the post, telegraph and railway systems; and the cession to her of points of military importance on the coasts of the North and Baltic Seas which would ensure Prussia's control of the canal to be constructed between the Baltic and North Seas Since Austria, in spite of Prussian opposition, condoned the agitation in the duchies in favour of the prince of Augustenburg, and since an attempt to win the assent

of Prussia to the union of the duchies by the cession of the countship of Glatz was frustrated by King William's opposition it became more and more clear to Bismarck that an open conflict could not be avoided. If war came about, however, Prussia's greatest concern would be the attitude adopted by the Emperor Napoleon III Napoleon, indeed, had already frequently made known his desire for an alliance with Prussia and his willingness to permit an extension of Prussian authority in northern Germany The only question was what price he would demand for his assistance A personal interview at Biarritz between the emperor and Bismarck decided nothing definite

Under repeated pressure from Austria, Bismarck (Feb. 1865), announced the conditions on which he was prepared to recognize the prince of Augustenburg as duke The Vienna Government thereupon declared that these conditions were unacceptable because they would make the new duchy nothing more than a vassal of Prussia During the summer of 1865 the situation was still further complicated by the resolution passed by a majority of the *Bundestag* at Frankfurt in favour of the unconditional recognition of the prince of Augustenburg In May, Bismarck proposed to send an ultimatum to Austria and on its rejection to declare war. King William, however, was not prepared to go so far and only agreed that Austria's consent to the expulsion of the prince from the duchies should be demanded As Vienna too was averse to a conflict, Austria and Prussia once more came to an agreement, but it was of a very incomplete nature On Aug 14, 1865 the Treaty of Gastein was signed, which laid down that both Powers should provisionally continue to exercise joint sovereignty in the duchies, but that Austria should administer Holstein, and Prussia Schleswig The fortress of Rendsburg and the port of Kiel were handed over to the Confederation under Prussian control. The duchies were to become members of the *Zollverein* and Prussia was given the right to construct the canal uniting the Baltic with the North Sea

Bismarck never believed that this agreement formed a basis for a permanent solution of the Schleswig-Holstein Question (*q v*). After a further visit to Biarritz in which he again tried to ascertain Napoleon's intentions, Bismarck set to work to strengthen Prussia's position for the coming conflict by winning allies and guiding public opinion in Germany to believe that the approaching war with Austria would be fought for the establishment of new conditions in Germany rather than for the future of the duchies It was not without difficulty that he concluded an alliance with Italy on April 8, 1866 Italy undertook to participate in the war against Austria should war be declared within the ensuing three months The two allies agreed that neither would conclude an armistice nor make peace until Italy had gained Venetia and Prussia had an equivalent extension of territory Napoleon advised the Italians to sign this treaty because he hoped to profit by an outbreak of war in Germany

At the same time Bismarck laid before the *Bundestag* a proposal for the immediate convocation of a German parliament to carry out the reform of the Confederation in conjunction with the Governments (April 9) Soon afterwards he let it be known that in his opinion the authority of the Confederation must be extended to foreign economic and military affairs and that the parliament must be accorded an equal power of legislation

Prussia's negotiations with Italy, and the proposal for a reform of the Confederation, were taken in Vienna to indicate that Prussia was resolved upon war To avoid being taken by surprise Austria strengthened her military forces in Bohemia, and Prussia also began to arm At this juncture, as the result of efforts at mediation on the part of Russia and England, King William consented to the abandonment of all preparations for war on both sides. But the Emperor Francis Joseph, on receiving news of the Italian preparations for mobilization, ordered on April 21, the mobilization of the Austrian southern army Prussia regarded this action as invalidating the recent understanding, and commenced mobilization on a large scale As war now seemed inevitable, Austria sought by the intermediary of Napoleon, to prevent Italy from participating in the conflict In event of an Austrian victory over Prussia, Napoleon was promised Venetia with the right to make it over to Italy Austria was to be compensated in Germany at the expense of Prussia and her allies; but with the proviso that her expansion should not be carried so far as to endanger the balance of power in Europe or to effect a complete subjection of the other German states When it is remembered that at the same time Napoleon had promised Prussia his benevolent neutrality, and had given her to understand that he had nothing against an extension of her authority in northern Germany his policy stands revealed as highly dishonourable.

On June 1, Austria announced that she proposed to leave the decision of the Schleswig-Holstein Question to the *Bundestag*, and, when shortly afterwards she summoned the *Landtag* to meet in Holstein, Bismarck immediately declared that her action had violated the earlier treaties; for Austria in Jan 1864 had undertaken not to take measures for the future of the duchies without Prussia's consent and the right of summoning the *Landtag* was undoubtedly one of the sovereign rights which, according to the Treaty of Gastein, were to be exercised jointly by both Powers Bismarck therefore affirmed that Prussia too was no longer bound by these treaties, and was once more entitled to share in the administration and military occupation of Holstein On the entry of Prussian troops into Holstein, Austria moved in the *Bundestag* that the troops of the Confederation should be mobilized against Prussia for the preservation of peace Such a step was a contravention of the laws of the Confederation which only permitted of sanctions after the failure of a friendly attempt at reconciliation Bismarck therefore intimated to the *Bundestag* that he would be forced to regard every State which voted in favour of the Austrian proposal as at war with Prussia, while at the same time he placed before it a plan for a new constitution which in fact included the fundamental propositions he had already made known to the *Bundestag* The command of the south German troops of the Confederation was to be given to Bavaria whom Bismarck thus hoped to win over to his side The diet adopted by 9 votes to 6 the Austrian proposal, which had been modified by Bavaria The Prussian representative announced that his Government considered that this unconstitutional decision dissolved the Confederation and he called upon the other German States to join with Prussia in establishing a new Confederation on the principle of the earlier reform proposals (June 14, 1866)

The Austro-Prussian War.—War was now inevitable With the exception of some small North German states, the German governments ranged themselves on the side of Austria Italy supported Prussia France remained neutral. At the battle of Langensalza (June 29) the entire Hanoverian army, which was about to march southwards, was captured by the Prussian troops The Prussian armies then occupied Hesse, Nassau and Frankfurt, and advanced into Bavaria as far as Nuremberg. Meanwhile, in the south, the Austrians defeated the Italians at Custozza (June 24). It was obvious, however, that the decisive action must be fought in Bohemia In accordance with General von Moltke's plan of campaign, three Prussian armies advanced from Saxony and Silesia into Bohemia The Austrian commander, General von Benedek, had taken up a strong position at Koniggratz where, on July 3, he was attacked by the united first and second Prussian armies The result of the battle hung in the balance, until the Crown Prince Frederick William arrived with the third Prussian army at the critical moment, when it ended in the utter defeat of the Austrians and the wholesale rout of their army The road to Vienna seemed to lie open before the victors

Napoleon had not expected so speedy a victory. On the contrary, he had hoped that both sides would be exhausted by a long campaign, thus enabling him to dictate a peace under the threat of intervention without using his own forces Napoleon, fearing to be excluded from participation in the reconstruction of Germany offered his meditation to the belligerents (July 5), Austria having previously ceded Venetia to him On the advice of Bismarck, although contrary to his own inclinations, King William accepted the proffered mediation on condition that the terms of peace should be determined before an armistice was concluded. As it was of the utmost importance to him that the war should not be prosecuted in spite of his intervention, Napoleon decided to

support the conditions of peace laid down by Prussia and to work for their acceptance in Vienna Hanover, electoral Hesse, Nassau and Frankfurt were to be incorporated in Prussia. Further, Austria was to be excluded from Germany, the North German States were to form a North German Confederation under Prussian leadership, the southern States were however to remain independent and have the right to form a separate Confederation Austria was to pay a war indemnity and definitely consent to the cession of Venetia to Italy Only after a fierce struggle had Bismarck been able to secure King William's assent to these conditions The king did not wish to absorb the hostile North German States but only to reduce them, but on the other hand wished to impose cessions of territory on Saxony and the South German States and force Austria to surrender the Austrian portion of Silesia Bismarck thought these proposals imprudent because the princes who had been deprived of a portion of their dominions would never prove trustworthy allies For this reason he wished to annex to Prussia those territories which interposed between the two halves of the kingdom, whilst leaving the remaining States untouched so that they might be the more ready to enter in the future into a German Confederation Bismarck also thought that, if Prussia were to encroach in South Germany, it might still lead to Napoleon's entry into the war To obtain peace would then mean that no cessions of territory could be exacted from Austria and that the kingdom of Saxony would also have to be left intact King William, however, finally yielded, and a preliminary peace was signed on July 26, at Nikolsburg Bismarck refused the Italian request for a cession of the South Tirol on the ground that this was not included in the treaty of alliance

After the conclusion of peace Napoleon unexpectedly came forward with the demand for compensation for his acquiescence in the expansion of Prussia At first he demanded the transference to France of the entire Bavarian Palatinate, Rhenish Hesse and the fortress of Mainz When Bismarck replied with a complete rejection of these demands, Napoleon said there had been a misunderstanding and reduced his demand to a request for the restoration of the frontier of 1814, that is to say, for the cession of Landau and the Saar district On receiving a further refusal from Bismarck, Napoleon attempted at least to secure Prussian support for the annexation of Luxembourg to France and for the future conquest of Belgium Thinking it unwise to answer these propositions with a flat refusal, Bismarck dragged out the negotiations for months without giving any definite reply But he made use of these demands on the part of Napoleon, to reveal to the South German States the danger to which they were exposed by the covetousness of the French emperor Since peace had not yet been concluded between these States and Prussia, Bismarck was able to hold before them the hope both of an abandonment by Prussia of her demands for territory and a reduced war-indemnity in return for their entry into an offensive and defensive alliance with Prussia The South German States were ready to enter into his plans and themselves asked for such an alliance Bavaria, Wurttemberg and Baden entered into a reciprocal agreement with Prussia to defend her with their entire military force against every attack and to place their troops under the command of the king of Prussia for the duration of any war thus waged in common As the northern portion of the grand-duchy of Hesse was a member of the North German Confederation, no such treaty was concluded with Hesse

The North German Confederation.—When the war had finally been brought to an end by the signature of the definitive Peace of Prague (Aug 23, 1866), Bismarck's first care was to end the internal conflict in Prussia The possibility of doing so had arisen during the war through an election which had materially altered the composition of the house of deputies The Conservatives had won a great number of seats from the Liberals; while the feeling against Bismarck entertained by many Liberals had greatly altered Many of them now saw in him the man who alone was in the position to accomplish that unification of Germany for which they were also striving Bismarck persuaded the king to lay before the new *Landtag* a bill of indemnity to give retrospective assent to the taxes and the expenditures made by the Government since the beginning of the conflict which had not hitherto been authorized At first the parliament showed a disposition to demand guarantees from the Government that it would abstain from similar measures in the future, but, when the king refused to agree to this, the majority finally passed the bill in the form in which it had been presented to them. A cleavage in what had been hitherto the Progressive Party resulted from these proceedings Those Liberals who were prepared to support Bismarck's German policy, and to abandon the full achievement of their objects in home affairs for the sake of the greater aim of national unity, formed themselves into the "National Liberal Party" under the leadership of the Hanoverian deputy Rudolph von Bennigsen

The termination of the constitutional struggle in Prussia left the way open for the construction of a constitution for the North German Confederation With the help of a number of experts, Bismarck had himself prepared the groundwork of the draft which was first submitted to the individual Governments and then laid before the North German *Reichstag* The *Reichstag*, which had been elected on a universal franchise, met in Berlin towards the end of Feb 1867, and, after some not unimportant changes had been made in the draft of the constitution, this was finally adopted on April 17, 1867, by a majority of 230 votes to 52 The important features in this constitution, which with few alterations became that of the German Empire after 1871, were as follows the federal sovereignty reposed in the hands of the federated governments whose organ was the *Bundesrat*, in which out of a total of 43 votes, Prussia held 17. thus she did not possess the majority although her territory composed by far the greatest part of the federal territory The presidency was given to the king of Prussia, and the direction of the affairs of the Confederation was placed in the hands of a chancellor nominated by the president Next to the *Bundesrat* came the *Reichstag*, chosen on a universal, equal, secret and direct franchise and thus representative of the mass of the population.

For its passage, a federal act had to receive the assent of a majority in both the *Bundesrat* and the *Reichstag*, whilst an alteration in the constitution could only be effected by a two-thirds majority in the *Bundesrat* The authority of the Confederation extended to foreign policy, the army and economic affairs Moreover the constitution made provision for a unified financial, penal, commercial, economic and judicial system The laws of the *Reich* were to have precedence over the laws of the separate States As in the constitution of 1849, the individual States retained their own administrative systems and the control of ecclesiastical affairs and education The expenditure of the Confederation was to be met by the customs revenue, indirect taxes, and the post and telegraph revenue If these proved insufficient, the individual States were to make supplementary grants proportionate to their population so long as federal taxes had not been introduced The *Bundesrat* possessed the right, with the approval of the president, of dissolving the *Reichstag* This constitution gave the individual States a greater measure of independence than the Frankfurt constitution of 1849 by permitting them to retain their own diplomatic representatives, while they exercised through their votes in the *Bundesrat* a stronger influence upon the government of the *Reich*

The establishment of the North German Confederation marks the first step towards the re-organization of Germany. The Liberals indeed often feared that the cleavage of Germany into two halves along the line of the Main might prove permanent But Bismarck, from the beginning had in view the inclusion of the South German States within the Confederation as soon as the feeling of animosity against Prussia, which prevailed in the south after the war, had disappeared and the international situation permitted it Through the conclusion of the offensive and defensive alliance with the South German States, Bismarck had already provided that, in event of a hostile attack from without, the military resources of Germany would be collected together under one leader for the defence of her territory. He now sought to unite North and South still more closely in economic bonds

The war had destroyed the *Zollverein*. Bismarck at once set to work to resurrect it, and in July 1867 he invited the representatives of all the German Governments to a conference at Berlin. He informed the conference that Prussia was only prepared to conclude a new treaty with those States which were willing to establish a customs-parliament. This parliament was to co-operate with the Governments in the work of the *Zollverein*, especially in determining the customs-duties; it was to meet at Berlin and consist of deputies to the North German *Reichstag* as well as of a corresponding number of South German deputies Since the South German States were not prepared to sacrifice the advantages to be derived from membership in a greater economic entity, they were forced to accept these conditions On July 8, 1867, the new *Zollverein* treaty was signed, and the customs parliament met for the first time in the following year In this parliament South Germany and North Germany again became accustomed to co-operate in public affairs and although its activities were restricted to economic questions, it contributed not a little to the overcoming of the differences between the various States. Whilst Bismarck by these two treaties established good relations with the South, the Bavarian Government strove to bring about the establishment of a separate South German Confederation under its own leadership—fruitlessly because Wurttemberg and Baden were less unwilling to place themselves under Prussian than Bavarian leadership

The Luxembourg Question.—The crux of international affairs after 1866 lay in Prussia's relations with France Napoleon still hoped to receive at least the grand-duchy of Luxembourg as a recompense for his neutrality during the Austro-Prussian War. The grand-duchy had belonged to the old German Confederation but had not joined the North German Confederation But since the town of Luxembourg prior to 1866 had been a fortress occupied by Prussia, a Prussian garrison still remained there Napoleon demanded that Prussia should withdraw this garrison and declare her consent to his acquisition of the grand-duchy by purchase from the king of the Netherlands While Bismarck let Napoleon hope that by this means he might gain possession of Luxembourg, he from the outset made it clear that the Prussian garrison could only be withdrawn at the request of the king of the Netherlands or the inhabitants of Luxembourg, and further the whole affair must be very cautiously handled in order to avoid irritating German nationalist feelings If this occurred it would make it impossible for Prussia to consent to the transfer of Luxembourg to France for she could not risk incurring the reproach of having handed over to France, without urgent reasons for doing so, a land in which the population was, at least in part, German Ignoring these warnings Napoleon entered into direct negotiations with the king of the Netherlands for the purchase of Luxembourg, although the Prussian garrison had not been withdrawn The king of the Netherlands was not prepared to make so weighty a decision without first assuring himself of the agreement of Prussia, but Bismarck declared that he was unable to advise him in the matter Meanwhile the French had already spread abroad a rumour that the purchase had been completed, and in Germany an intense feeling of indignation made itself apparent Von Bennigsen brought forward an interpellation in the North German *Reichstag* and in reply Bismarck stated that he had no knowledge of the conclusion of any such treaty and that he hoped to be able to protect the rights of German States and German citizens from any injury without prejudicing the friendly relations with neighbouring States The king of the Netherlands thereupon refused to sign the treaty, and Napoleon was placed in a difficult position For a long time it seemed as though war would break out, but this danger was averted by a European congress which met in London. As a result of its deliberations, Prussia abandoned her right to garrison the fortress, which was destroyed, while the grand-duchy remained an independent State under its then ruler

If Bismarck had desired war with France, he could easily have brought it about at that moment Instead he chose this moment to publish the, hitherto secret, offensive and defensive alliance with the South German States, as a warning to Napoleon that in event of an attack upon Prussia he need not hope to find the South German States either fighting upon his side or maintaining an attitude of neutrality

Napoleon regarded this fresh defeat as a deep personal humiliation. Henceforth he worked for an alliance with Austria and Italy that should be directed against Prussia, and he also began a great re-organization and re-armament of his army. But although Napoleon found that Austria and Italy were in general inclined to favour his plans, he was unable to bring about the conclusion of an actual alliance After her severe defeat at the hands of Prussia, Austria was unwilling to become involved in a new war of which the result could not with certainty be forecast If France first gained the upper hand in South Germany, Austria would then be prepared to intervene in the struggle Napoleon's negotiations with Italy broke down over the Roman Question, for he could not hand over Rome to the Italians without offending clerical parties in France These negotiations, coupled with the appointment of the avowed enemy of Prussia, the duke of Grammont, as minister for foreign affairs, showed clearly the direction of Napoleon's policy.

The Spanish Succession Question.—Although Bismarck was aware of the existence of these negotiations, he was uncertain whether they had produced any definite result, and in any case he believed it to be his duty to make use of every available means of defence against an imminent French attack An opportunity for this was afforded him by the emergence of the Spanish succession question After the expulsion of Queen Isabella in 1868, a regency had been set up in Spain When various attempts to find a suitable occupant for the throne had failed, it was offered to Prince Leopold of Hohenzollern-Sigmaringen who was descended from the Catholic and Suabian line of the Hohenzollerns, and married to a Portuguese princess At first the prince manifested little inclination to accept the proposal, but Bismarck favoured his acceptance from the outset on the ground that, in view of the state of Franco-Prussian relations, it would be useful to have a friendly government in Spain The king, however, was unwilling to influence the prince in making a decision, and the prince declined the proposal Since among the reasons for his refusal the prince had alluded to the instability of the situation in Spain, and the untrustworthiness of the Spanish army, Bismarck despatched two agents to Spain to obtain accurate information as to the position there He also induced the head of the Spanish Government, Marshal Prim, to inform the prince that he did not look upon his refusal as a final one When the agents reported in a sense favourable to his candidature, the question was once more laid before the prince, as in these circumstances his father, Prince Charles Anthony also favoured an acceptance, the prince reversed his previous decision Bismarck thereupon informed Prim that he should again approach Leopold

The prince announced his acceptance to Prim's ambassador on June 19, 1870, after King William had given his consent, on condition that he should be elected by a considerable majority The whole affair was to remain a secret until a proposal had been brought forward in the *Cortes* for the election of Leopold Through a misunderstanding, however, the *Cortes* had been adjourned before the receipt of Leopold's final answer, and Prim, believing that in these circumstances it was not possible to preserve secrecy any longer, informed the French ambassador of the position of affairs A wave of indignation spread over France A question was answered in the French Chamber on July 5, by Grammont, with the declaration that France could not without anxiety see the establishment by a foreign power of one of its princes on the throne of Charles V, and the consequent disturbance of the balance of power in Europe He ended his speech with an open threat of war against Prussia, if she did not withdraw Prince Leopold's candidature, and he despatched Count Benedetti to Ems, where King William was taking the cure, with instructions to see that he ordered the prince to withdraw his candidature

While he hesitated to give such an order, King William informed Prince Charles Anthony that he would be very glad if his son were to abandon his candidature in order to avoid bringing about a war with France over this question The prince, believing

that the decision must await the re-assembling of the *Cortes*, had gone on a tour in the Alps and could not at the moment be reached Prince Charles Anthony therefore took it upon himself in the name of his son to telegraph to Paris and Madrid that the latter withdrew his candidature. Meanwhile in Paris a feeling had grown up that a mere withdrawal of Leopold's candidature was not of itself enough, and that the opportunity should be utilized to inflict upon Prussia a humiliation similar to that inflicted upon France over Luxembourg. Grammont demanded of King William that he should write a letter of apology to the Emperor Napoleon and at the same time verbally informed him, through Benedetti at Ems, that he must promise not to permit the prince to resume his candidature

But before Benedetti had had time to present these new demands on July 13, Bismarck had taken action When the crisis arose, he had been on holiday on his Pomeranian estates; but, on reading Grammont's reply to the interpellation in the Chamber, he resolved at once not to give way before any threat on the part of France He would personally have preferred that the King should refuse to receive Benedetti at Ems, and, when he did so, Bismarck determined to go to Ems himself On arriving in Berlin on July 12, he learnt that Prince Charles Anthony had already renounced the candidature on behalf of his son, and, as he thought that it was now too late to alter the situation, he determined to remain in Berlin But he sent Count Eulenburg to Ems to convey his views to the King On his arrival, Eulenberg found that the interview with Benedetti had already taken place, and that the King had told the ambassador he could give no guarantee for the future On Eulenburg's advice, the King decided to inform Benedetti that under the existing circumstances he could not again receive him in audience and that any further negotiations must be transacted with his ministers. The King at once telegraphed an account of what had taken place at Ems to Bismarck and further gave him permission to make known to the Press and the diplomatic corps the further French demands and the fact of their rejection Bismarck made use of this authorization to publish the King's telegram with certain abridgements which did not affect its actual content (*See* BISMARCK, PRINCE OTTO VON.)

The French Government was now confronted with the necessity of deciding whether or not to accept the Prussian reply Napoleon would perhaps have been disposed to let the matter rest there, if Grammont and the Empress Eugénie had not advised him that such a policy would still further imperil the already insecure position of his dynasty in France Thus he resolved to sign the declaration of war on July 15. If the French Government had contented itself with the withdrawal of the Prussian candidature, he could have concluded the whole affair with a diplomatic triumph for France, it was only when they took the fateful decision to seize the opportunity to inflict a personal humiliation upon the Prussian king, that war became inevitable.

The War with France.—The South German States at once recognized that the eventuality provided for in the offensive and defensive alliance with Prussia had arisen, and placed their troops under the command of King William in fulfilment of their treaty obligations But Germany could not count upon the support of any other allies, Russia preserved a strict neutrality, Austria pursued a very indecisive policy, and if the French had gained a distinct success in the first weeks of the war, the party in Vienna which favoured participation in a war against Prussia would certainly have gained the upper hand, England desired to remain neutral, but at the same time to prevent Belgium being involved in the war Gladstone, indeed, thought that the safety of Belgium was not sufficiently secured by the existing treaties and he therefore, concluded new treaties with France and Prussia in which both States undertook not to violate the neutrality of Belgium, whilst England bound herself to make war upon any State that should violate that neutrality

In accordance with a plan of Moltke's, three armies were formed for the purpose of invading French territory from three different directions General Steinmetz from the Moselle, Prince Frederick Charles from the Palatinate on Metz and the crown prince from the upper Rhine on Strasbourg The French advanced into the Saar district and won a small victory at Saarbrücken So confident were they of victory that they had already drawn up an elaborate plan for the partition of Prussia and a re-division of Germany, by which France was to receive the Saar district. The further progress of the campaign was to belie their confidence On Aug. 4 and 6 the crown prince won two great victories over Marshal MacMahon at Worth and Weissenburg, forced the marshal to evacuate Alsace, invested Strasbourg and advanced against Nancy. The other two German armies surrounded the troops of Marshal Bazaine in Metz and in the bloody fights at Mars-la-Tour and Gravelotte (Aug 16 and 18) repulsed his attempt to break through the Prussian lines Metz itself was besieged and the advance towards Chalons begun When Marshal MacMahon attempted to get round the northern flank of the German forces and press forward on Metz, he found the road already closed to him by numerically superior German forces. Nevertheless he attempted to break through, only to meet with a terrible defeat at Sedan on Sept 1, where, on the following day, he was forced to surrender with all that remained of his army, including the Emperor Napoleon himself The arrival in Paris of the news of this disaster brought about the overthrow of the empire and the establishment of a Government of National Defence under the leadership of General Trochu This new Government asked for an armistice But on the refusal of Moltke to grant this request before he had received the surrender of Strasbourg, Metz, Bitsch and Toul, the negotiations broke down Whilst the main German army advanced against Paris, the fortresses of Metz and Toul capitulated in September, and Strasbourg fell into German hands in October of the frontier forts, Belfort alone held out until the middle of Feb 1871 Paris was completely encircled with German troops and the attempts at relief made from the north and the Loire were repulsed after fierce fighting Finally Bourbaki's army—the sole efficient army left to France—was driven over the Swiss frontier on Feb. 1, 1871, and there disarmed

Shortly before this, Paris had capitulated (Jan. 28), and thereby the resistance of France was virtually ended An armistice was concluded for a period of 21 days, and during this time a national assembly was to be elected with whom negotiations could be carried on for the conclusion of peace The national assembly met at Bordeaux on Feb. 13, and elected Thiers as president of the executive body As his representative, Jules Favre appeared at the German headquarters in Versailles and, after long and difficult negotiations, the preliminary peace was signed there on Feb 26, which was subsequently to form the basis for the final peace concluded at Frankfurt-on-Main on May 10 France had to cede Alsace and a portion of Lorraine with the city of Metz, as well as to pay a war indemnity of five milliards of francs At the outset Bismarck had wished to demand the cession of Belfort, and he had only desisted from doing so when he had been assured by Moltke that the possession of this fortress was not of vital necessity for the defence of the south-west frontier of Germany. German troops occupied Paris, only to leave it again when the national assembly had ratified the peace treaty, and certain districts in Lorraine continued in German military occupation until the war indemnity had been paid in full (*See* also FRANCO-GERMAN WAR)

The German Empire.—During the war public opinion throughout Germany had loudly demanded that one result of the war should be a permanent union of northern and southern Germany Bismarck laid great stress upon the necessity of the Southern States seeking admission to the Confederation of their own volition It might otherwise be said that Prussia had seized the opportunity afforded her by the trustfulness of these States in placing their troops under her command, to compel them to make unwelcome decisions. Ultimately, under pressure from public opinion in Bavaria, and acting on the pressing advice of the rulers of Saxony and Baden, the Bavarian Government determined to initiate a discussion upon the new organization of Germany The conference met in Munich (Sept 22 to 27, 1870), and Bismarck was represented by the president of the federal chancellory, Rudolph Delbrück. The conference was composed

solely of representatives of Prussia, Bavaria and Württemberg. Complete unity was still not effected because the Bavarian minister, Count Bray, firmly maintained that the conference was not competent to deal with the entry of the South German States into the North German Confederation but had only to consider a new treaty of confederation, and moreover, he demanded far-reaching privileges for Bavaria

Nevertheless the existing difficulties seemed capable of solution, and Bismarck therefore induced the grand-duke of Baden to effect the inclusion of his State in the North German Confederation and to send the minister for war, von Suckow, to Versailles for this purpose Thereupon Bavaria and Wurttemberg also felt obliged to send representatives. On Oct. 25, began the final negotiations which were carried on with each of the South German States separately In return for an assurance on the part of Bismarck that he was prepared to concede at least some of her special desires, Bavaria withdrew her opposition to entry into the North German Confederation, and by the end of November treaties had been concluded with all the South German States. Bavaria and Wurttemberg retained their own postal and telegraph services and the right to levy their own taxes on beer and brandy. Bavaria was further conceded the right to independent control of her army in time of peace, her troops were only to be placed under the command of the federal commander-in-chief in time of war. Further the Bavarian ambassadors were to have the right to represent the ambassadors of the Confederation should occasion arise Finally a diplomatic committee of the *Bundesrat* was established under Bavarian chairmanship which was to give its opinion concerning important questions of foreign policy.

Even during these negotiations there arose the idea that it might perhaps be possible to renew the old German imperial dignity in connection with the re-establishment of a national German State Lest this question should first be raised by anyone else, King Ludwig II of Bavaria determined to take the initiative, and he addressed a letter to King William in which he invited him to accept the imperial title The letter was drafted by Bismarck at Ludwig's own desire When the remaining German rulers proclaimed their agreement, with the request contained in the letter, and when the North German *Reichstag* despatched a special deputation to lay a similar request before him, the king decided to comply with the general wish although he personally was averse to seeing the Prussian royal title thus subordinated to the imperial dignity But it was only after the acceptance of the Treaty of Versailles by the North German *Reichstag* and the South German *Landtags* that the idea could be put into execution On Jan 18, 1871, the Hall of Mirrors in Versailles beheld the ceremonial proclamation of William I as German emperor

In accordance with the provisions of the Treaty of Versailles the Constitution had to be remodelled to include the alterations necessitated by the transformation of the German Confederation into the German *Reich* and the president of the Confederation into the German emperor In its new form the Constitution was laid before the *Reichstag* which had been elected by the whole population of the new *Reich* The Constitution was almost unanimously adopted on April 14, 1871 The new *Reich* was composed of 25 States, the four kingdoms of Prussia, Bavaria, Saxony and Wurttemberg; five grand-duchies, 13 duchies and principalities; and the three free cities of Hamburg, Bremen and Lubeck Alsace-Lorraine was to be the common property of all the German States It was designated a *"Reichsland"* and was given an imperial *Statthalter* The main principles of the constitution followed that of the North German Confederation of 1867, the special rights of the South German States were embodied, and it was clearly laid down that they could not be annulled without their consent

Thus the aim of the small German party in the Frankfurt parliament was finally attained Germany once more possessed a common political organization, such as she had not in fact enjoyed since the Peace of Westphalia, although the old constitutional forms had nominally existed until 1806. But this unification of the greater part of the German peoples was purchased at the cost of the exclusion of German Austria. As long as the Habsburg empire existed, and as long as its German inhabitants felt that they owed allegiance primarily to this State, no other scheme for unification of Germany was possible

THE GERMAN EMPIRE

The new German Empire had a territory of 541,000 square kilometres, and its population, including that of the newly acquired districts, was 41,000,000 The population had been increasing steadily and rapidly ever since 1815, when it was 25,000,000 By 1900 it had reached 56,000,000, and at the outbreak of war in 1914 it was nearly 68,000,000 In 1871 Germany was still mainly an agricultural country, the production of foodstuffs was sufficient to supply the needs of the home population and leave a surplus for export From the middle of the 19th century onwards, however, the industrial districts rapidly grew in importance Industry was the principal gainer by the period of economic prosperity which set in after 1871, and German manufactured goods gradually began to compete with British on the world market German export trade steadily increased, and tended more and more to be carried in German-owned and German-built ships

Since the rural population still constituted the majority of the nation, its political influence was naturally great In the districts east of the Elbe the old landed aristocracy maintained its traditional predominance; but in other parts of the country too its power was considerable, for the peasants and agricultural workers were unorganized and tended to follow its leadership. In the industrial districts and the old commercial towns a wealthy middle class had grown up, but the industrial workers were rapidly becoming a numerous class and were making themselves felt as an important factor in political life

Party Politics.—Party divisions in German political life developed on somewhat different lines from those which they followed in most other countries. This was due to the important part played by sectarian considerations The stronghold of the Conservatives was in the north-eastern part of the country, where the influence of the landed aristocracy was predominant Conservative views also largely prevailed among public officials As the electoral system in force in most of the States constituting the empire was specially favourable to the land-owning classes, the Conservatives felt their political position much more secure in the States than in the empire, where there was no upper house and the suffrage was general and equal Most of them were, therefore, more strongly attached to the State to which they belonged than to the empire Many of them disapproved of the policy which Bismarck had followed since 1866 They regarded the dethronement of German dynasties as an offence against Conservative principles and the Indemnity Act as a concession to Liberal demands The Conservatives in consequence split up into two groups. the Independent Conservatives or *Deutsche Reichspartei* found most of their supporters among the public officials and, generally speaking, followed Bismarck, while the *Deutsch-Konservative* adhered strictly to legitimist principles and stood for the interests of the great land-owners.

The chief strength of the Liberals was to be found in the larger towns and among the upper middle classes, especially in North-west and Central Germany and in the Rhineland Ever since the beginning of the 19th century the Liberals had been the chief supporters of German unity and had opposed what they regarded as the unreasonable and reactionary views of those who clung to the system of small States The fact that political power was in the hands of the Conservatives in the individual States led the Liberals to think of a united Germany as the destined field for the realisation of their ideas If they had had the sole voice in the drafting of the new constitution, they would presumably have limited the powers of the individual States much more drastically The new empire however was not their creation, but that of Prussian diplomacy and the Prussian army, and they could only obtain the realization of such of their demands as Bismarck was willing to grant It may be said in general that German Liberalism has suffered greatly from the fact that it has never been able to attain a position of power and responsibility It was never able to do more than carry through now one, now another isolated item of its policy by means of compromises wrung with difficulty

from the Government; and as a consequence it inevitably tended to adopt a negative and critical attitude Even when the Liberals came to terms with Bismarck after 1866, they were obliged to leave the real direction of affairs in his hands. The Liberal Party, like the Conservative Party, split on the vote on the Indemnity Act, the Right wing became the National Liberal Party, while the Left wing retained the old name of the Progressive Party. The latter party remained in opposition because it refused to support any Government which did not take up its stand on the Liberal programme as a whole The National Liberals on the other hand supported Bismarck's foreign policy in the hope of obtaining concessions to Liberal policy in return Liberalism was enormously weakened by the split, and has never fully recovered from its consequences

The Democrats or Radicals had endeavoured to set up a United German Republic during the Revolution of 1848, but after the defeat which they then suffered they practically disappeared from public life Separate democratic parties only continued to exist in the South German parliaments; the Democrats of the North were too weak to form a party of their own, and attached themselves to the left wing of the Liberal Party They gradually acquired considerable influence in the Progressive Party

Another important political group was that of the Clericals Even before the middle of the 19th century there had been Catholic political groups in the various States In the Frankfurt parliament the Catholic members had met separately for discussion It was not however until after 1850 that they actually constituted a party In 1852 a Catholic party was formed in the Prussian Chamber of Deputies, and in 1858 it took the name of the Centre Party Its object was stated to be to combat unbelief and all the resultant phenomena in public life The Catholic clergy tried to induce every good Catholic to vote only for deputies belonging to the Catholic parties The Clericals were particularly influential in Bavaria During the war with France, when it seemed inevitable that an empire consisting of the German States without Austria and with a Protestant monarch would be formed, all the Catholics of Germany—they represented about one-third of the population—combined to form a single German Centre Party, and this party succeeded in getting a considerable number of its candidates returned at the elections to the first *Reichstag* The Centre Party endeavoured to induce Germany to enter the lists for the restoration of the temporal power of the Pope, and to introduce provisions in the constitution of the empire which would secure the Catholic Church against any form of State interference In neither of these respects was it successful The Centre did not actually work against the existence of the new empire, but rather tried to induce it to further the interests of the Catholics as far as possible The party was strongest in those parts of the country where the population was predominantly Catholic and under the influence of the clergy—in Southern Bavaria, the Rhineland and Westphalia, Upper Silesia, Posen and West Prussia

Side by side with the older parties there gradually grew up a socialistic workers' party The first organization of this kind was the *Allgemeiner Deutscher Arbeiterverein*, founded in 1863, of which Ferdinand Lassalle was at first the head After Lassalle's death the party split up into several groups, but they reunited at the party congresses of Eisenach (1869) and Erfurt (1875) and assumed the name of the Social Democratic Party Their objects were based on the principles laid down by Karl Marx and Friedrich Engels in the communist manifesto of 1848 the abolition of the whole existing social, economic and political order in favour of a new order based on communal ownership of all the means of production (the land, factories and machinery) They regarded the existing State as nothing more than a capitalist organization, and therefore entirely repudiated it. Only the proletariat, they held, could bring the new social order into being, and therefore, since the interests of the proletariat of all countries were identical, the workers of all countries should be induced to unite in an international struggle against capitalism They considered that wars between nations were caused entirely by economic rivalry between the ruling groups of capitalists, and would automatically cease in a socialist society In 1871 the Socialist Party was still very small; it had only three members in the first German *Reichstag*. In the following decades however it grew rapidly

There were also a number of political groups which were opposed to the new empire on principle These included in the first place the representatives of the foreign nationalities which had been incorporated in the empire—the Danes in North Schleswig, the Poles in the eastern provinces of Prussia, and the inhabitants of Alsace-Lorraine whose sympathies were with France In addition there were those elements which refused to recognize the forcible abolition of the North German States which had been annexed in 1866—the Guelph Party in Hanover and the *Rechtspartei* in the electorate of Hesse

The fact that so many parties were in existence prevented any one of them from obtaining a solid majority in the *Reichstag*. The prime minister thus always had the difficult task of constituting a majority by negotiating with the leaders of the various groups which were prepared to support the measures which he was contemplating at the time Bismarck's ideal was to combine the two Conservative parties and the National Liberals so as to form a permanent majority This however was exceedingly difficult because the right wing of the Conservatives regarded him with distrust, and objected to any kind of collaboration with the Liberals A coalition between these parties was moreover not at first absolutely necessary, because the National Liberals won so many seats at the elections of 1871 and 1874 that they were able to constitute a majority with the help of the Independent Conservatives and a few Progressive votes Bismarck therefore found it necessary to work in close touch with the National Liberals, but as his personal views were nearer to those of the Conservatives, he took care from the outset to prevent the Liberals from becoming too powerful

The Liberal Period.—In 1873 imperial legislation was extended to cover the entire field of civil law The imperial court of justice was set up in Leipzig in 1879 Work was begun at the same time on the drafting of a civil code for the German empire A uniform penal code and uniform rules for civil and criminal procedure were drawn up Under the Constitution there was only one responsible minister of the empire, the federal chancellor (*Bundeskanzler*) or imperial chancellor (*Reichskanzler*) as he had been called since 1871. The secretaries of State, as the heads of the various departments were called, were entirely subordinate to the imperial chancellor A new act of 1877 empowered secretaries of State to countersign, as representatives of the chancellor, those imperial decrees which related to their particular department This gave them a greater degree of independence, though they were not placed on a footing of equality with the imperial chancellor, but remained his subordinates The heads of the various departments had no collective responsibility for the general policy of the Government, such responsibility rested solely with the imperial chancellor.

On other questions also Bismarck did something to meet the views of the Liberals The Imperial Press Act of 1874 finally abolished the censorship and the obligation of the publishers of newspapers to deposit a guarantee, the freedom of the press was thus secured In the economic sphere, new uniform standards for the whole empire were erected by legislation dealing with the currency and banks, the protection of trade marks and patents and inventors' rights, and by the foundation of the imperial bank The reform of the administration which was carried out in Prussia from 1872 to 1875 was also a concession to Liberal views The new municipal system gave the representatives of the nation a greater share in local government, freed the large towns from the supervision of the *Landrat*, and handed over the settlement of disputes arising out of the action of the administrative authorities to special administrative courts These measures met with violent resistance from the Conservatives, and the king was obliged to appoint 25 new members to the *Herrenhaus* in order to get them adopted by that body.

Bismarck came into violent collision with the Liberals on military questions The Government considered it necessary to make the maintenance of the army independent of the annual consent

of the *Reichstag*, and demanded that the credits necessary for the upkeep of an army of 400,000 men should be voted without limitation of time. The Liberals regarded this as an intolerable encroachment on the right of parliament to control the budget. A compromise was finally agreed upon at the proposal of Bennigsen—the so-called *Septennat*, according to which the military credits were voted for seven years. At the end of that period the amount of the credit was to be reconsidered The sums required for the creation of an imperial navy and for coastal defences were voted without much difficulty. The navy was to be used for the protection of the German coasts and of German commerce; it was decided not to create a battle-fleet or high sea fleet, in order to keep military expenditure within bounds.

The Kulturkampf.—On the religious and educational side, the alliance between Bismarck and the Liberals found its expression in the conflict which came to be known as the *Kulturkampf* The dispute originally arose out of the decrees of the Vatican Council of 1870, which declared the infallibility of the pope in matters of faith to be a dogma of the Catholic Church Serious objection was felt to these decisions among the intellectual leaders of German Catholicism Many of them regarded them as a departure from the traditional spirit of the Catholic Church. They therefore called themselves the Old Catholics, and they refused to recognize the new dogma The Bavarian Government went so far as to prohibit the publication of the decisions of the council because they had not received the royal approval (*Regium placetum*). The German bishops, however, though not without reluctance, recognized the Vatican decrees, and the great mass of the Catholic population remained quite indifferent to the question, consequently the Old Catholics remained a little group of leaders without followers. They were excommunicated by the pope, and were forbidden to teach or to undertake the cure of souls The Church demanded that the Government of the States should dismiss from their posts all Old Catholics who were teachers in State educational institutions Bismarck regarded this as an encroachment by the Church on the sovereignty of the State, and it seemed to him the more dangerous as the Centre Party was at the same time putting forward the demands in the Catholic interest which have already been mentioned He was confirmed in his attitude by the fact that the leadership of the Centre Party was tending to fall into the hands of the former Hanoverian Minister Windthorst, who was a supporter of the Guelph movement and consequently an avowed opponent of the new order of things He refused to dismiss the Old Catholic teachers, and abolished the special section which had previously existed in the Prussian ministry of public worship to deal with Catholic affairs Foreseeing that the Catholic Church would resist these measures, he tried to introduce radical changes in the relation between Church and State in Germany as a whole He proposed to take the registration of births, deaths and marriages out of the hands of the clergy, and to make the celebration of marriages an exclusive function of the State, as well as to abolish clerical supervision over schools and to alter the system of training of the Catholic clergy

Bismarck's plans were warmly supported by the Liberals, while, as was to be expected, they were strongly opposed by the Centre Party, the Poles (*see* POZNAN) and the right wing of the Conservatives The conflict began when the bishops forbade all Catholics to attend classes or lectures given by excommunicated Old Catholic teachers Bismarck replied by expelling the Jesuits from Germany, and by demanding that all bishops should recognize the duty of implicit obedience to the laws of the State He withheld their emoluments from all those who refused to make such a declaration. An imperial act was passed forbidding the clergy to make use of the pulpit or the confessional for purposes of political agitation In May 1873 the Prussian *Landtag* passed a number of measures limiting the exercise of ecclesiastical disciplinary and penal measures It was further decided that no cleric should in future be appointed to a benefice unless he had undergone a three years' course of study at a university or a seminary recognized by the State, and had passed a Government examination in philosophy, history and German and classical literature. The State was to have the right to veto the appointment of any priest to a benefice A special State court of justice for Church matters was set up to try priests who failed to conform to this legislation. The court had power to remove them from their posts

The German bishops protested against this legislation in Prussia and the similar measures adopted in Baden and Hesse, and called on the clergy and the population to engage in passive resistance Government inspectors were refused admission to the seminaries, and appointments were made to ecclesiastical benefices without previous notification of the State The clergy refused to appear before the State court of justice or to pay the fines which it imposed. The archbishops of Posen and Cologne and the bishop of Trier were consequently arrested, and the first-named was deposed by the State court of justice on the ground of contumacy

A number of still more drastic measures were adopted in 1874 and 1875; the State was empowered to appoint its own commissioners to administer clerical posts which had not been regularly filled, and to withhold State grants from parishes which offered resistance The article of the Prussian Constitution which conferred complete autonomy on the Catholic Church was revoked These measures aroused intense feeling among the German Catholics; indeed an attempt on Bismarck's life was made by a certain Kullmann at Kissingen in July 1874 Feeling ran still higher when the pope, on Feb 15, 1875, declared the Prussian ecclesiastical legislation invalid and called on the people to resist it because they owed greater obedience to God than to men.

The Catholics felt it as a special threat to their position that the State was attempting to exercise its influence over the training of the clergy, to bring them into closer touch with secular culture and to prevent their education from remaining wholely in the hands of the Church Bismarck and Dr Falk, the Liberal minister of public worship who was his principal coadjutor in this affair, certainly underestimated the power of resistance of the Catholic Church The Old Catholics had no influence with the nation at large, and the orthodox elements among the Protestants were inclined to support the Catholic point of view on the question of relations between Church and State The question was whether in spite of this Bismarck would be able to carry the struggle through to the end For him the main point at issue was always to maintain the strong political position of Germany, and to contrive such a state of affairs among the parties as would ensure that he could obtain the necessary resources He had entered on the struggle because he regarded the alliance of the Catholic Church with the Centre and the Poles as a serious danger; but he himself repeatedly declared later that he had never really meant to go so far, and that the May laws were the work of Falk and the Liberal majority in parliament Probably he began by demanding more than would really content him, so as to have a margin with which to offer concessions and thus finally arrive at agreement Conditions soon became such as to make him very anxious that an agreement should be reached

Financial Reform.—It soon became apparent that the revenues which the Empire derived from its own resources would not be sufficient to cover its expenditure The "imperial" contributions of the States repeatedly had to be increased Bismarck considered this undesirable, and tried to devise means of finding increased sources of revenue in the empire itself His first idea was that the railways, which belonged partly to the individual States and partly to private companies, should be taken over by the empire As a preparatory measure, an Imperial Railway Board was set up in 1873. The scheme broke down however owing to the resistance of the States, which were unwilling to part with so valuable a source of income Bismarck next tried to increase the taxation of articles in common use, and to introduce a tobacco monopoly In this he met with opposition from the Liberals, who objected to any increase in indirect taxation because they regarded it as an encroachment on parliament's right of control over the budget The only other possible means of raising fresh revenue for the empire appeared to Bismarck to be an increase in customs tariffs Here again opposition was to be expected from the Liberals, the vast majority of whom were believers in free trade, but on the other hand it was possible to reckon on a strong protectionist movement among the great manufacturers and landowners

German industrialists regarded increased protective tariffs on foreign imports as an assistance to them in their struggle for the control of the home market German agriculture was beginning to have difficulty in meeting the food requirements of the rapidly growing population; more and more cheap foreign grain was being imported, and this tended to depress the prices of agricultural products, while at the same time agricultural wages were rising. The landowners were convinced that increased import duties on grain were the only means of keeping prices at a level which would make farming pay Bismarck accordingly felt sure of support from the principal economic elements of the country, and decided to undertake a complete revision of the customs tariffs

Bismarck would very much have liked to win over the right wing of the National Liberals, the support of the Conservatives was not in doubt. He declared himself ready to include Bennigsen, the principal National Liberal leader, in the ministry if he could bring over the majority of his party to the side of tariff reform Bennigsen however insisted that two other National Liberals, Forkenbeck and Stauffenberg, should also be given office, and the scheme broke down Bismarck now saw that his plans for financial and tariff reform could not be carried out with Liberal aid

Social Questions.—There was yet another question on which Bismarck and the Liberals had come to the parting of the ways The Social Democrats had been gaining many adherents among the workers; they had won no less than 12 seats at the 1877 elections Bismarck regarded the growth of this movement, which was hostile to the existing political order, as a grave menace He thought its development might be checked if satisfaction were given to some of the justifiable demands of the workers, while at the same time stern measures were taken to repress all extremist tendencies. It had for some time been in his mind that the State ought to find some means of protecting workers against destitution when they were no longer able to support themselves by their own earnings Ideas of this kind had first been put forward in Catholic circles, and had found an ardent defender in Ketteler, archbishop of Mainz Among the Protestants too there were many who thought that both Christian and general humanitarian considerations demanded that something should be done to improve the material and moral conditions of the workers These tendencies found representation in the *Verein fur Sozialpolitik.*

Bismarck was no doubt indirectly influenced by these points of view, but it was mainly political considerations that he had in mind He prepared a scheme for the insurance of workers against sickness, industrial accidents and old age, in which a considerable part of the necessary funds was to be contributed by the empire At the same time he proposed to make it an offence to engage in agitation for revolutionary or republican objects, or for the subversion of the existing social order. As early as 1875 he attempted to introduce provisions into the act supplementing the penal code laying down penalties for public attacks on the principles of marriage and the family and of private property. The Liberal majority rejected the proposed clauses, and Bismarck then began to consider introducing exceptional legislation against Social Democratic agitation The Liberals were however opposed both to the introduction of exceptional legislation against one particular political tendency, and to compulsory State insurance of the workers, which was in their view an unwarrantable interference of the State in economic affairs Since these plans of Bismarck's also were opposed by those who had been his allies, he began to consider whether some other parliamentary majority could not be won over to his side Such a majority could only be found among the Conservatives and the Centre Party, but no understanding with the Centre Party could be reached unless the *Kulturkampf* came to an end. This did not seem impossible, since Leo XIII., who had become pope on the death of Pius IX in 1878, also manifested the desire to put an end to the regrettable state of affairs which prevailed in the Catholic districts of Germany as a result of the conflict between Church and State.

At the time when Bismarck was considering these possible changes in policy, a journeyman tinsmith, named Hodel made an attempt on the life of the Emperor Wilhelm I. on May 11, 1878. Although the emperor was not actually wounded, and although there was no evidence of any connection between Hodel and the Social Democrats, Bismarck thought that he might make use of the indignation aroused by the attempted assassination of the aged monarch to carry through exceptional legislation against the Social Democrats. The Liberal majority however again threw out the bill. A few weeks later, on June 2, a second attempt was made on the Emperor's life, this time by a certain Dr Nobiling The emperor was so seriously wounded that the crown prince had to be empowered to act as his representative for a time Social Democratic publications were actually found in Nobiling's possession, and Bismarck thinking that fresh elections might result in a majority more favourable to his schemes, dissolved the *Reichstag* The Liberal parties in fact lost 42 seats, and the Conservatives gained 37

Bismarck once more submitted exceptional legislation against Social Democratic agitation to the new *Reichstag* Meetings, associations, funds and publications intended to promote Social Democratic propaganda were to be prohibited, professional agitators were to be liable to expulsion from the country, martial law might be proclaimed in districts where the movement manifested itself particularly strongly The National Liberals, thoroughly alarmed by their failure at the polls, allowed themselves to be prevailed upon to vote for the bill with a few attenuating amendments, it was provisionally to remain in force for two and a half years The Conservatives also voted for the bill, and it was adopted on Oct 19, 1878 by 221 votes to 149 It did not produce the desired effect. The Social Democrats printed their journals in Switzerland and smuggled them into Germany in large quantities; as long as the act was in force (*i.e.*, till 1890) they held their party assemblies abroad Persecution simply resulted in making their organization stronger

The New Customs Tariff.—Bismarck at first thought it would be possible to win over enough of the National Liberals to protection to enable it to be introduced by a similar majority When however it became clear that this was hopeless, he decided to enter into direct negotiations with the Centre. On March 31, 1879 he had an interview with Windthorst which proved to be one of the turning points in the internal history of the German empire The Centre expressed its willingness to accept an increase in customs duties and indirect taxation if the *Kulturkampf* were broken off In order, however, to safeguard the *Reichstag's* control of the budget, it demanded that all revenue from the new taxation in excess of 130,000,000 marks a year should be divided among the individual States The object of this was that if the Government should require more than this sum, it should be obliged to ask for matricular contributions, the amount of which had to be approved by the *Reichstag* every year On this basis the new customs tariff and the increases in indirect taxation were adopted on June 12, 1879 Hamburg and Bremen were brought within the customs frontiers of Germany with the exclusion of a free harbour for goods in transit (1881), the customs barrier surrounding the empire thus became complete The grant of imperial subsidies to certain great steamship lines (1885) also served to facilitate the application of the system by which the Government hoped to create better conditions for the economic activity of the country.

The breach between Bismarck and the Liberals was now complete, and the Conservatives and the Centre began to make their influence more and more strongly felt in all spheres. Their task was the easier because Bennigsen failed in his efforts to prevent a split in the National Liberal Party, the right wing desired to regain its position of alliance with the Government, while the left wing joined with the Progressive Party, the two together forming the German Independent Party (*Deutsch-freisinnige Partei*) Both groups lost more and more of their adherents. The Conservatives became increasingly powerful, especially in Prussia. A ministerial order issued by von Puttkamer in 1882 instructed all officials to support the policy of the Government, and to exercise their influence in the elections for this purpose.

The End of the Kulturkampf.—Falk, the minister of public worship, had resigned while the *Kulturkampf* was still continuing. In 1880 Bismarck obtained powers from the *Reichstag* to dispense with the application of the May laws in individual cases.

The secular examination for candidates for the priesthood was abolished, the competence of the State ecclesiastical court was limited, and the payment of emoluments to the clergy in most cases resumed. Finally, in 1886, the State ecclesiastical court was abolished, together with State inspection of seminaries. The pope on his side induced the archbishops of Posen and Cologne, who had been the two most violent opponents of the State in the recent struggle and had been deposed by the State ecclesiastical court, to resign their office. Peace was finally concluded between Church and State in 1887 The pope recognised the right of the State to veto ecclesiastical appointments if there was any serious objection to them on doctrinal or moral grounds In return, the State agreed to modify the formula of the oath required of the clergy, and readmitted the Catholic orders with the exception of the Jesuits. Civil marriage was maintained Certain difficult questions of principle remained outstanding, but agreement was reached on the most pressing of the points at issue

Social Legislation.—Bismarck now returned to his plan for far-reaching legislation on the insurance of the workers In March 1881 he laid an Accident Insurance bill before the *Reichstag*. All workers were to be insured against industrial accidents by an Imperial Insurance Institution The cost was to be borne partly by the employers and workers and partly by the State As however the Liberals were opposed to compulsory insurance, while the Centre and the Conservatives disliked any extension of the sphere of influence of the central Government, the bill did not go through the *Reichstag* without drastic amendment The principle of compulsory insurance was accepted, but the empire was not to make any contribution to the scheme, and it was decided to set up insurance institutions for each of the States instead of an Imperial Insurance Institution One of Bismarck's main objects was to make the workers feel that they were receiving direct benefit from the Empire, and he regarded the amendment as so serious a mutilation of his scheme that he withdrew the bill for the time being The 1881 elections showed a great decrease in the strength of the Conservatives, and an accession of power to the Liberals and Social Democrats Bismarck submitted his bill to the new *Reichstag* in a modified form, and persuaded the emperor to take the almost unprecedented step of announcing it to the *Reichstag* by a special message He said that the object of the new law, which was to be followed by others, was to promote peace between classes in a spirit of Christianity. Although Bismarck had made up his mind to give up the idea of an Imperial Insurance Institution and to set up a system of trade associations (*Betriebsgenossenschaften*) on a local and occupational basis under State control, there was still a great deal of opposition to the bill because the principle that 25 per cent. of the expense should be provided by an imperial subsidy was maintained It was only after prolonged negotiations that the bill finally became law in March 1884, with an amendment substituting an imperial guarantee for the imperial subsidy Bills were later introduced setting up sickness insurance funds and a system of old age and invalidity insurance, and these too gave rise to heated discussion and were only adopted after far-reaching amendment Bismarck however succeeded in getting the principle of a subsidy from the empire adopted in the case of the old age and invalidity insurance system.

Whatever may have been its defects of detail, this body of social legislation represents a great achievement and has served as a model for the other countries of Europe It did not however achieve Bismarck's object of bringing over a large proportion of the workers from the Social Democratic camp and winning their adherence to the existing political order The workers regarded the concessions which it represented as a sort of payment on account which they were glad to accept because it meant an improvement in their material position; but it did not persuade them to give up the rest of their aims

Foreign Politics.—In the sphere of foreign policy, Bismarck's principal object was to preserve peace, which Germany required in order to develop its economic activities and to consolidate its internal organisation He was convinced that it was not to Germany's interest to extend its territories any further at the expense of its neighbours, and that therefore even a successful war could bring no real advantage.

The most serious menace to peace lay in the desire of France to recover Alsace-Lorraine Within a few years France had paid off its war indemnity of five milliard francs, and it then began to reorganize and strengthen its army and to improve the fortifications on the German frontier France alone would not however have been strong enough to reopen the struggle, and Bismarck therefore regarded it as his first duty to maintain friendly relations with all countries which might have become the allies of France. He endeavoured to strengthen the traditional ties of friendship between Germany and Russia, to bring Austria and Italy into closer relations with Germany, and to establish contact with Great Britain

Conditions in the Balkan Peninsula constituted another great danger to peace Here the interests of Russia and those of Austria were in sharp opposition Russia was striving to establish its hegemony over the Slav states of the Balkans and Constantinople Austria on the contrary was anxious that Russia should not gain complete control over the lower Danube and the way to the Aegean, and was therefore in favour of the maintenance of Turkey. England threw its weight into the same scale, in the hope of keeping Russia out of the eastern Mediterranean The maintenance of Turkey however did not appear to be possible unless the Sultan carried out far-reaching reforms and granted full equality of rights to his Christian subjects But it was exceedingly doubtful whether this was feasible in a State the very foundation of which was the principle of the exclusive supremacy of Islam From the point of view of Germany, which was not directly interested in Eastern questions, the main thing was to prevent a collision between Russia and the other Powers.

Bismarck's first idea was to renew the close alliance between Russia, Austria and Germany which had existed some decades ago. For some time this appeared to be successful. The revolt of Bosnia and Hercegovina against the Turks in 1875 however threatened the very existence of Turkey, and in consequence the danger of war between Austria and Russia once more became acute The revolt spread to Serbia and Bulgaria, Russia intervened in favour of the Christian peoples of the Balkans and declared war on the Sultan in 1877 The tzar succeeded in averting the intervention of Austria, but in return he was obliged to leave the administration of Bosnia and Hercegovina to Austria. In the spring of 1878 England seemed to be on the point of entering the field, but this was avoided by Bismarck's mediation At the Congress of Berlin, which took place from June 13 to July 13, 1878 and over which Bismarck presided, the Powers agreed upon a new settlement of Balkan affairs, but none of them received full satisfaction, and thus the seed was sown for future complications. Russia above all was discontented at the accession of territory to Austria, and at the fact that the foundation of a Greater Bulgaria had been prevented It was resented that Bismarck had not supported Russian claims more warmly, and the tzar was actually betrayed into uttering open threats in a letter to the Emperor William

This gave Bismarck an opportunity of beginning negotiations with Austria with a view to a defensive alliance Count Andrássy, who was mainly responsible for Austrian policy, was in favour of the idea, but the Emperor William resisted the scheme because he disliked the idea of an alliance directed against Russia and because he thought it wrong that Austria should refuse to promise help to Germany in the event of an attack by France The old emperor finally yielded to Bismarck's threat of resignation, though with great reluctance The German-Austrian alliance was concluded on Oct 7, 1879. It was laid down that either of the contracting parties would support the other with its whole power in the event of an attack by Russia on one of them If either contracting party were attacked by any other Power, the other undertook to maintain benevolent neutrality If, however, Russia should intervene in the struggle on the other side, the obligation to give the fullest assistance would at once come into play

It was far from being Bismarck's object to adopt a permanent attitude of hostility towards Russia In June 1881 he succeeded in bringing about a new treaty between the three emperors by

which they undertook to support one another against other Powers, and agreed that no alterations of frontier should take place in the Balkans unless they had been previously agreed upon by Russia, Austria and Germany. In the spring of 1884 the treaty was renewed, with slight modifications, for a further period of three years

Another feature of Bismarck's policy was the establishment of closer relations with Italy The Triple Alliance treaties between Germany, Austria and Italy were concluded on May 20, 1882; they remained in force, with some modifications, until 1914. Austria and Germany undertook to assist Italy with all means in their power in the event of an attack by France, such an attack did not seem improbable at the time, as the Italians considered their interests to be gravely injured by the French occupation of Tunis Italy undertook to help Germany in the case of an unprovoked attack by France The existing treaty obligations between Germany and Austria were maintained

Bismarck's system of alliances as laid down by these treaties was only modified in appearance when, after the Balkan conflicts of 1884 and 1885, it became impossible to renew the alliance of the three emperors on its expiry in 1887. In order to provide a substitute, Bismarck concluded the so-called Reinsurance Treaty with Russia on June 18, 1887 He recognised Bulgaria as falling within the Russian sphere of influence, and even promised diplomatic and moral support if Russia found itself obliged to occupy Constantinople The text of the other clauses shows that a temporary occupation was all that was intended; permanent frontier changes in the Balkans could not be made without Germany's consent

This treaty cannot be rightly judged unless it is borne in mind that at the same time an agreement was being concluded between Great Britain, Italy and Austria, with Bismarck's knowledge but without the participation of Germany, the aim of which was the maintenance of the *status quo* in the Near East. Moreover, when the Triple Alliance was renewed in Feb 1887, Bismarck obtained the inclusion of a new clause under which Austria and Italy undertook to give compensation to the State concerned if they should proceed to the temporary or permanent occupation of territory in the Balkans The intention of these mutually complementary treaties was to prevent either Russia or Austria from engaging in an unchecked policy of conquest in the Balkans The affiliation of Rumania to the Triple Alliance was to serve the same object Bismarck was aware of the strong opposition of interests which existed between Russia and Austria and between Italy and Austria, and he thought that peace could best be ensured if he maintained close relations with all the Powers in question so that he could mediate between them if relations became strained

It was most important at this time that steps should be taken to keep the peace, for the situation had become exceedingly serious owing to France's increasing desire for *"revanche"* and owing to the growing influence of the Panslavists in Russia Bismarck felt it necessary to strengthen the defences of Germany In the autumn of 1886 he laid a bill before the *Reichstag* to increase effectives of the army by 41,000 men and to fix the figure for a further period of seven years The *Reichstag* threw out the bill because the Centre would only consent to a period of three years; it was therefore dissolved At the new elections in Feb 1887 the Conservatives and National Liberals were returned in greatly increased strength, they held respectively 122 and 97 seats, and thus they had between them an absolute majority in the *Reichstag* They had worked together in the electoral campaign with a view to securing the passing of the Army bill It seemed clear that if the "cartel" of the two parties could be maintained it would form the basis for a stable parliamentary majority The Army bill was passed on March 11, 1887 Although Bismarck had repeatedly declared in the *Reichstag* that the increase in the army was intended solely to strengthen the defensive power of Germany, it was regarded in France as a threat Feeling ran so high that a minor incident, the arrest of the French frontier commissioner Schnäbele on German soil, nearly led to war By another law adopted early in 1888, Bismarck raised the age for compulsory service in the *Landwehr* to 39. This did not involve any increase in the size of the army in peace time, but made it possible to draw on a considerably larger number of trained men in time of war.

Colonial Policy.—Whereas in Europe Bismarck confined his aims to the preservation of Germany's existing frontiers and to the maintenance of peace, he was beginning to contemplate an extension of German territory overseas. Germany was the only one of the great industrial Powers which had no colonies. Since the occupation of Egypt by the British and of Tunisia by the French, the division of territory between the European Powers had begun to progress so rapidly that Bismarck was anxious to obtain a share for Germany before all that was available should have been allotted He directed his attention only to districts where German traders or colonists had already established themselves firmly Having first made sure that Great Britain had no rights of sovereignty over the districts in question, he declared on April 24, 1884, that the settlements founded on the south-west coast of Africa by the trader Luderitz of Bremen were under the protection of the German empire Subsequently the whole of the coast district from the frontier of Cape Colony to that of Portuguese Angola, with the exception of the British settlement of Walfisch Bay, was, with the consent of Great Britain, made a German protectorate In the summer of 1884 Dr Nachtigal concluded treaties with the local chieftains in the Cameroons and Togoland, and in the autumn of the same year similar treaties were made by Dr Karl Peters in the hinterland of Zanzibar; these districts, as well as the north-eastern part of New Guinea and the neighbouring islands, were also declared German protectorates Bismarck had no idea of making these districts into provinces of the German empire overseas, their administration and economic development was to be left to special companies, and only if the interests of the German traders there were threatened by the natives or by foreign Powers would Germany intervene to protect them Later, however, German colonial development was to follow other lines The German East African Company found itself unable to deal with an important revolt which took place among the natives, the revolt was suppressed by Major von Wissmann, acting as imperial commissioner, and the company had to make over its rights to the empire The New Guinea Company also made over its rights in 1899, and in 1907 all the colonies were placed under the control of the Colonial Office.

William II. and the Dismissal of Bismarck.—The Emperor William I. died on March 9, 1888, at the age of 91 His reserved and impressive personality inspired universal respect, and did much to reconcile the non-Prussian rulers and populations of Germany to the new régime. He was succeeded by his son Frederick III, who had already shown his quality as general in the wars of 1866 and 1870, and was specially popular in South Germany, whose troops he had led to battle against France For some time, however, he had been suffering from a serious complaint of the throat, and the doctors agreed that he had not long to live. As a matter of fact, his reign only lasted 99 days. In these circumstances, although he was personally much more sympathetic to Liberal ideas than his father or Bismarck, he left Bismarck a free hand in the conduct of business, and only showed by isolated acts that his real views on questions of internal policy were different On June 15, 1888, he was released by death from his cruel sufferings

William II, the eldest son of the Emperor Frederick and the English Princess Victoria, came to the throne at the age of 29. He was a man of quick intelligence and great self-confidence, and was determined to take an active part in affairs Although he took a great interest in modern technical progress, his general outlook was that which prevailed among the Conservative officials and officers He entertained exceedingly lofty ideas of the position of a monarch, based on religious and mystical assumptions His father's Liberal tendencies were distasteful to him; but he did not possess his grandfather's tact and stability of character. He was liable to be swayed by the influences of the moment, and he was very susceptible to skilful flattery His intentions were excellent; but he was firmly convinced that he was the only person who knew what was good for his country He had in times past

often assured Bismarck of his profound admiration; but this had not prevented occasional minor disagreements. When he came to the throne, he asked Bismarck to remain in office, but it very soon became clear however that Bismarck and the young Emperor would not be able to work together very long.

The immediate cause of the conflict between the emperor and his chancellor was that the former suddenly expressed a desire to have a number of social measures of a far-reaching character introduced, and to announce them in advance by a sort of proclamation Bismarck had serious objections to such a course, and thought that at the least the probable consequences of the measures should first be carefully considered Differences of opinion also arose on the question whether the Socialists' Act, which was due to expire in the autumn of 1890, should be re-enacted in an attenuated form Bismarck tried to persuade his colleagues in the Prussian ministry to declare their solidarity with him, but they, regarding themselves according to the traditional view of Prussian officialdom as being primarily the servants of the monarch, refused to do so The emperor looked upon Bismarck's action as an attempt to make him subject to the will of his first minister and practically to depose him Bismarck, on the basis of a cabinet order dating from 1850, forbade any minister to have an audience with the emperor at which he himself was not present. William II demanded that the order should be withdrawn Bismarck refused to do so on the ground that the unity of the Government would be endangered if the prime minister's authority were weakened The emperor thereupon gave him the choice of drawing up a decree reversing the order or handing in his resignation He chose the latter In his letter of resignation, dated March 18, 1890, he set forth all his objections to the policy which the emperor had hitherto followed His resignation was at once accepted

The decisive factor in the conflict between Bismarck and William II was not the difference of view between the older and the younger generation or between different political tendencies, but the young emperor's unwillingness to yield to any will but his own Questions of foreign policy played only an incidental part Bismarck's attempt to come to an understanding with the old Centre leader Windthorst without the emperor's knowledge, after the *Reichstag* elections had destroyed the majority of the Conservatives and National Liberals, was an aggravating feature but not the real cause On Bismarck's side the desire to keep the power which he had enjoyed for the last 27 years played an important part, as well as his distrust of the Emperor's personality, which he believed to be fraught with the gravest dangers for Germany How trivial the emperor's immediate motives were is shown by the fact that he completely dropped his schemes for social legislation before more than a small part of them had been realized, and did not even insist on the revocation of the cabinet order of 1850 which had been the principal bone of contention

Caprivi.—As Bismarck's successor in the chancellorship, the emperor appointed Count Caprivi, who had hitherto occupied exclusively military positions, and had no experience either of administration or of foreign policy The new foreign secretary was Marschall, formerly public prosecutor in Mannheim, who took over that difficult department of State with equally little experience. The man who, from now on, really dominated the Foreign Office was Holstein, an official trained in the school of Bismarck, who had, however, assisted in bringing about the fall of the former chancellor He was a man of keen insight and comprehensive experience, but solitary and aloof, avoiding publicity and responsibility, and of a morbidly suspicious temperament His reports exercised a tangible influence on German foreign policy up to 1905.

The first significant act of the new Government was the decision not to renew the "re-insurance compact" with Russia, which expired in the spring of 1890 Holstein took the view that the compact was inconsistent with obligations to Austria He instigated Marschall and Caprivi to advise the emperor to put an end to the compact, in spite of the strong desire of Russia for renewal, which the emperor personally favoured The result of this step was to clear the way for a *rapprochement* between France and Russia. Bismarck had throughout considered it his most urgent task to prevent Germany from being placed in the position of having to wage war simultaneously on both fronts In August 1891 an alliance was concluded between Russia and France, and a year later the alliance was strengthened by a military convention

At the same time, the emperor was endeavouring to effect a *rapprochement* with England By a treaty signed on July 1, 1890 Heligoland was ceded to Germany, and German sovereignty was recognised in East Africa from Lake Tanganyika to the coast, with a slight extension of the boundaries of German South West Africa, Germany resigned in favour of England the claim to a protectorate in Witu and Uganda and renounced possession of the island of Zanzibar The treaty removed certain causes of friction, but failed to lead to closer relations between Germany and England The attempts of Germany during the next few years to bring about an understanding failed because of the conviction entertained by the English Government at the time that the policy of "splendid isolation" was in the best interests of the country

A serious disagreement between the two Powers resulted from the attempt of England to annex from the Congo Free State a strip of land between Lake Tanganyika and Albert Nyanza, contrary to the Congo Act of 1885, which had been signed by all the great Powers England was forced to renounce the transaction, and there was strong feeling in London over the attitude of Germany in this matter, and also over the close relations maintained between Germany and the Boer States in South Africa Marschall's efforts to bring about a more sympathetic understanding with France also failed

In home affairs, attempts were made to carry out the promises contained in the emperor's manifesto of Feb 4, 1890, on social policy. The Industrial Courts Act of July 29, 1890 gave jurisdiction in labour disputes to a court including representatives of workers and employers An amendment to the Trade Regulations on June 1, 1891 gave legal sanction to the Sunday rest, limited the right of employers to impose fines and introduced special safety regulations for unhealthy industries It also provided for the institution of committees of workers entitled to advise on matters connected with the internal working of an undertaking, and regulated the employment of women and children Provision was made for the appointment of special factory inspectors to see that the law was enforced In order to promote German trade, important commercial treaties were concluded with Austria, Italy, Bulgaria and Switzerland Germany extended to these countries a reduction in the protective duties on corn from five marks to 3 50 marks on every two cwt , and received in return a reduction of tariffs in favour of German industrial exports These treaties were concluded for 12 years, and came into force at the beginning of 1892 Rumania and Serbia subsequently entered into similar agreements Caprivi aroused the opposition of the conservative element by these treaties, which favoured industry at the expense of agriculture The foundation of the League of Agriculturists in 1893 marked a strengthening of the influence of the large landowners within the Conservative Party

The chancellor was obliged to obtain the support of the Centre Party in order to obtain ratification of the commercial treaties by the *Reichstag*, and had to purchase this support with concessions in other directions Among these concessions was the introduction of a new Prussian Education bill, which gave the Church control of religious instruction and introduced Church schools The bill aroused keen opposition on the part of the Liberal party, and Miquel, the Prussian minister of finance, who had been a member of the National Liberal Party, threatened to resign if it were passed The emperor intervened, and at the session of the privy council on March 17, 1892 insisted on thorough revision of the bill Zedlitz, the minister of education, thereupon resigned, and the bill was withdrawn by his successor The Centre Party returned to the Opposition, and the Government was not certain of a majority either in the *Reichstag* or in the Prussian *Landtag* The difficulty of the situation made itself felt during the debate

His decision to resign was due not only to the fact that he no longer had a majority in the *Reichstag*, but also partly to the consideration that for some time he had ceased to enjoy the personal confidence of the emperor, as a result of disagreement over questions of foreign policy.

Morocco Crisis.—After the negotiations with England broke down, Bulow had also refused the offer of a Russian alliance The Triple Alliance was weakening Italy strove more and more openly for better relations with France, and in November 1902 undertook to give assistance if France were compelled by provocation to declare war on Germany The bonds between England and France were tightened by a treaty concluded on April 8, 1904 Germany's position was becoming more precarious The outbreak of war between Russia and Japan in Jan 1904 favoured the maintenance of peace in Europe; the Russian forces were immobilized in the Far East for some time, France was obliged to avoid any complications so long as her most powerful ally was not in a position to give any assistance If the German Government had intended to bring about war with France, this would have been the most favourable moment But neither the emperor nor Bulow entertained any such notion The chancellor proposed to take advantage of the situation merely to prevent France from acquiring actual possession of Morocco, which had been recognized as lying within the French sphere of interest by the treaty with England mentioned above He thought that such an extension of the power of France could not be tolerated unless Germany received some colonial compensation He induced the emperor, against his will, to seize the opportunity of a Mediterranean cruise to land in Tangier on March 31, 1905 and inform the sultan's representative that Morocco was regarded as a completely independent country The French Government interpreted this announcement as calculated to elicit an offer of compensation from France, and attempted to ascertain the extent of the German demands by direct negotiations with Berlin

The emperor had, however, informed the king of Spain shortly before that he sought no territorial expansion but merely wished to ensure the political and economic equality of all nations in Morocco, and Bulow was thus unable to enter into any arrangement He insisted on the convening of a conference of all Powers which were engaged in trade in Morocco and had been parties to a treaty signed in Madrid in 1880, guaranteeing equality of treatment for all foreigners in Morocco, for the purpose of reaffirming the principle of equality France wished to avoid a renewal of such a guarantee, which might be an obstacle to future policy, and consequently opposed the conference altogether In the face of Bulow's insistence, a group of French politicians led by Delcassé was in favour of refusal, even at the risk of war, believing that they could count on assistance from England if necessary, although there was no definite undertaking on the part of England In the end, however, pacific opinion preponderated and Delcassé resigned in July 1905 It was arranged that the conference should be held in the following year at Algeciras (*See* Morocco; Algeciras Conference)

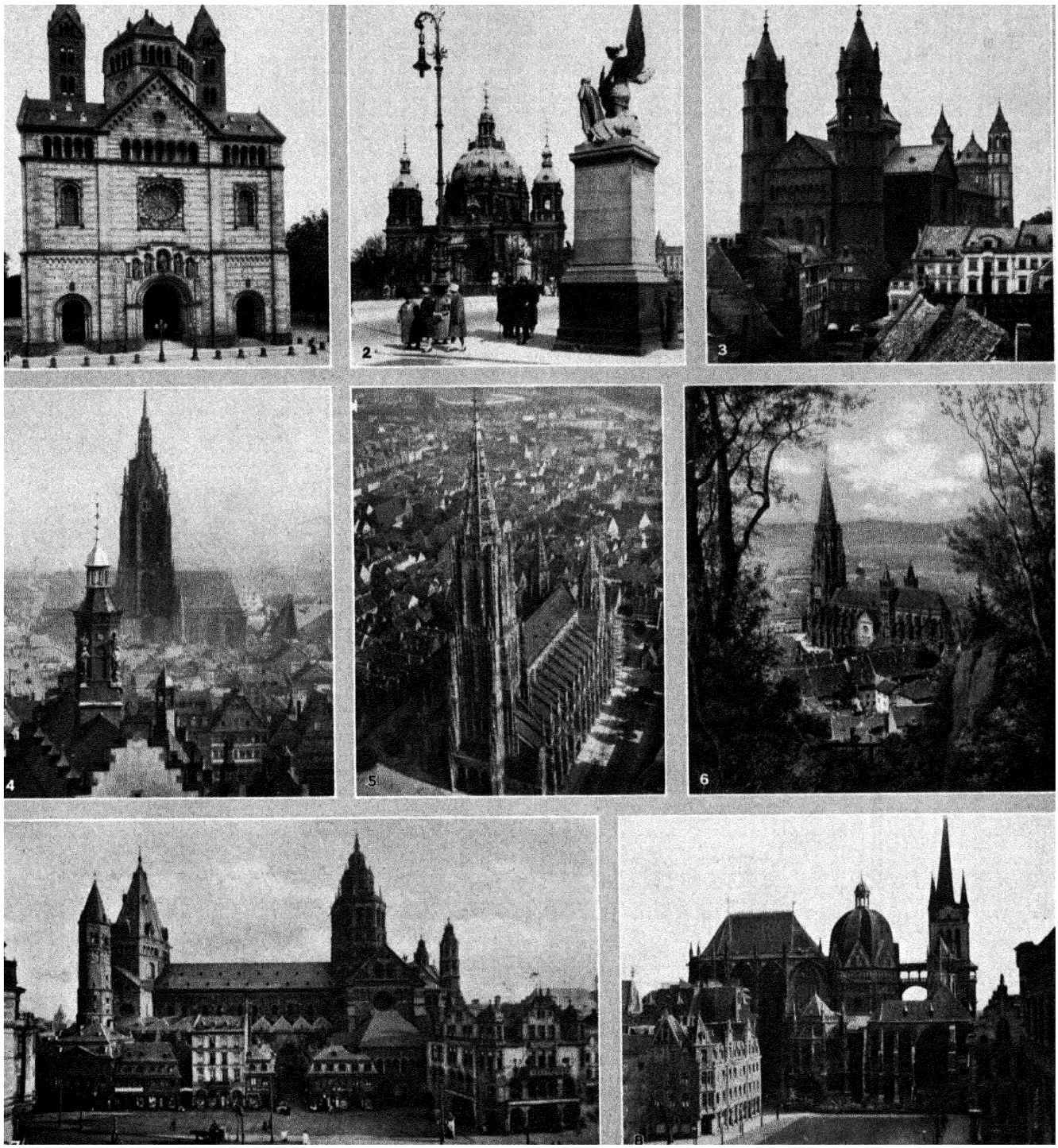
In the meantime, Russia was completely defeated by Japan The tsar met the Emperor William at Bjorko in Finland in July 1905 By agreement with Bulow, the emperor endeavoured to persuade the tsar to conclude an alliance, to which France was to become a party under pressure from Russia The tsar was induced to sign a treaty to this effect, but his Ministers decided that such an arrangement was inconsistent with the terms of the alliance with France, and he withdrew from the agreement under various pretexts In the meantime a serious disagreement had arisen between the emperor and Bülow, because the former had altered the wording of the text of the treaty as approved by Bulow The chancellor announced that he felt obliged to resign The emperor formally requested him to remain in office. Bülow gave way, but the emperor cherished a strong feeling of resentment on account of the incident.

The conference held at Algeciras from January to April 1906 did not follow the course desired by Germany Russia and England were openly on the side of France, and Italy, bent on the annexation of Tripoli, showed more consideration for France than for Germany. Germany could thus count only on Spain and Austria. The majority agreed to recognise the priority of French interests in Morocco, and Germany was forced to consent in order to avoid the complete failure of the Conference which she had herself proposed. The independence of Morocco was formally guaranteed, but in military and economic matters international adjustments were made in which France was specially favoured

The failure of the German policy in Morocco led to the retirement of Holstein, who had played a leading part in determining it. There was, however, no appreciable change in the direction of German foreign policy as a result of his retirement.

The German interference in Morocco indirectly affected England, since the consent of France to the complete establishment of the English protectorate in Egypt was conditional on the acquisition of Morocco by France When the possibility of war arose, the English Government agreed that members of the French and English military and naval staffs should collaborate in preparing plans to be carried out in the event of a common war against Germany Through the mediation of France, England also entered into negotiations with Russia with a view to the adjustment of colonial rivalries. A treaty concluded on Aug. 31, 1907 defined the English and Russian spheres of interest in Asia, and formed a basis for a closer political understanding between the two Powers Germany was now faced with the danger of having to meet the combined strength of France, Russia and England if a conflict arose Bulow frequently expressed a feeling of uneasiness at this isolation, but saw no means of counteracting it except a further attempt to arrive at a sympathetic understanding with England so far as possible—which was rendered difficult by the suspicion aroused in England by the growth of the German navy As a result of the understanding with France, a redistribution of the English fleet had taken place, involving a reduction in the number of ships in the Mediterranean and the Far East and an increase in the number assigned to the Channel and the North Sea. In 1906 a new type of battleship, the Dreadnought, was constructed, which went far beyond all previous achievements in size, speed and fighting strength The other Naval Powers felt obliged to build similar warships in order to be able to hold their own in a battle. Largely for this reason, Admiral Tirpitz proposed in 1906 an amendment to the Navy Act, increasing the building plan adopted in 1900 by six large cruisers and providing that all new vessels should be of the Dreadnought type A further amendment adopted in 1908 provided for more rapid replacement of obsolete vessels Although the complete realization of these plans would have left the German navy considerably smaller than the English navy, the increase was regarded with apprehension in England If the English naval superiority was to be maintained to the same extent as before, England would have to undertake a vast programme of naval construction, which the Liberal Government desired to avoid

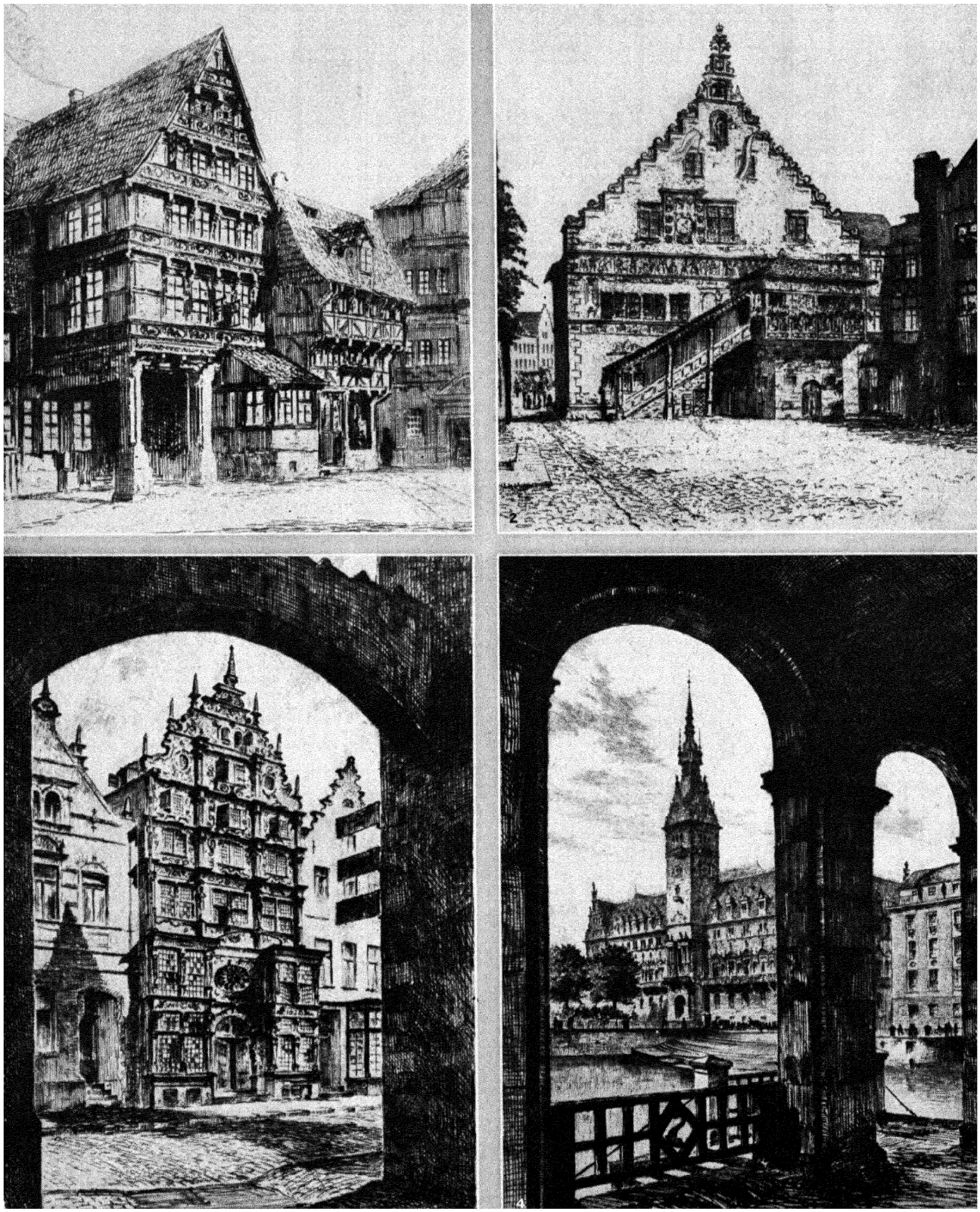
At the second Peace Conference in The Hague an unsuccessful attempt was made to bring about a general reduction of naval armaments The English Government then endeavoured to arrive at a direct understanding with Germany It was proposed that Germany should retard the rate of construction laid down in the Navy Act, and that England should undertake not to exceed a fixed annual number of new ships The emperor and Tirpitz were of the opinion, however, that the honour and interest of Germany did not permit the extent of her armaments by land or sea to be determined by any standard other than the requirements of her own safety, and the proposals were rejected. Bulow was in favour of arriving at an agreement, but was overruled On the occasion of King Edward's visit to Friedrichshof in Aug. 1908, a conversation took place between Lord Hardinge and the emperor but with no effect. The emperor, during his visit to England in the autumn of 1907, had endeavoured by personal conversation with influential persons to dispel the apprehension that Germany's naval construction was designed for purposes of aggression, but without success One of these individuals, with the emperor's consent, published an account of his interview in the *Daily Telegraph*, and certain remarks contained in it aroused renewed resentment in England.



GERMAN CATHEDRALS AND OTHER CHURCHES

1. The Cathedral at Speyer (capital of the Bavarian Palatinate), founded in 1030; the largest of the mediaeval cathedrals in Germany. 2. The Cathedral at Berlin, in the Italian renaissance style, built between 1894 and 1905 from designs by Julius and Otto Raschdorff. 3. The Cathedral at Worms, province of Rheinhessen, an example of the German Romanesque style, dating from the 12th century. 4. The Gothic Cathedral at Frankfurt-am-Main, province of Hesse-Nassau, Prussia, in which the emperors of the Holy Roman empire were formerly elected and crowned. The cathedral, founded in 852, was reconstructed in 1235–1239 and added to in the 14th and 15th centuries. Following a fire in 1867 the building was restored, and the tower, formerly unfinished, was completed from a 15th century design. 5. The Cathedral at Ulm, Würtemberg, now a protestant church, was begun in 1377 and completed in the 16th century. It is a distinguished example of the early Gothic style in Germany. The modern spire, 528 feet in height, is the highest church tower in the world. 6. Freiburg im Breisgau, in the Black Forest, Baden; a view of the minster, considered one of the finest of German Gothic structures. It was built about 1122–1252, except the choir, which was completed in the 15th century. 7. Cathedral at Mainz on the Rhine, a Romanesque basilica, in its present form dating from the 12th, 13th and 14th centuries. 8. Cathedral at Aachen (Aix-la-Chapelle), begun under Charlemagne's auspices in 796. After being almost entirely wrecked by Norman raiders, it was rebuilt by the Emperor Otto in 983; the octagonal domed structure shown in the centre of the picture dates from this period. The Gothic choir seen to the left was added in the 14th and early 15th centuries. The spire is modern

GERMANY



FOUR EXAMPLES OF GERMAN RENAISSANCE ARCHITECTURE

FROM ETCHINGS BY ANTON SCHUTZ

1. Hildesheim; the Pfeilerhaus on Andreas Platz, built in 1623
2. Lindau; the Old City Hall, on the Reichsplatz, built in 1422–36, and rebuilt in 1578. It was restored, 1885–87, with modern mural decorations on the façade
3. Bremen; the Altbremer or Essig House on Langer Strasse, built in 1618, restored in 1897, and now used as a restaurant
4. Hamburg; the City Hall on the West side of the Rathaus Markt, a sandstone building built in 1886–97 in German Renaissance style

In Germany, this public expression of the emperor's views was regarded as an improper interference on his part in the details of public policy. Before consenting to the publication of the interview, the Emperor had obtained the approval of the Foreign Office in accordance with the usual procedure, but Bulow stated in reply to a question in the *Reichstag* that through inadvertence he had not himself read the article He offered his resignation, but the emperor declined to accept it in view of the political situation in Germany at the time On account of the excitement aroused by the discussion in the *Reichstag,* the emperor announced on Oct 31, 1908 that in future he would take no action of political importance without the advice of the chancellor. He felt humiliated, however, by Bulow's behaviour, and in future placed no personal confidence in him

England now decided on a considerable increase in her navy Much ill-feeling had been aroused on both sides, but no one desired a war, and it seemed still possible to co-operate in important matters in the interests of peace This was clearly shown in the crisis which was precipitated by events in the Near East

The Bosnian Crisis.—Since Russia had had to renounce its schemes of conquest in Eastern Asia, it once more became the chief object of its policy to gain control over the Balkan peninsula and the Black sea Austria however was also anxious to secure permanent possession of Bosnia and control of the road to Salonika in case it should come to the partition of Turkey in Europe Germany was now more closely interested in Near Eastern questions than before A German company had begun the construction of a railway to Baghdad through Asia Minor in 1898, it was opened as far as Konia in 1904 Although Germany did not aim at using its economic power in Turkey to gain political control of the country, it nevertheless now had a greater interest in the maintenance of Turkey

When the Young Turk Revolution broke out in July 1908, Austria considered it necessary to annex Bosnia (Oct 5) Serbia protested, and was strongly supported by Russia Austria could not draw back, and the danger of an armed conflict between the two Powers became imminent Bulow and the emperor, who were not informed of Austria's intentions until the last moment, thought Aehrental's action unwise, because they were anxious that the existence of Turkey should not be endangered, but as Austria was the only remaining ally on whom Germany could rely, they thought that the only course open to them was to support Austria's policy unreservedly Bulow therefore informed Russia that if she did not recognize the annexation she would be held solely responsible for the consequences After the severe defeat which it had suffered in Asia, and in view of the internal disturbances which had followed, Russia was not prepared to go to war with Austria and Germany, and it was therefore obliged to yield and recognize the annexation Austria thereupon withdrew its troops from the Sandjak In Russia the course which events had taken was ascribed mainly to Germany's intervention, and still more effort was made to establish closer relations with England and to arrive at an understanding with Italy

Bulow fully realized that what had taken place had rendered the situation more acute, and he tried to improve Germany's relations with France by expressly recognizing that the French, as neighbours of Morocco, must enjoy a privileged position there (Feb 9, 1909) He also made fresh advances to England, which had offered its offices as mediator in the Bosnian crisis Before, however, he had achieved much success in this attempt, he resigned office

Morocco: 1911.—The emperor appointed as his successor von Bethmann-Hollweg, who had been secretary of State for home affairs. Bethmann-Hollweg was a conscientious and painstaking official, but he was utterly inexperienced in foreign affairs, and did not possess the strength of will and power of decision which a prime minister needs He was most anxious to improve relations with Great Britain by an agreement on naval building programmes, but he could not overcome the opposition of the emperor and Admiral von Tirpitz. Feeling that he needed a colleague with a diplomatic training to assist him in the conduct of foreign affairs, he induced the emperor in June 1910 to appoint Herr von Kiderlen-Wächter, who had been German ambassador at Bucharest, as secretary of State for foreign affairs. Although the new secretary of State was a man of intelligence and strong character, his imprudent and uncompromising conduct in the Morocco crisis of 1911 helped to make the position of Germany still more difficult.

The French were at this time taking further steps to establish their supremacy in Morocco Kiderlen said that Germany could not let this pass without protest unless it received compensation At first he demanded that the whole of the French Congo should be ceded to Germany, and persuaded the emperor, in spite of his unwillingness, to send the warship *Panther* to Agadir to protect the German subjects in Morocco while the fighting continued (July 1911). The threat which this implied embittered feeling in France, but also aroused anxiety in England, and Lloyd George made a strongly worded speech in the House of Commons Kiderlen would have been ready to go to war to obtain satisfaction for his demands, but could not induce either Bethmann-Hollweg or the emperor to adopt his point of view He was therefore obliged to moderate his claims, and an agreement was finally reached on Nov. 4, 1911, by which France ceded a part of its colonies in the Congo in return for full freedom of action in Morocco Germany thus gained a small accession of colonial territory, but the distrust of its policy which had for some time prevailed in other countries was greatly strengthened Germany was blamed for being willing to endanger the peace of the world for the sake of a slight advantage In England in particular it was increasingly thought that Germany was meditating an attack on France, and that in that case Great Britain would probably have to go to war in support of France

As a direct consequence of the French occupation of Morocco, Tripoli was occupied by the Italians In Germany this new step towards the partition of Turkish territory was looked upon askance, but it was not desired to protest against the action of Italy because that would have meant the complete break-up of the Triple Alliance Turkey however resisted, and the war in Tripoli dragged on until the autumn of 1912, and the Balkan States, which had formed a coalition under the protectorate of Russia, decided to seize the opportunity in order to put an end to Turkish rule in Europe They attacked in Oct 1912, and this opened the first Balkan War

The Balkan Wars.—At this time when new perils were appearing on the horizon, Germany began to consider the strengthening of its defensive forces It was only with great reluctance that Bethmann agreed to the introduction of a new Naval bill under which six new battle-ships in addition to those already planned were to be laid down in the coming years Serious anxiety was felt in Great Britain when this became known, and an oral discussion of the situation was proposed Haldane, who was secretary of State for war, came to Berlin in Feb 1912, he seemed ready to conclude a treaty of neutrality and to make certain colonial concessions if an agreement on future programmes of naval shipbuilding could be reached At one time agreement seemed on the point of being attained, but it soon appeared that there had been a misunderstanding The Emperor and Tirpitz believed that England would be satisfied if the new Naval bill, the exact purport of which Haldane only learned when he came to Berlin, were applied, and an agreement were simply reached on future naval programmes The British on the other hand considered that such an agreement would only be of value if it came into force immediately, and if the provisions of the German Naval bill were modified accordingly It was also found impossible to agree on the wording of a treaty of neutrality, for Great Britain was anxious to avoid any drafting which might offend its French allies

Although the desired agreement was not reached the two countries made every effort during the Balkan War of 1912–13 to maintain peace The complete defeat of the Turks made it appear probable that little would remain of Turkey in Europe Austria would, however, in no case accept an extension of Serbia to the Adriatic, whereas Russia supported Serbia's demands France under the leadership of Poincaré endeavoured to stiffen Russia in its attitude, even at the risk of war, while Great Britain used its

influence to preserve peace. Russia finally made up its mind to give way A conference of ambassadors of the Great Powers which was held in London in Jan 1913 attempted to bring about an armistice and to negotiate peace As, however, Serbia found it necessary to give up the northern part of Albania, it demanded a greater extension in the south-east, this could only be at the expense of Bulgaria This question led to a war between Serbia and Bulgaria, in which Rumania, Greece and Turkey came in on the side of Serbia. After a short period of hostilities, Bulgaria was obliged to conclude the Peace of Bucharest (Sept 29, 1913). In Vienna the question once again arose whether it would be necessary to go to war to prevent the aggrandizement of Serbia. In view of urgent representations from Germany however, it was decided to raise no objection to the Peace of Bucharest (*See* BALKAN WARS.)

Relations between Russia and Austria continued to be extremely strained after the Balkan War, and a danger of war was liable to arise at any moment A difference of opinion also arose between Germany and Russia when the sultan entrusted the German General Liman von Sanders with the reorganization of the Turkish army, and Russia protested The final solution was that the German general continued to be responsible for the training of the Turkish army, but did not actually hold a military command

The collaboration of Germany and Great Britain on Eastern questions made Bethmann-Hollweg, who exercised greater influence on foreign policy after the death of Kiderlen on Dec 30, 1912, hope to bring Great Britain and Germany permanently into closer relations. During the following months two important treaties were negotiated between London and Berlin The aim of one of them was a new agreement on the future of the Portuguese colonies in Africa, and that of the other an arrangement for the further development of the Baghdad Railway (*q v*) with the help of British capital. Both treaties were drafted and only required ratification when the World War broke out

Home Policy.—Bethmann-Hollweg was equally unsuccessful in home affairs His attempts to achieve electoral reform in Prussia broke down owing to the resistance of the Centre and the Conservatives Social legislation was carried a stage further in some respects by the adoption of the imperial insurance code of 1911, but after this it came to a complete standstill Bethmann-Hollweg was equally unable to solve the question how the inhabitants of Alsace-Lorraine and Poland were to be won over to accept their incorporation in the German empire

The imperial province of Alsace-Lorraine had had a representative assembly in addition to the *Statthalter* since 1879, and union with Germany had brought with it important economic advantages Even those Alsace-Lorrainers who had reconciled themselves to the idea of permanent union with Germany however demanded that their province should become a State with the same rights as the other German States The repeal of the exceptional legislation applying to the imperial province, and in particular the so-called dictatorship clauses, in May 1902 was not enough for them Bethmann-Hollweg only gave partial satisfaction to these demands The act of May 30, 1911, gave the imperial province a considerable measure of autonomy in home affairs; in future it was to have three seats in the *Bundesrat;* but a *Statthalter* appointed by the emperor continued to govern the province These concessions did not satisfy public opinion in Alsace-Lorraine, and the discontent of the population was unmistakably expressed in connection with the Zabern incident in Nov 1913 (*See* also ALSACE-LORRAINE)

German policy in the eastern districts had continually wavered between attempts to win over the Poles to Germany by granting them a certain measure of autonomy, and endeavours gradually to Germanize the country by buying out the great Polish landowners and settling German peasants on the land. On March 3, 1908, when Bülow was still in power, an act was passed empowering the Government to undertake the compulsory expropriation of Polish landowners to a maximum of 70,000 hectares This act aroused so much feeling among the Poles that Bethmann-Hollweg scarcely ventured to enforce it, though it was not repealed

Generally speaking the home policy of the German empire after the dismissal of Bismarck was extraordinarily sterile. Both in the individual States and in the empire the influence of the Conservatives and the Clericals steadily increased. The ever-growing and ever more strongly organized working class was hostile to the existing political order, and no serious effort was made to draw them into responsible collaboration. The capitalist employers did much to develop commerce and industry, but were entirely absorbed by economic considerations and did not attempt to collaborate in political life or to reconcile their particular interests with those of the community as a whole.

THE WORLD WAR

June 28–August 4.—On June 28, 1914, Francis Ferdinand, heir to the throne of Austria, was assassinated at Serajevo The assassins came from Belgrade and had received money, passports and arms from Serbian officials Vienna was therefore convinced that the assassination had been planned in Serbia with the knowledge or at the least the connivance of the Serbian Government It was therefore decided to send an ultimatum to Serbia demanding the repression of Greater Serbian propaganda, the dismissal of all officials associated with such propaganda, and the collaboration of Austrian authorities in the investigation of the origins of the murder of the Crown Prince Germany was not consulted in the framing of these demands, and was only informed of them just before they were communicated to Belgrade Serbia sent a reply within the period of 48 hours which had been fixed, the reply was in general conciliatory, and accepted some of the demands, while others were refused or made subject to conditions. The Austrian ambassador declared that this implied the rejection of Austria's demands, and left Belgrade on the evening of July 25, 1914 Serbia mobilized, and Austria also mobilized its eight southern army corps Attempts at mediation were made in several quarters, Great Britain in particular proposed arbitration by the four Great Powers not directly involved. The Emperor William was absent on a Northern tour from which he returned only on July 28, but the German Government did not feel it possible to bring the dispute between Austria and Serbia before a tribunal of the European Powers, and took up the attitude that the conflict must be localized which meant in practice that Russia must be prevented from intervening in favour of Serbia At first public opinion on the whole was not unfavourable to Austria When however the Serbian reply became known, opinion veered round against Austria It was thought that Austria could obtain sufficient satisfaction if it moderated its demands in certain respects Vienna however persisted in the view that nothing less than full compliance on the part of Serbia would be satisfactory, and Russia thereupon began to prepare for war

Anxiety now began to be felt in Berlin, and Austria was advised to accept the British proposals for mediation or to enter into direct negotiations with Russia on the demands made to Serbia It was only when Bethmann informed Vienna that Germany would not let itself be involved in a world war lightly, or if its counsels were disregarded, that Vienna made up its mind to adopt the latter course Now, however, it was too late In the meantime the tsar, who had received assurances of full support from France, had decided on July 31 to order the mobilization of the entire Russian army. It was believed in Berlin that war was now inevitable, but it was desired not to lose the advantage of more rapid mobilization An attempt to obtain a declaration of neutrality from England having failed, a demand was sent to the tsar that the mobilization order should be revoked Consent was not given within the stipulated period of 12 hours, and Germany thereupon declared war on Russia It was thought certain that France would come to the help of its allies, and it was considered that the French should not be allowed to choose the moment for the attack The French minister, when asked whether France would undertake to remain neutral, gave an evasive reply, and Germany thereupon declared war on France on Aug 3

Germany, by declaring war both on Russia and on France, assumed before the world the odium of being the aggressor This however is no proof that Germany intended to cause the war The most serious error of the German Government must be ad-

mitted to be that it did not from the outset declare that it would only support Austria if agreement on every step were reached in advance. The peremptory terms of the ultimatum and Austria's declaration of war on Serbia came as a surprise to Germany, and forced its hand The counsels of moderation which were subsequently given to Austria came too late. They might perhaps still have achieved something if Russia had not mobilized in the meantime It was this which really made war inevitable. The fact that Germany did not wait for a formal declaration of war from the other side was due to the obvious military considerations, and to Germany's belief that war could not now be averted

The British Government was resolved from the outset to stand by France and Russia if war could not be prevented. The only question was whether parliament and public opinion would endorse its views On this point the Belgian question was decisive The essence of the German plan of campaign was a swift and decisive blow at France; and as the north-east frontier of France was strongly fortified, this only seemed possible if the German army marched through Belgium. The neutrality of Belgium was however guaranteed by the Powers, and it was therefore thought in London that steps must be taken to prevent such a possibility France and Germany were therefore asked whether both Powers would undertake to respect Belgian neutrality so long as it was respected by the other side France agreed, but Germany refused to give any definite undertaking, and informed Belgium on Aug 2 that it found itself compelled to send its troops into that country because it had reliable information that French troops were on the point of invading Belgium from the south Although Germany declared itself ready to promise to respect the integrity of Belgium and to evacuate its territory immediately on the conclusion of peace, its action was regarded by Belgium as tantamount to a declaration of war, and the Belgian Government appealed to Great Britain and France for help Grey, having obtained a majority in Parliament for his policy on Aug 3, once more sent a demand to Berlin that Germany should undertake to respect Belgian neutrality Germany could not give such an undertaking, since its troops had already crossed the Belgian frontier Great Britain declared war on Germany on the night of Aug 4 (*See* also EUROPE, DIMITRIEVIC, WAR GUILT)

The War.—The course of events in the World War will be found described under that heading The decisive factor was the failure of the attempt at a rapid and decisive defeat of France The German advance was checked at the Battle of the Marne in Sept 1914, and the fact that the German army succeeded in occupying nearly the whole of Belgium and warding off the Russian invasion at the battle of Tannenberg could not really make up for this When Italy came into the war against Germany on May 23, 1915, and Rumania in the summer of 1916, the prospect of obtaining a decisive victory became more remote Germany's only allies besides Austria were Turkey and Bulgaria, and the military power of these was not very great The attempt to attack the British position in Egypt and on the Persian gulf through Asia Minor and Mesopotamia was unsuccessful, but the endeavours of the other side to capture Salonika and to break the enemy front in the south-east were for a long time equally fruitless Germany was completely cut off from the world market by the blockade of its coasts, and had to rely entirely on its own resources for its food supply and for the replenishment of its war material The shortage of food and munitions became more and more serious every year. As a final attempt to turn the fortunes of war in favour of Germany, it was decided to try ruthless submarine warfare, with the idea of creating a *de facto* blockade of England and cutting off its food supplies There were however not enough submarines available to make this scheme successful Its final result was to determine the United States of America to come into the war on the other side in the spring of 1917

The position of the Central Powers was further weakened by the death of Emperor Francis Joseph on Nov 21, 1916 His successor, the Emperor Charles, soon attempted to open peace negotiations with England and France, and though these were not successful, they showed the other side that the unity of the Central Powers was shaken On the other hand, the outbreak of the Russian Revolution in March 1917 seemed likely to ease the position of the Central Powers. The new Russian Government which came into power as a result began peace negotiations in November, but it was not until March 8, 1918 that the Treaty of Brest-Litovsk (*q v*) was finally signed This however was only a temporary success The attempts which were made to set up independent States in the Ukraine and Poland which would support Germany had no lasting result, and their consequence was that much of Germany's military strength was frittered away in minor operations in South Russia. After the great German offensive in Northern France in March and April 1918 had failed to break the Allied front, the French, British and Americans attacked on the Western front In September the British and French attacked the Bulgars from Salonika and completely destroyed their army

In the meantime the position in Germany had greatly changed. At the beginning of the war the greatest enthusiasm prevailed, and the nation was ready for any sacrifice, because it was firmly convinced that war had been forced on it and that it was fighting for existence This applied to the workers as well as the rest, and the Social Democrat deputies voted for the war credits in the Reichstag But as the war dragged on, and every department of economic life suffered from the blockade, while the loss of life became greater and greater, that section of the Social Democrats who desired the end of the war at any price increased in strength In 1918 they formed a separate party, the Independent Social Democrats Their spokesmen said that it was not in the interest of the working classes that Germany should be victorious in the war, for such a victory would only consolidate the rule of militarism and capitalism The huge fortunes made by war profiteers helped to embitter public feeling More and more people began to believe that only the military leaders and those capitalists who were making money by the continuance of the war stood in the way of the conclusion of peace However mistaken such a view might be, it was impossible to eradicate it from the public mind.

Bethmann-Hollweg felt it necessary to make some concession in view of the increasing popular discontent, and at his suggestion the emperor, in the Easter proclamation of April 7, 1917, promised the reform of the Prussian electoral system so soon as peace should have been concluded This promise did not however produce much effect, as it was extremely doubtful whether it could be legally carried out against the will of the majority of the Prussian *Landtag* An increasingly critical attitude began to prevail in the *Reichstag*. It was demanded that parliament should enjoy a greater measure of influence, and a proclamation was drafted declaring that Germany was ready to make peace on the basis of the pre-war territorial position if all the belligerents would renounce any claim to war damages Bethmann-Hollweg tried in vain to allay the unrest by the issue of an imperial proclamation promising the introduction of equal suffrage in Prussia His vacillation and indecision had cost him the confidence of all parties The Emperor therefore made up his mind to dismiss him on June 14, 1917 But Germany could not at the moment produce a personality capable of taking over the real control of affairs at this difficult time The new chancellor, Michaelis, who had been head of the Imperial Grain Office, soon proved himself quite unfitted for his position, and was replaced on Nov 2 by the Bavarian premier Count Hertling, who was a man of 75 years of age, but who enjoyed the confidence of the Centre Party

The peace resolution of the *Reichstag* was adopted on June 19 by a majority composed of the Centre, the Progressive People's Party and the Social Democrats It could not fail to strengthen the view in the outside world that Germany's power of resistance was breaking down Whether the various attempts which the German Government made both before and after the autumn of 1917 to bring about the conclusion of peace ever had any prospect of success, and why they failed, cannot yet be determined with any certainty, since the relevant documents have not yet been made public.

The military events of the late autumn of 1918 were not long in producing their effect on the internal situation in Germany

When, on Sept 29, the Supreme Command urged that negotiations for an armistice should be opened at once because it was impossible to hold the front any longer, Count Hertling handed in his resignation, for it was generally felt that a Government must be brought in which would possess the confidence of parliament. The various parties united in proposing to the emperor that Prince Max von Baden should be appointed imperial chancellor, this was done on Oct 3 He had the reputation of being an adherent of the idea of international reconciliation, which was an important feature in President Wilson's programme, and he was therefore thought a specially suitable person to take over the conduct of affairs at the present juncture The new chancellor at once informed President Wilson that Germany was ready to conclude an armistice and peace on the basis of the Fourteen Points (*q v*) which Wilson had laid down as the basis of a new settlement of affairs on Jan 8, 1918 Wilson, however, said that before he could approach his allies, the occupied districts of France and Belgium must be evacuated, and the German political system must be changed by "the destruction of every arbitrary power anywhere that can separately, secretly, and of its own single choice, disturb the peace of the world" This was taken to mean that the emperor's power must be greatly restricted, and real control placed in the hands of a Government responsible to the *Reichstag* As this entirely corresponded to the desires of the majority parties, the *Reichstag* resolved on Oct 26 that the consent of the *Reichstag* was necessary for the declaration of war or the conclusion of peace, and that the imperial chancellor must, in the exercise of his functions, possess the confidence of the *Reichstag* and consequently of the nation The emperor gave his consent to this decision a few days later

The Revolution.—It thus appeared as if the German Constitution would be changed by peaceful methods, but in the meantime the Revolution broke out on Nov 3 It began with a mutiny in the fleet at Kiel, and spread to the workers and the *Landwehr* troops behind the lines The Socialists demanded that the emperor should abdicate, Prince Max von Baden, seeing no other way out, advised the emperor to accede Although the emperor had not yet consented, he proclaimed on Nov 9 that the emperor renounced the throne and the crown prince the succession, and that a Regency would be set up He hoped by this means to preserve the monarchical form of Government The Social Democrats, however, replied by proclaiming a republic Not enough forces were available to fight the revolutionaries with any prospect of success, and Prince Max therefore resigned the office of Chancellor and handed over the conduct of affairs to the Social Democrat deputy Ebert On hearing of what had taken place, the emperor fled to Holland, where he found refuge on neutral soil The other German rulers also thought resistance useless and renounced their rights

In the meantime President Wilson had declared in the name of the Allied and Associated Powers that they were ready to take the Fourteen Points as a basis for a treaty of peace on condition that Germany should pay compensation for all damage suffered by the civilian population of the occupied territories during the war When however the commission which was sent to negotiate an armistice met the Allied commanders, conditions were proposed which amounted to a complete capitulation The occupied territories in the West and the whole left bank of the Rhine were to be evacuated, all war material surrendered, and all prisoners released without corresponding obligation on the other side German troops in the East were to withdraw behind the 1914 frontiers In view of the circumstances prevailing in Germany at the time it was impossible to contemplate continuing the struggle, and the terms were therefore accepted on Nov 11, 1918 An armistice of 30 days was granted The German army, under the leadership of Hindenburg, executed the difficult operation of withdrawal in perfect order, but was at once disbanded on arrival in Germany, as the Socialist Party, which was now in power, regarded it as a menace to the new order.

The Socialists, who found themselves so suddenly in possession of power, were not able to set up a social and political order corresponding to their ideals. Sharp divergences of opinion soon made themselves felt in their own ranks The Council of People's Representatives, which at first took over the direction of affairs, removed all restrictions on freedom of assembly and on the freedom of the press, granted a general amnesty and announced the introduction of an eight hour day for workers, but it did not venture to abolish private ownership of property, as the strict Socialist programme would have required, because it was not felt practicable to take over the entire control of economic affairs A conference of representatives of the newly formed Governments of the individual States, which met in Berlin on Nov 25, decided that a National Constituent Assembly should be elected at once to draw up a new Constitution for the whole of Germany; until the Assembly met, the workers' and soldiers' councils which had been formed during the revolution in the various States should continue to control affairs The left wing of the Social Democrats, who were known as the Spartacists, were dissatisfied with this solution and tried to prevent the elections to the National Assembly by raising fresh revolts There was street fighting in Berlin, but the disturbances were suppressed by Noske The elections took place on Jan. 19, 1919, all Germans over the age of 20, irrespective of sex, were entitled to vote Even during the electoral campaign it became clear that the revolution had not radically altered the relative position of the various parties They continued to exist under new names, and in most cases their leaders remained unchanged Those who had been Conservatives were now called the German National People's Party (*Deutschnationale Volkspartei*), the National Liberals became the German People's Party (*Deutsche Volkspartei*), and the former Progressive Party was known as the Democratic Party A section of the National Liberals went over to the Democrats, but broke away in the years which followed The Centre was to some extent weakened by the secession of the Bavarian People's Party, while the Social Democrats split into two groups, the Majority Socialists and the Independents A separate Communist Party was also formed If the Social Democrats had hoped to obtain a majority in the National Assembly, they were doomed to disappointment The elections resulted in the return of 163 Majority Socialists and 22 Independents, while the bourgeois parties obtained 236 seats The composition of the Assembly nevertheless showed a marked shifting to the Left as compared with previous Parliaments

THE GERMAN REPUBLIC

The National Assembly met at Weimar on Feb 6, 1919, and elected Friedrich Ebert as president of the Republic He was to govern through a ministry responsible to the Assembly The discussion of the Constitution occupied several months It was finally promulgated on Aug 11 The new German State, which kept the old traditional name of the *Deutsches Reich*, although it was now transformed from an empire into a republic, was still to be on a federal basis The proposal of Secretary of State Preuss to make Germany into a single State, abolishing the distinction between the old separate States and dividing the whole country up afresh into provinces, was rejected The powers of the Reich were extended in some respects, it was given complete control of taxation, and the right to lay down the guiding principles for education and church affairs The head of the Government was to be a president elected for a period of seven years by the whole nation, he was to be assisted by a federal ministry, the members of which were to be obliged to resign if they ceased to enjoy the confidence of parliament The *Reichstag* was to continue to consist of a single chamber, and the suffrage was to be the same as that which had been adopted for the elections to the National Assembly A *Reichsrat* was set up to provide representation for the individual States, but it was not similar to the old *Bundesrat*, since it was only to have an advisory voice. Provision was made for a plebiscite to be taken in certain cases

In drawing up the Constitution an endeavour was made to embody in a new form those elements which seemed to have worked satisfactorily in the history of other States which had adopted the republican form of government The Constitution included clauses allowing for the possibility of the formation of new German States or the amalgamation of States which already existed Up to the present these clauses have only been applied

in three cases Saxe-Weimar, Saxe-Gotha, Saxe-Altenburg, the two Principalities of Reuss and the two Principalities of Schwarzburg combined to form the Free State of Thuringia; Saxe-Coburg united with Bavaria, and (in 1929) Waldeck with Prussia The electoral system was changed proportional representation and voting by lists were adopted, the object being to ensure that parliament reflected the state of opinion in the nation as accurately as possible As however no electoral list was admitted unless it was drawn up by a political party, the effect of the system was enormously to increase the influence of the party organizations on the election results, and in practice to limit the freedom of choice of the elector Another consequence was to favour the formation of a large number of minor parties, since each one could be sure of gaining a few seats under the new electoral system.

Although the new Constitution of Germany had many defects, it represented a great step forward towards more satisfactory conditions in Germany Since the revolution there had been no generally recognised political order sanctioned by law, whereas the life of the country could now resume a regular course

The Peace Treaty.—The National Assembly at Weimar also had the difficult task of concluding peace with the victorious Powers. There cannot be said to have been any real negotiation of the peace terms, the conditions were fixed by the Allies in Paris They were simply submitted for acceptance to the German delegation, headed by Count Brockdorff-Rantzau, which had arrived in Paris on May 7, 1919, at the request of the Allies The German objections were not taken into account The provisions of the treaty—a long document containing 440 articles—which were the most important from the German point of view were the following. Germany had to cede all its colonial possessions to the Allies, Alsace-Lorraine to France, North Schleswig to Denmark, the districts of Prussia, Posen and Upper Silesia in which the majority of the inhabitants were Poles to the newly created country of Poland, Memel to Lithuania and a few small frontier districts in the West to Belgium Danzig became an independent free city The precise delimitation of the territory to be ceded to Poland and Denmark was to be settled on the basis of a plebiscite Germany lost territory in Europe to an extent of about 87,000 square km with a population of over 7,000,000

In addition, the left bank of the Rhine was to be occupied by Allied troops for 15 years to come, and the Saar Basin to be administered by the League of Nations for a similar period, after which a plebiscite was to be taken The amount which Germany was to pay by way of reparations was to be fixed in 1921 A provisional payment of 60 milliard marks in gold was to be made between 1921 and 1926 Germany also undertook to make payments in kind, consisting of ships, cattle, coal and railway rolling stock, which were to be written off against reparation payments at a rate to be fixed by the Reparation Commission Germany was in future to maintain a standing army consisting of not more than 100,000 soldiers and 15,000 sailors, and was not to reintroduce compulsory military service It was only to manufacture arms and munitions to the amount required by an army of this size All fortresses up to a line 50 km east of the Rhine were to be demolished, and the fleet to be reduced to 6 battleships, 6 small cruisers, 12 destroyers and 12 torpedo boats If it is remembered that all the Germans in foreign countries who had lost property owing to the war received no compensation, and that Germany had to give the victorious countries most favoured nation treatment in commerce for a period of five years, it will be possible to form an idea of the immense economic burdens which were laid on a country already impoverished by the war The worst feature of the situation was that the amount to be paid by way of reparations was not fixed, but was to be settled in the future in accordance with Germany's capacity to pay The reason given for the severity of these conditions was that Germany had deliberately brought about a terrible war in order to increase its own power This assertion is now recognized by the great majority of those who have studied the history of the events which led up to the war as being quite unfounded

In the circumstances which prevailed at the time, there seemed nothing else to be done than to accept the conditions which were forced upon Germany, though they were only accepted under protest If they had been refused, the Allied troops would at once have crossed the Rhine, and now that the old army had been disbanded, Germany would have been entirely defenceless On June 23 a majority of the National Assembly accepted the Treaty of Peace, and it was signed at Versailles on June 28

Many people in Germany blamed President Wilson, by whose mediation the armistice had been concluded, because they said that he had not kept his promise to bring about a peace on the basis of his Fourteen Points They considered that the handing over of a considerable number of Germans to foreign countries was quite contrary to the principle of self-determination, and that the payments required of Germany moreover went far beyond compensation to the civil population of the occupied territories for damage suffered Practically the only one of Wilson's aims which was realised was the creation of a League of Nations Since even this consisted at first only of the victorious Powers and some of the smaller neutral States, it was felt in Germany that there could be no guarantee of the impartiality of its decisions (*See* VERSAILLES, TREATY OF, and PARIS, CONFERENCE OF)

Foreign Relations Since 1919.—The new boundaries of Germany had yet to be determined by the taking of plebiscites in certain areas A plebiscite held in Schleswig in Feb and March 1920 gave the towns of Hedersleben, Apenrade and Tondern and the island of Alsen to Denmark, Flensburg remaining German In East and West Prussia, a plebiscite held on July 11, 1920 resulted in a large majority for Germany in the disputed areas, Allenstein and Marienwerder Nevertheless, in accordance with the terms of the Treaty of Versailles, the majority of West Prussia, though largely inhabited by Germans, was handed over to Poland, to provide communication with the sea This "Polish corridor" completely cut off East Prussia from the rest of Germany In Upper Silesia, a plebiscite taken on March 20, 1921 gave 707,000 votes for Germany and 479,000 for Poland On this showing, the whole territory, being economically indivisible, should have remained German, but the Poles raised a violent protest and organised a revolt in the districts in which the majority of the population was Polish France supported the Polish claims, and the Supreme Council of the Allies decided to refer the matter to the League of Nations for settlement The award was published on Oct 20, 1921 Poland received the districts of Pless, Rybnik, Kattowitz and Konigshutte, and a number of adjacent areas in which the population was principally Polish Germany had to accept the award, in spite of the serious economic blow sustained by the loss of the coalfields

At the same time, the French made unsuccessful attempts to induce the population of the Rhineland to set up an independent State under French protection, Bavaria was also incited to secede from Germany Under the pretext that Germany had not loyally carried out her undertakings as regards disarmament and reparations payments, the French temporarily occupied Frankfurt, Homburg, Hanau and Darmstadt in April 1920, in May 1921 they occupied Dusseldorf, Duisburg, Ruhrort, Muhlheim and Oberhausen, and in Jan 1923 the whole territory of the Ruhr Their attempts to separate these districts from Germany failed on account of the resolute attitude of the population

TOWARDS STABILIZATION

The assessment of reparations presented enormous difficulties According to the peace terms, the amount was to be fixed definitely in 1921 At a conference in Brussels in Dec 1920, the Allies demanded 269,000 million gold marks, to be paid in 42 annual instalments The German representatives rejected this demand as impossible of fulfilment The Allies did not accept the German counter-proposals, and the question remained completely in suspense, it was merely laid down that Germany should pay certain sums during the next few years On Oct 20, 1921, an agreement was concluded at Wiesbaden to the effect that these payments should be made partly in cash and partly in materials for the restoration of the devastated areas Payments had to be reduced or postponed repeatedly, on account

of the financial situation in Germany, and in July 1922 a moratorium was obtained only by giving the Allied Powers the right of scrutiny over all German financial measures so long as it lasted. It gradually became clear that a final settlement would never be reached in this manner As a result of the occupation of the Ruhr, serious differences of opinion had arisen between France and England on the subject of future relations with Germany, and the Allies finally decided to convene a conference of experts to estimate Germany's capacity to pay The chairman of this international committee was Charles Dawes, an American financier His proposal, known as the "Dawes Plan," was accepted by the Allies and by Germany, after long negotiations, in the summer of 1924 (*See* REPARATIONS AND DAWES PLAN) The German State railways were made over to a company, which had to issue 11,000 million gold marks of first mortgage bonds for reparations A large share of the indirect taxes was also pledged as security for the reparations payments The payments were to begin with 1,000 million gold marks in the first year, rising to 2,500 million in 1928 No attempt was made to determine the total amount to be paid by Germany This settlement, though incomplete, provided a definite basis for calculating the German payments during the next few years, and the French were obliged to evacuate the Ruhr in July 1925

In order to bring about a permanent improvement in the relations between Germany and France, England proposed a guarantee pact in respect of Germany's western frontier After prolonged negotiations, a conference was held at Locarno (*q v*), where the proposed pact was concluded on Oct 16, 1925 Germany voluntarily re-affirmed the renunciation of Alsace-Lorraine in favour of France, and undertook not to attempt any alteration of the frontiers by violent means The inviolability of the new frontiers between Germany, France and Belgium was guaranteed by the signatory Powers, which included England and Italy Special treaties of arbitration were drawn up for the regulation by pacific means of any differences which might arise The first tangible result of the Pact of Locarno was the evacuation of the northern third of the Rhineland, including Cologne, by the French and British troops in Dec 1925 According to the Treaty of Versailles, this zone should have been evacuated two years earlier, but the French had hitherto interposed delays Another result was the entry of Germany into the League of Nations, with a permanent seat on the Council (Sept 10, 1926)

In the meantime, Germany had also resumed relations with Russia. By the Treaty of Rapallo, signed on April 17, 1922, Germany definitely recognised the Soviet Republic, and agreed to a reciprocal renunciation of all claims to war indemnities On April 24, 1926, this treaty was supplemented by a Treaty of Friendship and Neutrality, modelled on the Pact of Locarno, providing for the amicable adjustment of future disputes Germany's economic relations with other nations were restored by commercial treaties with England, Russia, Italy, the Netherlands, Spain and a number of smaller States She thus gradually regained a position in the European world corresponding to her size and importance At the Assembly of the League of Nations at Geneva, Sept 1927, Stresemann demanded that since Germany was already completely disarmed, the other Powers should likewise make a serious effort towards disarmament The negotiations on this point have, however, not yet reached any conclusion On the other hand, he was successful in obtaining a promise from France that the number of the troops of occupation still in the Rhineland should be reduced by ten thousand men, this was carried out in October. The suggestion made by America, of an international pact for the renunciation of war received a warm welcome in Germany, and Stresemann went to Paris in person in the summer of 1928 to sign the pact for Germany

Home Policy Since 1919.—The Weimar Constitution represented a compromise between the views of the different Parties existing in Germany Extremists both of the reactionary and of the revolutionary type were dissatisfied, and made several attempts during the next few years to overthrow it. A serious Communist revolt took place in the Ruhr territory in the spring of 1920, but was suppressed by the Government with the help of the newly constituted Defence Corps, after heavy fighting. Another unsuccessful Communist rising took place in Thuringia and the neighbouring regions of Central Germany in March 1921. On the other hand, in March 1920, Kapp, Director of the Agricultural Credit Institute, together with General von Lüttwitz, attempted, at the head of a volunteer army, to seize the Government They succeeded in assuming power in Berlin for a short time, and Ebert, the President, and Bauer, the Chancellor, fled. The new Government failed, however, to receive the support which had been anticipated, either from the Defence Corps or from the public, and Kapp and Luttwitz were obliged to give up the enterprise and flee In Nov 1923, Hitler attempted to take over the Government in Munich by a sudden stroke His intention was to establish himself in power in Bavaria and then to march to Berlin and carry out a complete revolution there After a brief appearance of success, this attempt also ended in complete failure Since then, there have been no serious disturbances of the peace A clear indication of the political excitement and bitterness of the years following the revolution is given by the occurrence of a series of assassinations Erzberger, the Centre Party Minister of Finance, was murdered on Aug 29, 1921, and Rathenau, the Democratic Foreign Minister, on June 24, 1922. By emergency legislation passed on June 18, 1922 and the establishment of a special court to deal with political offences, the Government succeeded in restoring order and security.

In financial matters, the crucial event was the stabilization of the mark, which was achieved largely through the instrumentality of Schacht, the president of the national bank On account of the disturbed condition of the country, the enormous reparations payments and the decline of production, the Government had not been able to discover any means of relieving the acute shortage of specie except by a progressive increase in the issue of notes As a result of this inflation, the value of the paper money was constantly falling In the course of time, the depreciation became so rapid that financial calculations were rendered impossible On Nov 15, 1923, a dollar was worth 2½ billion marks It was finally decided to establish a special bank of issue, the notes of which were guaranteed by the leading personalities in the economic life of the country At the same time, the printing of paper money by the State was entirely suspended The new notes were temporarily the only currency in use When they were generally accepted at their face value in international trade, they were replaced by a new State issue at par The return to a normal currency paved the way for the recovery of German trade, though the depreciation of the old paper money dealt a blow to small and middling incomes which will continue to be felt for many years

Relations between employers and workers, which had been very strained immediately after the war and the Revolution, under the influence of the current of Communism emanating from Russia, gradually became more satisfactory A noticeable improvement has resulted from the introduction of workers' representation in the larger undertakings, the establishment of the National Economic Council in June 1920, and the development of arbitration procedure in wage disputes

In the political sphere, the complexity of party divisions continued to be the principal obstacle to progress The constitution provides that the ministry must possess the confidence of a majority in parliament. It is practically impossible for any single party to obtain a majority, and, whenever a new Government is formed, a coalition of different groups must be arranged by negotiations between the leaders of the largest parties Being made up of heterogeneous elements, the coalition is generally short-lived The Government formed by Bauer as chancellor in June 1919 consisted of six Socialists and four Catholics, and was increased in October by the inclusion of three Democrats. This distribution was maintained in the Government formed by H. Muller in March 1920. In June 1920, Fehrenbach, the leader of the Catholic Party, became chancellor His ministry consisted of five Catholics, three Democrats and three members of the German People's Party He was succeeded in May 1921 by another member of the same Party, Wirth Wirth's Government

was made up at first of four Catholics, four Democrats and three Socialists, and after Oct. 1921 of four Catholics, three Democrats and four Socialists. In Nov. 1922, Cuno, a member of the People's Party, became Chancellor. His ministry contained three members of the People's Party, three Democrats and two Catholics. In Aug 1923, the "grand coalition" was temporarily achieved; the Government comprised two members of the People's Party, two Catholics, two Democrats and four Socialists, with Stresemann as chancellor In Nov. 1924, it was replaced by a ministry formed by Marx, a member of the Centre (Catholic) Party, consisting of four Catholics, three Democrats and one representative of the People's Party.

A Government formed by Luther in Jan 1925 was the first to contain a Nationalist minister. A comparison of these ministries shows that it was still impossible to obtain a majority without the co-operation of the Centre Party The influence of that Party has consequently increased, and shown itself particularly in the regulation of spiritual matters, including the establishment of a Bavarian Concordat with the Catholic Church Strenuous efforts have also been made for the adoption of a similar Concordat for the whole of Germany and of an Education Act which would allow the widest possible scope for the influence of the Church A Bill to this effect was brought in by the minister of the interior, von Keudell, a member of the Conservative Party, in July 1927, but met with very violent opposition and was rejected

After the death of Ebert (Feb 28, 1925), Field-Marshal von Hindenburg was elected president Hindenburg reconciled differences between the political parties on various occasions, but took no prominent part in politics Luther remained for the time at the head of the Government as chancellor, while Stresemann remained in charge of foreign policy After the conclusion of the Locarno Pact, a violent dispute broke out between the Government parties Although the German National members of the Government had given their consent in advance, they were forced by their party to leave the Government. The Conservatives looked on the concessions made by the Government as detrimental to German interests, and also attempted to delay Germany's entry into the League of Nations. On Dec 5, 1925, they succeeded in forcing the resignation of the Government Attempts to form a new ministry under the Democrat Dr Koch proved, however, unsuccessful, and in Jan 1926 Luther was again appointed chancellor Stresemann remained minister for foreign affairs Neither the Conservatives nor the Social Democrats were represented in the new Government

During the next months the question of the compensation of the deposed princely houses became acute. A bill was brought in for giving them suitable compensation The Parties of the Left, however, looked on this as an unjustifiable imposition on the people and requested a plebiscite on the question whether the ex-ruling houses should not be expropriated without compensation The plebiscite (June 20, 1926) did not give the majority required by the Constitution for this motion, and the compensation bill was then passed by the *Reichstag*. Shortly before this, however, Luther had enacted an order that the black-white-red commercial ensign should be hoisted on public buildings on certain occasions besides the black-red-gold flag of the *Reichstag* Thereupon the Democrat ministers, who considered this an improper concession to Conservative circles, resigned The Democrats and Social Democrats combined and on May 12, 1926 carried a vote of non-confidence which forced Luther to resign His place was again taken by Marx, one of the leaders of the Centre Party, who had already filled the office of chancellor on two occasions His cabinet was composed of five Clericals, three members of the German People's Party, three of the Democrats and one of the Bavarian People's Party. In Dec 1926 the ministry was defeated and resigned; Marx, however, was entrusted with the formation of a new cabinet in which the three members of the Democratic Party were replaced by Conservatives. The *Reichstag* elections of May 20, 1928 brought a considerable change in the relative strength of the parties The German National Party, with its allied groups, received 86 seats, the German People's Party 45, the Centre Party with the Bavarian People's Party 78, the Democrats 25, the Social Democrats 153, the Communists 54 and the smaller groups 50 together. The different composition of the Reichstag necessitated the formation of a new Government The Social Democrats, as the strongest party, provided the chancellor, in the person of Herman Muller, together with three other ministers, while the German People's Party and the Democrats each supplied three ministers, the Centre Party one

The most serious problem of home policy remains that of the relation between the Federal Government and the various States, The States demand a greater measure of financial autonomy; on the other hand, a strong section of public opinion is in favour of further development of Federal institutions at the expense of the States. In Germany, as in all Capitalist countries, there is great antagonism between the propertied classes and the workers; but the population is also divided by religious differences, and by the conflict between the partisans of national unity and those who favour the maintenance of the political individuality of different parts of the German federation, a conflict which is a constant feature of German history It is this problem which gives rise to the peculiar difficulties with which Germany is confronted in the development of organic political life

(E BRA)

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Between Caesar and Tacitus and Charlemagne there are only a few scanty notices of the Germans, mainly in the works of foreign writers like Gregory of Tours and Jordanes. With the 8th and 9th centuries came the period of the revival of learning, by the end of which Christianity had been firmly established among most of the German tribes; the monks became the trustees of the new learning, and we must look mainly, although not exclusively, to the monasteries for our authorities The work of the monks generally took the form of *Annales* or *Chronica*, and among the numerous German monasteries which are famous in this connection may be mentioned Fulda, Reichenau, St Gall and Lorsch. For contemporary history and also for the century or so which preceded the lifetimes of their authors these writings are fairly trustworthy, but beyond this they are little more than collections of legends In a large number of lives of saints and churchmen the legendary element is still more conspicuous It must be remembered that the writer in the Saxon abbey of Corvey, or in the Franconian abbey of Fulda, knew only about events which happened near his own doors, he recorded, it is true, occurrences which rumour brought to his ears, but in general he was trustworthy only for the history of his own neighbourhood. The Annals also are chiefly monastic To their writers the affairs of the great world are of less importance than those of the monastery itself The Saxon Widukind, for instance, gives more space to the tale of the martyrdom of St Vitus than he does to several of the important campaigns of Henry the Fowler Lastly, the annalist is a partisan One is concerned to glorify at all costs the Carolingian house, another sacrifices almost everything to attack the Emperor Henry IV and to defend the papacy, while a third holds a brief for some king or emperor, like Louis the Pious or Otto the Great

The connection between the empire and Italy serves to promote a difficulty: while the chroniclers were recording deeds of Frederick I and Frederick II in the peninsula, the domestic history of Germany remained to a large extent unwritten Among the early German chroniclers the Saxon Widukind, the author of the *Res gestae Saxonicae*, is the best authority for the early history of Saxony Lambert, a monk of Hersfeld, and Widukind's countryman, Bruno, in his *De bello Saxonico*, tell the story of the great contest between the Emperor Henry IV. and Pope Gregory VII, with special reference to the Saxon part of the struggle But perhaps the ablest and the most serviceable of these early writers is Otto of Freising, a member of the Babenberg family Otto was also related to the great house of Hohenstaufen, a relationship which gave him access to sources of information usually withheld from the ordinary monastic annalist, and his work is very valuable for the earlier part of the career of Frederick I. Something is learned, too, from biographies written by the monks, of which Einhard's *Vita Karoli Magni* is the greatest and the best Wipo's life of the emperor Conrad II. is valuable, while Nithard has a

special interest as, almost alone among these early chroniclers, being a soldier and not a monk

The monastic writers remain our chief authorities until the great change brought about by the invention of printing The Renaissance was followed by the fierce controversies aroused by the Reformation, and the result was the output of an enormous mass of writings covering every phase of the mighty combat and possessing every literary virtue save that of impartiality. But apart from these polemical writings, many of which had only an ephemeral value, the Renaissance was the source of another stream of historical literature. Several princes and other leading personages, foremost among whom was the Emperor Maximilian I , had spent a good deal of time and money in collecting the manuscripts of the mediaeval chroniclers, and these now began to be printed The chronicle of Otto of Freising, which appeared in 1515, and the *Vita* of Einhard, which appeared six years later, are only two among the many printed at this time The publication of collections of chronicles began in 1529, and the uncritical fashion in which these were reproduced made forgeries easy and frequent, both parties in the great religious controversy of the time used these records of the past as a storehouse of weapons of offence

New stores of information were coming into existence, or rather the old stores were expanding and taking a different form Very roughly these may be divided into six sections (1) Official documents issued by the emperors and other German rulers (2) Treaties concluded between Germany and other Powers and also between one German State and another (3) Despatches sent to England, Spain and other countries by their representatives in various parts of Germany (4) Controversial writings or treatises written to attack or defend a given position, largely the product of the Reformation period (5) The correspondence of eminent and observant persons (6) An enormous mass of personal impressions taking the form of Commentaries, Memoirs and Diaries (*Tagebucher*) Moreover, important personages still find eulogistic biographers and defenders, *e g* , the fanciful writings about the emperor Maximilian I or Pufendorf's *De rebus gestis Friderici Wilhelmi Magni electoris Brandenburgici*

THE SCIENTIFIC SPIRIT

The scientific spirit in the writing of history was now dimly visible and in this connection the name of Aventinus, "the Bavarian Herodotus," may be mentioned But for many years hardly any progress was made in this direction Court historiographers could not afford to be impartial Thus new histories were written and old ones unearthed, collected and printed, but no attempt was made to criticize and collate the manuscripts of the past, or to present two sides of a question in the writings of the present Among the collections of authorities made during the 16th and 17th centuries those of J Pistorius (Frankfurt, 1583–1607), of E Lindenbrog (Frankfurt, 1609) and of M Freher (Frankfurt, 1600–11) may be noticed, although these were only put together and printed in the most haphazard and unconnected fashion. At the beginning of the 18th century the philosopher Leibnitz issued *Accessiones historicae* (1698–1700) and the *Scriptores rerum Brunsvicensium*, the latter of these, containing documents centring round the history of the Welf family, was published in three volumes at Hanover (1707–11) Leibnitz worked at another collection, the *Origines Guelficae*, which was completed and issued by his pupils (Hanover, 1750–80), and also at *Annales imperii occidentis Brunsvicenses*, which, although the most valuable collection of the kind yet made, was not published until edited by G H Pertz (Hanover, 1843–46) Other collections followed those of Leibnitz, among which may be mentioned the *Corpus historicum medii aevi* of J G Eccard (Leipzig, 1723) and the *Scriptores rerum Germanicarum* of J B Mencke (Leipzig, 1728). They are the foundations upon which modern German scholarship has built

In the 19th century, in the field of scientific research, the Germans were pioneers, with Ranke as their most famous name and the *Monumenta Germaniae historica* as their greatest production —a critical and ordered collection of documents relating to the history of Germany between 500 and 1500 It owes its origin mainly to the efforts of the statesman Stein, who was responsible for the foundation of the *Gesellschaft fur altere deutsche Geschichtskunde*, under the auspices of which the work was begun. The *Gesellschaft* was established in 1819, and, the editorial work having been entrusted to G H Pertz, the first volume of the *Monumenta* was published in 1826 The work was divided into five sections. *Scriptores, Leges, Diplomata, Epistolae* and *Antiquitates*. When Pertz resigned his editorial position in 1874 and the *Gesellschaft* was dissolved, the Prussian Academy of Sciences made itself responsible for the continuance of the work In 1928 39 volumes had been published The ground covered by the *Monumenta* is enormous. The volumes of the *Scriptores* contain not only the domestic chroniclers, but also selections from the works of foreign writers who give information about the history of Germany—for example, the Englishman Matthew Paris In the main these writings are arranged in chronological order The progress of the *Monumenta* stimulated the production of other works of a like nature, and among the smaller collections of authorities which appeared during the 19th century two are worthy of mention These are the *Fontes rerum Germanicarum*, ed J F Bohmer (Stuttgart, 1843–68), a collection of sources of the 12th, 13th and 14th centuries, and the *Bibliotheca rerum Germanicarum*, ed Ph Jaffé (Berlin, 1864–73) Other collections of authorities have been made by competent scholars, of which the *Geschichtsquellen der Provinz Sachsen und angrenzender Gebiete* (Halle, 1870, new series, Magdeburg, 1925, etc), the smaller *Scriptores rerum Prussicarum* (Leipzig, 1861–74), and the *Publikationen aus den koniglichen preussischen Staatsarchiven, veranlasst und unterstutzt durch die konigliche Archivverwaltung* (Leipzig, 1878, etc), may be cited as examples In 1836 an *Urkundenbuch* of Frankfurt was published, and this example has been widely followed, the work done in Cologne, in Bremen and in Mainz being perhaps specially noticeable Moreover an historical commission at Munich has published *Die Chroniken der deutschen Stadte vom 14 bis ins 16 Jahrhundert* (Leipzig, 1862, etc) Lastly, many documents relating to the great families of Germany, among them those of Hohenzollern and of Wittelsbach, have been carefully edited and given to the world

General History See the *Bibliothek deutscher Geschichte* (ed H von Zwiedeneck-Sudenhorst, 1889, etc), T Lindner, *Geschichte des deutschen Volks* (Stuttgart, 1894), *Handbuch der deutschen Geschichte* (ed B Gebhardt, Stuttgart, 1901), H Class, *Deutsche Geschichte* (Leipzig, 1919) See also J G Droysen, *Geschichte der preussischen Politik* (1855–86) In English see C T Atkinson, *A History of Germany, 1715–1815* (1909), W T Waugh, *Germany* (1916), E F Henderson, *A Short History of Germany* (2nd ed , 1920), S Baring-Gould, *Germany* (1921), also J Janssen, *History of the German People* (trans M A Mitchell and A M Christie, 16 vols , 1896–1910), and the *Cambridge Modern History* (ed A W Ward, 13 vols , 1902–11)

Earliest Period K Zeuss, *Die Deutschen und die Nachbarstamme* (Munich, 1837, new ed , Gottingen, 1904) , F Dahr, *Urgeschichte der germanischen und romanischen Volker* (1880–89), and *Die Konige der Germanen* (1861–1909) ; J Buehler, *Die Germanen in der Volkerwanderung* (Leipzig, 1925) , E Norden, *Die germanische Urgeschichte in Tacitus Germania* (Leipzig, 1920)

Carolingian Period E Dummler, *Geschichte des ostfrankischen Reichs* (Leipzig, 1887–88) , L von Ranke, *Jahrbucher des deutschen Reichs unter dem sachsischen Hause* (1837–40) , W von Grischucht, *Geschichte der deutschen Kaiserzeit* (1855–88) , F von Raumer, *Geschichte der Hohenstaufer* (Leipzig, 1823–25) ; E Muhlbacher, *Deutsche Geschichte unter den Karolingern* (1889 etc), and *Die Urkunden der Karolinger* (1906, etc)

Lothair the Saxon and Conrad III P Jaffe, *Geschichte des deutschen Reiches unter Lothar dem Sachsen* (1843), and *Geschichte des deutschen Reiches unter Conrad III* (Hanover, 1845)

From the Fall of the Hohenstaufen to the Renaissance T Lindner, *Deutsche Geschichte unter den Habsburgern und Luxemburgern* (Stuttgart, 1888–93) ; O Lorenz, *Deutsche Geschichte im 13 und 14 Jahrhundert* (Vienna, 1863–67) , J Aschbach, *Geschichte Kaiser Sigmunds* (Hamburg, 1838–45), K Fischer, *Deutsches Leben und deutsche Zustande von der Hohenstaufenzeit bis ins Reformationszeitalter* (Gothen, 1884) ; V. von Kraus, *Deutsche Geschichte im Ausgang des Mittelalters* (Stuttgart, 1888–1905) ; A Bachmann, *Deutsche Reichsgeschichte im Zeitalter Friedrichs III. und Maximilians I* (Leipzig, 1884–94)

Reformation Period. L von Ranke, *Deutsche Geschichte im Zeitalter der Reformation* (Leipzig, 1882) ; J Janssen, *Geschichte des deutschen Volkes seit dem Ausgang des Mittelalters* (1897–1903) , F. B. von

Bucholtz, *Geschichte der Regierung Ferdinands I.* (Vienna, 1831–38); C. Egelhaaf, *Deutsche Geschichte im Zeitalter der Reformation* (1893); F von Pezold, *Geschichte der deutschen Reformation* (1890), A. Reimann, *Deutsche Geschichte im Reformationszeitalter, 1500–1648* (1907); C P. Hasse, *Die deutsche Renaissance* (1920, etc)

Post-Reformation Period L. von Ranke, *Zur deutschen Geschichte—Vom Religionsfrieden bis zum 30 jahrigen Kriege* (Leipzig, 1888); M Ritter, *Deutsche Geschichte im Zeitalter der Gegenreformation und des dreissigjahrigen Krieges* (Stuttgart, 1884–1908), J G Droysen, *Geschichte der Gegenreformation* (1893); A Gindely, *Rudolf II und seine Zeit* (Prague, 1862–68), and *Geschichte des dreissigjahrigen Krieges* (1869–80). *See* also THIRTY YEARS' WAR (X)

1648–1740 B Erdmannsdorffer, *Deutsche Geschichte vom westfalischen Frieden bis zum Regierungsantritt Friedrichs des Grossen* (2 vols, 1892–93); H. von Zwiedineck-Sudenhorst, *Deutsche Geschichte im Zeitalter der Grundung des preussischen Konigstums* (2 vols, 1887–94); M Immich, *Geschichte des europaischen Staatensystems von 1660–1789* (1905), W. Pletshoff, *Europaische Geschichte im Zeitalter Ludwigs XIV. und des Grossen Kurfursten* (1921), H von Mullenheim-Rechenberg, *Die Annexion des Elsasses durch Frankreich* (2 vols, 1896), A. Schulte, *Markgraf Ludwig Wilhelm von Baden und der Reichskrieg gegen Frankreich* (1892); A. von Arneth, *Prinz Eugen* (3 vols, 2nd ed 1864); C von Noorden, *Europaische Geschichte im 18. Jahrhundert* (3 vols, 1870–82)

1740–1789 R Koser, *Konig Friedrich der Grosse* (4 vols, 5th ed 1912); W. Oncken, *Das Zeitalter Friedrichs des Grossen* (2 vols, 1880–82); A von Arneth, *Geschichte Maria Theresas* (10 vols, 1863–79); L von Ranke, *Der Ursprung des siebenjahrigen Krieges* (1871), M Lehmann, *Friedrich der Grosse und der Ursprung des siebenjahrigen Krieges* (1894), *Preussische und osterreichische Akten zur Vorgeschichte des siebenjahrigen Krieges* (1899); A Beer, *Die erste Teilung Polens* (3 vols, 1873), A. S. Trachevsky, *La France et l'Allemagne sous Louis XVI.* (1880)

1789–1815. L. Hausser, *Deutsche Geschichte vom Tode Friedrichs des Grossen bis zur Grundung des deutschen Bundes* (4 vols, 4th ed 1869); A Sorel, *L'Europe et la Révolution française* (8 vols, 1885–1905), K Th von Heigel, *Deutsche Geschichte vom Tode Friedrichs des Grossen bis zur Auflosung des alten Reiches* (2 vols, 1899–1911); H. von Sybel, *Geschichte der Revolutionszeit* (5 vols, 1882), F Meinecke, *Das Zeitalter der deutschen Erhebung* (3rd ed 1924), C Th Perthes, *Pol Zustande und Personen in Deutschland zur Zeit der franzosischen Herrschaft* (2 vols, 1861–62), A Rambaud, *La Domination française en Allemagne* (2 vols, 1873–74), J Hashagen, *Das Rheinland unter franzosischer Herrschaft* (1908), L von Ranke *Ursprung und Beginn der Revolutionskriege* (vol 45 of his *Works*, 1872), H Berghaus, *Deutschland seit 100 Jahren* (5 vols, 1859–62), G Gaspari, *Der Deputationsrezess* (2 vols, 1803), Th Bittereuf, *Geschichte des Rheinbunds* (1905), M. Lehmann, *Freiherr von Stein* (3 vols., 1902–04); G Servières, *L'Allemagne française sous Napoléon I* (1904); J G. Droysen, *Vorlesungen uber das Zeitalter der Freiheitskriege* (2 vols, 2nd ed, 1886), *Geschichte der Befreiungskriege* (ed A. von Holleben, 9 vols, 1902–09); W Onken, *Oesterreich und Preussen im Befreiungskriege* (2 vols, 1876–79); W. A Schmidt, *Geschichte der deutschen Verfassungsfrage wahrend des Befreiungskrieges und des Wiener Kongresses* (1890).

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GERMERSHEIM, town in the Bavarian Palatinate, at the confluence of the Queich and the Rhine, 8 m S W of Speyer Pop (1925) 3,308 Germersheim existed as a Roman stronghold under the name of *Vicus Iulius* The citadel was rebuilt by the emperor Conrad II, but the town itself was founded in 1276 by the emperor Rudolph I, who granted it the rights of a free imperial city From 1330 to 1622, when it was conquered by Austria, the town formed part of the Palatinate of the Rhine From 1644 to 1815 it was sometimes in the possession of France and sometimes in that of the Palatinate. In 1835 the new town was built. The industries include enamel work and brewing

GERMINAL, "the month of buds," the first spring month of the French Republican calendar, substituted for the Gregorian calendar on Oct 5, 1793 *See* FRENCH REPUBLICAN CALENDAR.

GERMINATION, of seeds, *see* ANGIOSPERMS· *Germination of Seed*

GERMISTON, in Transvaal, 9 m E of Johannesburg. Altitude 5 478 ft Pop (1924) 20,344 whites, 29,020 coloured It is an important railway junction, where lines meet from Natal and Cape Colony ports, Laurenço Marques, Pretoria and Johannesburg Germiston is situated in the heart of the Witwatersrand gold mining area, and has a large gold refinery Much land has been taken up since 1917 for industrial sites

GERM PLASM, a term used in biology to denote the reproductive elements and their forerunners in the embryo, in contradistinction to the soma, or body cells The term is due to A Weismann (*See* HEREDITY, EVOLUTION, EMBRYOLOGY)

GERO (*c* 900–965), margrave of the Saxon east mark, was entrusted in 937 by the German king Otto, afterwards the emperor Otto the Great, with the defence of the eastern frontier of Saxony against the Wends and other Slavonic tribes In a few years he extended the Saxon frontier almost to the Oder, and suppressed a rising of the conquered peoples in a great victory on Oct 16, 955 In 963 he defeated the Lusatians, compelled the king of the Poles to recognize the supremacy of the German king, and extended the area of his mark so considerably that after his death it was partitioned into three, and later into five marks. Gero, who is said to have made a journey to Rome, died on May 20, 965, and was buried in the convent of Gernrode, founded by him on his Saxon estates He is referred to by the historian Widukind as a *preses,* and is sometimes called the "great margrave." He is the "margrave Gêre" of the *Nibelungenlied*

See Widukind, "Res gestae Saxonicae," in the *Monumenta Germaniae historica Scriptores,* Band III, O von Heinemann, *Markgraf Gero* (Brunswick, 1860)

GEROLSTEIN, a village and climatic health resort of Germany, in the Prussian Rhine province, situated on the Kyll, in the Eifel range, 1,240 ft. above the sea, 28 m north of Trier The castle of Gerolstein was built in 1115 and is now in ruins Gerolstein is celebrated for its lithia waters which are largely exported Pop (1925) 2,738

GÉRÔME, JEAN LÉON (1824–1904), French painter, was born on May 11, 1824, at Vesoul (Haute-Saône) He went to Paris in 1841 and worked under Paul Delaroche, whom he accompanied to Italy (1844–1845). On his return he exhibited "The Cock-fight," which gained him a third-class medal in the Salon of 1847 In 1854 Gérôme made a journey to Turkey and the shores of the Danube, and in 1857 visited Egypt To the exhibition of 1855 he contributed a large historical canvas, "The Age of Augustus and the Birth of Christ," which was purchased by the State Gérôme was a good draughtsman in the style of Ingres and an inventive illustrator in the style of Delaroche, he was also a sculptor. Gérôme was elected member of the Institut in 1865 He died on Jan 12, 1904

GERONA, a maritime frontier province in the extreme north-east of Spain, formed in 1833 of districts taken from Catalonia and bounded on the north by France, east and south-east by the Mediterranean sea, south-west and west by Barcelona, and north-west by Lerida In the north-west a small section of the province, with the town of Llivía, is entirely isolated and surrounded by French territory, otherwise Gerona is separated from France by the Pyrenees Pop (1920) 325,619, estimated (1925) 336,529 Area 2,264 sq miles The region has numerous historical associations (*see* CATALONIA), and it acted as the guardian of the passes through the Pyrenees at the eastern end, performing the same service as Roncesvalles in the west. The three main rivers, the Ter, Muga and Fluvia, rise in the Pyrenees and flow in a south-easterly direction to the sea Along their banks there is much good arable land, while the lower slopes of the Pyrenees are well wooded with oak, pine and chestnut Cape Creus is a marked feature of the coastline and is the most easterly point of the Iberian peninsula It is formed by the dying down seawards of the Pyrenees. The climate varies locally The Cerdãne district and other mountainous tracts are cold during eight months while Gerona, La Bisbal and Santa Coloma have typical Mediterranean features

The coastal fisheries are important especially at Llansá, Rosas, Palamos and Blanes The cork industry flourishes at San Feliu de Guixols (with fisheries), Palafrugell and Cassa There is also a little metalliferous mining. Much use is made of water-power and the linen, cotton and general textile manufactures are important The main railway from Barcelona to France runs through the province Gerona (*q v*) is the capital while Figueras (*q v.*) was long a most important frontier fortress

GERONA, the capital of the province of Gerona in north-eastern Spain, on the railway from Barcelona to Perpignan in France and on the right bank of the river Ter, at its confluence with the Oña, a small right-hand tributary Pop (1920) 17,691 Gerona is the ancient Gerunda, a city of the Auscetani It claims to be the place in which St Paul and St. James first rested when they came to Spain and it became the see of a bishop about 247 It was for a long time in the hands of the Moors whose emir, Suleiman, was in alliance with Pippin the Short, king of the Franks about 759 It was taken by Charlemagne in 785, but the Moors regained and sacked it in 795 and it was not until 1015 that they were finally expelled It gave the title of count to the king of Aragon's eldest son It has been besieged no fewer than twenty-five times in all, and only four of the sieges have resulted in its capture Its noblest resistance was in 1809 when it was besieged in May by the French with 35,000 troops under Verdier, Augereau and Gonvion St Cyr, forty batteries were erected against it and a heavy bombardment maintained, but under the leadership of Mariano Alvarez de Castro it held out till famine and fever compelled a capitulation on December 12 The French, it is said, had spent 20,000 bombs and 60,000 cannon balls, and their loss was estimated at 15,000 men

The older part of the town occupies the steep slope of the Montjuich or Hill of the Capuchins; the newer portion stretches down into the plain and beyond the Oña There are still remains of the city walls, and the hill is crowned by what were at one time very strong fortifications, now put to other uses The cathedral is a fine specimen of Gothic architecture; the nave measures 73 ft from side to side. The old cathedral on the same site was used as a mosque by the Moors, and on their expulsion in 1015 it appears to have been greatly modified if not entirely rebuilt New works were carried out during the 14th century, but it was not till the beginning of the 15th that the work on the present structure was really begun The collegiate church of San Feliu (St Felix) is mainly of the 14th century, but was modified in the 16th and its façade dates from the 18th. The spire is conspicuous The Benedictine church of San Pedro de Galligans (or de los Gallos) is an interesting Romanesque building of early date It is named from the small river Galligans, an affluent of the Oña, which flows through the city In the same neighbourhood is a small church with a rare Spanish example of a transverse triapsal plan Gerona is still the seat of a bishop There is a public library Paper, cotton and woollen goods are extensively manufactured

GERONIMO (*c.* 1829–1909), a chief of the Chiricahua band of the Apache tribe of North American Indians, was, according to his own story, born in No-do-yohn canyon, Ariz., in June 1829 From 1875 to 1885 as leader of a band of "hostiles" he terrorized the territories of New Mexico and Arizona An expedition commanded by Gen George Crook succeeded in bringing Geronimo to a meeting in March 1886, wherein the chief agreed to surrender if he and his men would be taken to Florida, where their families were being held. The terms were agreed to, but on the way the Indians escaped Gen Crook was succeeded by Gen Nelson A Miles, who followed the Indians for months, finally capturing them in August in Skeleton canyon, Ariz. Geronimo and 14 companions were taken to Ft Pickens, Fla., and in 1888 were removed to Alabama, but the climate proving unhealthy, they were in 1894 finally transferred to Ft Sill, Okla., where the chief lived until his death, on Feb 17, 1909 He dictated the story of his life to S. M. Barrett, who published it under the title *Geronimo's Story of His Life* (1906)

See also articles in the *U S Cavalry Assoc Journal,* vol xix. (1908), and the *Arizona Historical Review,* vol i (1928)

GERONTOCRACY, a system of government by old men. Almost everywhere in primitive society, old age commands respect and gives authority and prestige The older members of the community may take a less active part in the ordinary daily occupations of the people, but as the great depositories of tradition they exercise an influence referable to their experience and knowledge of precedent, and their leadership in ceremonial and political matters is often pronounced In some communities their authority is so great that they even constitute a dominant ruling class, able to control and guide the conduct of the community in all departments of its activity The distinctive feature of this gerontocracy (from Greek words meaning rule of the old men), is that political authority is not invested in any persons as individuals, but in the elders as a class. This form of government develops chiefly where the political unit is a small local group, and where the absence of any strong central authority tends to accentuate the influence of age and experience It occurs most frequently in Australia and Melanesia, and is also found in parts of Africa and America

The nature and functioning of gerontocracy varies As a rule the government lies in the hands of the older men only, women being more or less rigidly excluded from political activity, while the younger men are regarded as of little importance But the elders do not always form a body formally constituted or marked off from the rest of the community by any sharply defined line. In many parts of Melanesia, *e g.*, there is no organized form of government, the regulation of social affairs being in the hands of the older men generally In particular there are a few old men to whose decisions the people consent, and whose influence is based largely on the knowledge of magic and tradition which they possess Their authority, however, is by no means absolute,

and they are not necessarily obeyed They exercise their power not by command, but by advice, and they have no regular means of imposing their will upon the members of the community. In certain aspects of ceremonial life old women may also have considerable authority, but otherwise their influence is slight (*See* R. Thurnwald, "Politische Gebilde bei den Natur volkern," *Zeitschrift f. Vergl. Rechtswiss*, 37, 379 *seq*, 1919.)

In Australia, on the other hand, the dominance of the aged men is the salient feature of public life Among the Dieri, *e.g*, all the men who have passed through the initiation ceremony officially conferring the status of maturity, constitute an assembly which meets from time to time in council Its deliberations are kept secret, and anybody revealing them to an outsider may be punished by death. This council decides upon all questions of importance, and is implicitly obeyed by the rest of the community It administers justice according to a well-understood code, punishes breaches of tribal law, and regulates the ceremonies and movements of the group. At the same time old men who are distinguished in war, magic or debate, will stand out in the council, and their influence over its other members is marked. (A. W Howitt, *Native Tribes of South-east Australia*, 295 *seq.*; 320 *seq*, 1905) Similarly in northern Queensland the camp council is a secret assembly including all the older men of some consequence, and its authority in social affairs is supreme Here also, however, there are gradations of power dependent upon personal factors, and a man who has passed through the various stages leading to an elder's status, or who is renowned as a warrior or magician, or has a large following acquired by plural marriage, is likely to exercise more than usual influence (W E Roth, *North Queensland Ethnography*, Bulletin 8, 5 *seq*, 1906)

Elsewhere membership of the elders' council is more restricted In certain parts of Melanesia, *e g*, in the Banks islands, it is dependent upon a man's position in the secret societies which play so important a part in the life of the community These societies comprise a hierarchically graded series of divisions, in which each grade is entered by initiation and payment. The process of initiation becomes more complex and expensive the higher the rank attained, and as the government of the community rests entirely in the hands of the men of high rank, the rulers are necessarily old and wealthy men Owing both to their position in these societies and to the belief in their magical powers, they wield great authority in the tribe (W H R Rivers, *History of Melanesian Society*) A system somewhat similar in nature is found in parts of east Africa, where a man passes successively through the various age-grades into which the population is divided (*see* AGE-GRADES), until he reaches the grade of elders, election into which enables him to take part in the government of the community (*See* C. W. Hobley, *Bantu Beliefs and Magic*, 209 *seq*, 1922)

Age in itself is therefore not always a sufficient claim for supreme political prestige. Other qualifications are usually desirable as well, and the nature of these varies with the type of society. Sometimes it is knowledge of magic and tradition, sometimes wealth, sometimes ability in war or debate which adds to the authority of the old men Frequently they will retain their prestige only as long as they are in possession of their full mental and physical powers But that age alone may count for a great deal is seen, *e g*, in the case of the Yaurorka headman cited by Howitt, who was almost childish from old age and had to be carried about, but whose power and prestige remained unshaken

Similarly the power of the old men will vary according to the activities of the group Where the respect for tradition is enhanced by complicated religious and magical ceremonies, as in Australia, the absolute dominance of the elders is the most conspicuous social phenomenon. Where, again, as among some of the Plains Indians of North America and in parts of East Africa, military activities predominate, the fighting men may dispute leadership with the aged; while, as in Melanesia, the men's secret societies will often supplant the control of the council of elders There is thus no uniform pattern of gerontocracy, but rather a general tendency the direction of which is determined by local circumstances.

See R H Lowie, *Primitive Society* (1921, bibl), W. H. R. Rivers, *Social organization* (1924), G. C. Wheeler, *The Tribe and Intertribal Relations in Australia* (1910), A Knabenhans, *Die Politische Organization bei den australischen Eingeborenen* (1919), R. Thurnwald, *Die Gemeinde der Bánaro* (1921). (I S)

GEROUSIA, the council of elders at Sparta, corresponding in some of its functions to the Athenian Boulē In historical times it numbered 28 members, to whom were added *ex officio* the two kings and, later, the five ephors. Candidates must have passed their 60th year; *i e*, they must no longer be liable to military service. Vacancies were filled by the Apella, once elected, the *gerontes* held office for life and were irresponsible. The council prepared the business which was to be submitted to the Apella and was empowered to set aside, in conjunction with the kings, any "crooked" decision of the people Together with the kings and ephors it formed the supreme executive committee of the state, and it exercised also a considerable criminal and political jurisdiction, including the trial of kings; its competence extended to the infliction of a sentence of exile or even of death (*see* APELLA)

BIBLIOGRAPHY.—G F Schömann, *Antiquities of Greece; The State* (Eng trans) G Gilbert, *Constitutional Antiquities of Sparta and Athens* (Eng. trans. 1895), A. H J Greenidge, *Greek Constitutional History* (1896), L Whibley, *Companion to Greek Studies* (1916) For ancient authorities *see* Aristotle, *Politics* II, Plutarch, *Lycurgus*

GERRHA, ancient port on the Arabian coast of the Persian gulf inhabited by Chaldean exiles from Babylon (Strabo, Bk xvi, and Pliny, *Hist Nat* vi 32) Various identifications of the site have been suggested (Qatif, Kuwait, Salwa), but the ancient name is unquestionably preserved in that of modern 'Uqair (pronounced Ujair, Ojer) as suggested by Philby Cheesman in 1923 discovered ruins here which tend to confirm this conjecture though the matter still requires further examination The classical story that the houses here were built of rock-salt is difficult to understand 'Uqair is now one of the chief ports of Hasa with a growing trade. It has an excellent deep-water harbour with a very difficult approach from Bahrein, where goods are trans-shipped from ocean steamers to sailing-boats.

GERRY, ELBRIDGE (1744–1814), American statesman was born in Marblehead (Mass), July 17, 1744, the son of Thomas Gerry, a prosperous Marblehead merchant He graduated at Harvard in 1762 and entered his father's business In 1772 and 1773 he was a member of the Massachusetts general court, and in 1773 he served on the committee of correspondence which became one of the great instruments of intercolonial resistance. In 1774-75 he was a member of the Massachusetts Provincial Congress The passage of a bill proposed by him to arm and equip ships to prey upon British commerce (Nov 1775) was, according to his biographer, Austin, "the first actual avowal of offensive hostility against the mother country which is to be found in the annals of the Revolution" From 1776 to 1781 Gerry was a member of the Continental Congress, where he early advocated independence and was one of those who signed the Declaration after its formal signing on Aug. 2, 1776, at which time he was absent.

Gerry was again a member of Congress in 1783–85 and in 1787 was a delegate to the Constitutional Convention He served as an Anti-Federalist in the National House of Representatives in 1789–93 In 1797 he was sent by President John Adams, with John Marshall and Charles Cotesworth Pinckney, on a mission to France to obtain from the government of the Directory a treaty embodying a settlement of several long-standing disputes The discourteous and underhand treatment of this embassy by Talleyrand and his agents resulted in the speedy retirement of Marshall and Pinckney The episode is known in American history as the "X Y Z Affair" Gerry remained in Paris for some time in the vain hope that Talleyrand might offer to a known friend of France terms that had been refused to envoys whose anti-French views were more than suspected. This action of Gerry's brought down upon him from Federalist partisans a storm of abuse and censure from which he never wholly cleared himself

In 1810–12 he was governor of Massachusetts His administration was especially notable for the enactment of a law by which the State was divided into new senatorial districts in such a manner as to consolidate the Federalist vote in a few districts

thus giving the Democratic-Republicans an undue advantage. The outline of one of these districts, which was thought to resemble a salamander, gave rise in 1812, through a popular application of the governor's name, to the term "Gerrymander" (*q v*) In 1812 Gerry, who was an ardent advocate of the war with Great Britain, was elected vice president of the United States, on the ticket with James Madison He died in office at Washington, Nov 23, 1814.

See J. T. Austin, *Life of Elbridge Gerry, with Contemporary Letters* (Boston, 1828–29), Edward Channing, *History* vol iv., Yale, *Chronicles of America;* Henry Adams, *History*

GERRYMANDER (usually pronounced "jerrymander," but the *g* was originally pronounced hard), an American expression which has taken root in the English language, meaning to arrange election districts so as to give an unfair advantage to the party in power by means of a redistribution act, or to manipulate constituencies generally The word is derived from the name of the American politician Elbridge Gerry (*q v*) It was, however, only a new name for an old practice In the American colonial period political advantage was often obtained by changing county lines

See John Fiske, *Civil Government in the United States* (1890), E C Griffith, *The Rise and Development of the Gerrymander* (1907), J W Dean, "History of the Gerrymander," in *New England Historical and Genealogical Register,* vol xlvi (1892).

GERS, a department of south-western France, composed of the whole or parts of certain districts of Gascony, viz Armagnac, Astarac, Fezensac, Pardiac, Pays de Gaure, Lomagne, Comminges, Condomois and of a small part of Agenais It is bounded N by the department of Lot-et-Garonne, N E by Tarn-et-Garonne, E and S E by Haute-Garonne, S by Hautes-Pyrénées, S W by Basses-Pyrénées and W by Landes Pop (1926) 194,406 Area, 2,428 sq m The department consists of a plateau sloping from a height of 1,100 ft at the base of the Pyrenees to the Garonne beyond the northern boundary It is drained by the Save, Gimonne, Arrats, Gers and Baise diverging fanwise to the Garonne, and by the Arros, Midouze and Douze feeding the Adour in the west The climate is temperate, but subject to an unwholesome south-east wind and destructive spring hail-storms There is seldom any snow or frost The annual rainfall varies between 28 and 32 in Gers is primarily agricultural The valleys are fertile especially in the south-west and the grain produced is more than enough for local needs Wheat, maize and oats are the chief cereals Two-thirds of the wine produced is made into brandy, known by the name of Armagnac, second only to Cognac in reputation The natural pastures are supplemented chiefly by crops of sainfoin and clover; horses, cattle, sheep and swine are reared in large numbers, turkeys, geese and other poultry are abundant There are mineral springs at Aurenson, Barbotan and several other places in the department There are flour mills and tanneries, faience and cream of tartar are made, and feathers cleaned and prepared

Gers is divided into the arrondissements of Auch, Lectoure, Mirande, Condom and Lombez, with 29 cantons and 466 communes The chief town is Auch, the seat of an archbishopric

GERSCHOM BEN JUDAH (960–1040), French rabbi, was born at Metz Settling in Mainz in early life, he became the originator of Talmudic studies in France and Germany About 1000 he called a synod which prohibited polygamy and discussed the problems of divorce and of apostasy under compulsion Gerschom died in Mainz in 1040 Besides his revision of the text of the Mishnah and Talmud, he produced works on Biblical exegesis, the Masorah and lexicography.

GERSHWIN, GEORGE (1898–), American composer, prominently identified with music of the jazz type, was born in Brooklyn, New York city, on Sept 26, 1898 Though he had already written the music for eight musical comedies, and various other works, it was his *Rhapsody in Blue,* an elaborate composition for piano and orchestra in the jazz style, that first drew serious musical attention. His *Concerto in F* (1925) and a suite of preludes for the piano, published in 1926, confirmed this interest

GERSON, JOHN (1363–1429), otherwise JEAN CHARLIER DE GERSON, French divine, chancellor of the University of Paris, and the ruling spirit in the oecumenical councils of Pisa and Constance, was born at Gerson on Dec. 14, 1363, the son of pious peasants He was educated at the famous college of Navarre in Paris, studying theology under Pierre d'Ailly, who remained his life-long friend At the university, he was elected procurator for the French "nation" in 1383, and in 1387 was sent with the chancellor and others to Clement VII to procure the condemnation of John of Montson, a Dominican, who had rejected the Immaculate Conception When Pierre d'Ailly was made bishop of Puy in 1395, Gerson was elected chancellor of the university, and made a canon of Notre Dame The university was then at the height of its fame, and its chancellor was necessarily a man prominent in Europe, sworn to maintain the rights of his university against both king and pope, and entrusted with the studies of its students attracted from almost every country Gerson's work has three periods, in which he was engaged in reforming the university studies, maturing plans for overcoming the schism, and in the evening of his life writing books of devotion.

Gerson wished to banish scholastic subtleties and make theology plain and simple by founding it on the philosophical principles of nominalism; but like the great nominalist William of Occam, he saved himself from rationalism by laying hold on the mysticism of the Victorines The study of the Bible and of the fathers was to supersede the idle questions of the schools, and in his *Tract. contra romantiam de rosa* (iii 297) he warns young men against the evil consequences of romance-reading.

Gerson's chief work was concerned with the great schism In the new elections after the death of Clement VII, both Rome and Avignon felt the displeasure of the University of Paris so much that each of the new popes swore to "cede" if his rival would do so also Meanwhile in 1395 the national assembly of France and the French clergy adopted the programme of the university—cession or a general council In 1398 most of the cardinals and crowned heads in Europe had given their adhesion to the plan, which was supported by Gerson's multitude of pamphlets Finally in 1409, a general council assembled, deposed both anti-popes, and elected Alexander V Gerson was chosen to address the new pope on the duties of his office He did so in his *Sermo coram Alexandro Papa in die ascensionis in concilio Pisano* When, however, Alexander, who had been a Franciscan, issued a bull which laid the parish clergy and the universities at the mercy of the mendicants, the university rose in revolt, headed by her chancellor, who wrote a fierce pamphlet—*Censura professorum in theologia circa bullam Alexandri V.* The pope died soon after, and was succeeded by John XXIII

The council of Pisa had not brought peace; it had only added a third pope Gerson now maintained in a series of tracts that a general council could depose a pope, he drew up indictments against the reigning pontiffs, and reiterated the charges against Jean Petit, a theologian who had justified the treacherous murder of the duke of Orleans by the followers of the duke of Burgundy His efforts were seconded by the emperor Sigismund, and the result was the council of Constance in 1415 (*see* CONSTANCE, COUNCIL OF) Gerson's influence at the council was supreme up to the election of a new pope He dictated the form of submission and cession made by John XXIII, and directed the process against Huss. But the council became in the end the cause of his downfall He was the prosecutor in the case of Jean Petit, and the council, overawed by the duke of Burgundy, would not affirm the censure of the university and archbishop of Paris Petit's justification of murder was declared to be only a moral and philosophical opinion, not of faith The council would only condemn one proposition, and even this censure was annulled by the new pope, Martin V, on a formal pretext Not daring to return to France, because the duke of Burgundy was in power, Gerson retired to Rattenberg in Tirol, where he wrote his famous *De consolatione theologiae* On the death of the duke, he proceeded to Lyons, where his brother was prior of the Celestines His last years were spent in writing books of mystical devotion and hymns. He died at Lyons on July 12, 1429

The best editions of his works are those of Paris (3 vols., 1606) and Antwerp (5 vols, 1706), to which is prefixed Dupin's *Gersoniana,* including *Vita Gersoni* *See* C Schmidt, *Essai sur Jean Gerson* (Strasbourg, 1839); J B. Schwab, *Johannes Gerson* (Wurzburg, 1859), H Jadart, *Jean Gerson* (Reims, 1882); Thomassey, *Jean Gerson* (2nd ed.

1872); Masson, *Jean Gerson* (Lyons, 1894); Lafontaine, *Jehan Gerson* (1906); P. Tschackert, *Peter von Ailli* (Gotha, 1877); Herm. v. der Hardt, *Con. Constantiensis libri iv.* (1695–99), L Salembier, *Le grande schisme* (1900). *See* also Chevalier, *Repertoire des sources hist Bio-bibliographie* (1905), and Überweg, *Gesch. der Philosophie*, Bd 2 (1928).

GERSONIDES or **BEN-GERSON (GERSHON), LEVI,** known also as RALBAG (1288–1344), Jewish philosopher and commentator, was born at Bagnols in Languedoc, probably in 1288 His family had been distinguished for piety and exegetical skill, but though he was known in the Jewish community by commentaries on certain books of the Bible, he never seems to have accepted any rabbinical post Possibly the freedom of his opinions may have put obstacles in the way of his preferment He was at Avignon and Orange during his life, and is believed to have died in 1344, though Zacuto asserts that he died at Perpignan in 1370. Part of his writings are commentaries on Aristotle, or rather of commentaries on the commentaries of Averroes Some of these are printed in the early Latin editions of Aristotle's works His most important treatise, that by which he has a place in the history of philosophy, is entitled *Milhamoth 'Adonai* (The Wars of God), and occupied 12 years in composition (1317–29). A portion of it, containing an elaborate survey of astronomy as known to the Arabs, was translated into Latin in 1342 at the request of Clement VI

The *Milhamoth* is throughout modelled after the great work of Jewish philosophy, the *Moreh Nebuhim* of Moses Maimonides, and may be regarded as an elaborate criticism from the more philosophical point of view (mainly Averroistic) of the syncretism of Aristotelianism and Jewish orthodoxy as presented in that work Gersonides was also the author of a commentary on the Pentateuch and other exegetical and scientific works

A careful analysis of the *Milhamoth* is given in Rabbi Isidore Weil's *Philosophie religieuse de Lévi-Ben-Gerson* (1868) *See* also Munk, *Mélanges de phil juve et arabe;* and Joel, *Religionsphilosophie d L. Ben-Gerson* (1862) The *Milhamoth* was published in 1560 at Riva di Trento, and has been published at Leipzig, 1866 (I A)

GERSOPPA, FALLS OF, a cataract on the Sharavati river, in North Kanara district of Bombay The river descends in four cascades called the Raja or Horseshoe, the Roarer, the Rocket and the Dame Blanche The cliff over which the river plunges is 830 ft high, and the pool at the base of the Raja Fall is 132 ft deep Near the village are extensive ruins (the finest of which is a cruciform temple) of Nagarbastikere, the capital of the Jain chiefs of Gersoppa Their family was established in power in 1409 by the Vijayanagar kings, but subsequently became practically independent The chieftaincy was several times held by women, and on the death of the last queen (1608) it collapsed, having been attacked by the chief of Bednur Among the Portuguese the district was celebrated for its pepper, and they called its queen "Regina da pimenta" (queen of pepper)

GERSTENBERG, HEINRICH WILHELM VON (1737–1823), German poet and critic, was born at Tondern, Schleswig, on Jan 3, 1737 After studying law at Jena he entered the Danish military service and took part in the Russian campaign of 1762 He spent the next 12 years in Copenhagen, where he was intimate with Klopstock From 1775 to 1783 he represented Denmark's interests as "Danish Resident" at Lubeck, and in 1786 received a judicial appointment at Altona, where he died on Nov 1, 1823 His *Ariadne auf Naxos* (1767) is the best cantata of the 18th century; he translated Beaumont and Fletcher's *Maid's Tragedy* (1767), and himself wrote a gruesome but powerful tragedy, *Ugolino* (1768) His chief service to the new literary movement was his *Briefe uber Merkwürdigkeiten der Literatur* (1766–70), in which the critical principles of the *Sturm und Drang*—and especially its enthusiasm for Shakespeare—were first definitely formulated

His *Vermischte Schriften* appeared in 3 vols. (1815). The *Briefe über Merkwurdigkeiten der Literatur* were republished by A von Weilen (1888), and a selection of his poetry, including *Ugolino*, by R Hamel, will be found in Kürschner's *Deutsche Nationalliteratur*, vol xlviii. (1884) *See* also A M Wagner, *H W. von Gerstenberg und der Sturm und Drang* (1920, etc).

GERUNIUM. A town in Apulia which was the scene of the one important engagement between the Romans and Carthaginians during the first period of "Fabian" strategy which intervened between Trasimenus (*q v*) and Cannae (*q v*). It is described under CALLICULA (*See* also PUNIC WARS and HANNIBAL)

GERVASE OF CANTERBURY (d *c* 1210), English monk and chronicler, entered the house of Christchurch, Canterbury, at an early age He made his profession and received holy orders in 1163, and seems to have resided almost continuously at Canterbury from the time of his admission The only office which we know him to have held is that of sacrist, which he received after 1190 and laid down before 1197 About 1188 he began the compilation of his *Chronica* Beginning with the accession of Stephen he continued his narrative to the death of Richard I Up to 1188 he relies almost entirely upon extant sources, but from that date onwards is usually an independent authority A second history, the *Gesta Regum,* is planned on a smaller scale and traces the fortunes of Britain from the days of Brutus to the year 1209 The latter part of this work, covering the years 1199–1209, is the only part of the *Gesta* which deserves much attention

See the introductions and notes in W Stubbs's edition of the *Historical Works of Gervase of Canterbury* (Rolls Ser., No. 73, 2 vols., 1879–1880).

GERVASE OF TILBURY (*fl* 1211), Anglo-Latin writer of the late 12th and early 13th centuries, was a kinsman and schoolfellow of Patrick, earl of Salisbury, but lived the life of a scholarly adventurer, wandering from land to land in search of patrons Before 1177 he was a student and teacher of law at Bologna, his first employer of royal rank was Henry fitz Henry, the young king of England (d 1183), for whom Gervase wrote a jest-book which is no longer extant Subsequently Gervase was a clerk in the household of William of Champagne, cardinal archbishop of Reims (d 1202), and before 1189 he entered the service of William II of Sicily, who had married Joanna, the sister of Henry fitz Henry Some time after 1198, he found employment under the emperor Otto IV Though a clerk in orders Gervase became marshal of the kingdom of Arles, and married an heiress of good family For the delectation of the emperor he wrote, about 1211, his *Otia Imperialia* in three parts It is a farrago of history, geography, folklore and political theory—one of those books of table-talk in which the literature of the age abounded. The most interesting of his dissertations are contained in the second part of the *Otia,* where he discusses, among other topics, the geography and history of England

See the *Otia Imperialia* in G. Leibnitz's *Scriptores rerum Brunsvicensium,* vols i and ii (Hanover, 1707), extracts in J Stevenson's edition of *Coggeshall* (Rolls series, No 66, 1875) Of modern accounts the best are those by W Stubbs in his edition of *Gervase of Canterbury,* vol i introd (Rolls series, 2 vols, No 73, 1879), and by R Pauli in *Nachrichten der Gesellschaft der Wissenschaften zu Gottingen* (1882) In the older biographies the *Dialogus de scaccario* of Richard Fitz Neal (*q v*) is wrongly attributed to Gervase

GERVEX, HENRI (1852–), French painter, was born in Paris on Dec 19, 1852, and studied painting under Cabanel, Brisset and Fromentin His early work belonged almost exclusively to the mythological genre which served as an excuse for the painting of the nude—not always in the best of taste, indeed, his "Rolla" of 1878 was rejected by the jury of the Salon *pour immoralité* He afterwards devoted himself to representations of modern life and achieved signal success with his "Dr Péan at the Salpétrière," a modernized paraphrase of Rembrandt's "Anatomy Lesson" He was entrusted with several important official paintings and the decoration of public buildings

GERVINUS, GEORG GOTTFRIED (1805–1871), German historian and Shakespearian commentator, was born on May 20, 1805 at Darmstadt He studied at Giessen and at Heidelberg, where he attended the lectures of Schlosser In 1830 he became *Privatdozent* at Heidelberg, and in 1835 professor of history at Gottingen His *Geschichte der poetischen Nationallitteratur der Deutschen* (1835–42, 5 vols, subsequently entitled *Geschichte der deutschen Dichtung;* 5th edition, by K Bartsch, 1871–74) is the first comprehensive and scholarly history of German literature. In 1837 he was one of the seven Gottingen professors dismissed for their protest against the violation of the constitution by the king of Hanover After spending some years in Heidel-

berg, Darmstadt and Rome, Gervinus settled permanently in Heidelberg, where, in 1844, he was appointed honorary professor.

Between 1849 and 1852 Gervinus published his important work on *Shakespeare* (4 vols., 4th ed., 2 vols, 1872, Eng. trans. by F E Bunnett, 1863, new ed 1877) He also revised his *History of German Literature,* for a fourth edition (1853), and sketched out his *Geschichte des neunzehnten Jahrhunderts* (8 vols., 1854–60), which was preceded by an *Einleitung in die Geschichte des neunzehnten Jahrhunderts* (1853) He died on March 18, 1871

Gervinus's autobiography (*G G. Gervinus' Leben, von ihm selbst*) was published by his widow in 1893. It does not, however, go beyond the year 1836 *See* E. Lehmann, *Gervinus, Versuch einer Charakteristik* (1871), R Gosche, *Gervinus* (1871), J Dorfel, *Gervinus als historischer Denker* (1904); M. Rychner, *G Gervinus* (Berne, 1922).

GERYON (Geryones, Geryoneus), in Greek mythology, the son of Chrysaor and Callirrhoë, daughter of Oceanus, who lived in the island of Erytheia, *i e*, "red," situated in the far west, the land of the red sunset, later identified with Spain He is represented as a monster with three heads or three bodies, sometimes with wings, and as the owner of herds of red cattle, which were tended by the giant shepherd Eurytion and the two-headed dog Orthrus He seems to be a figure of the underworld, and Heracles' exploit a kind of "Harrowing of Hell" To carry off these cattle to Greece was one of the twelve "labours" imposed by Eurystheus upon Heracles The hero travelled through Europe and Libya, set up the two pillars in the Strait of Gibraltar to show the extent of his journey, and reached the great river Oceanus. Having reached the island, Heracles slew Orthrus, Eurytion and Geryon and drove off the cattle. After various adventures he succeeded in getting them safe to Greece, where they were offered in sacrifice to Hera by Eurystheus In some accounts Heracles crosses Oceanus in the golden cup or boat of the sun-god Helios The euhemeristic explanation of the struggle with the triple monster was that Heracles fought three brothers

See Hesiod, *Theogony,* 287, Herodotus iv 8, Apollodoros, II 106; Diod. Sic iv 17, Preller-Robert, II p 465 ff, and the classical dictionaries

GESENIUS, HEINRICH FRIEDRICH WILHELM (1786–1842), German orientalist and biblical critic, was born at Nordhausen, Hanover, on Feb 3, 1786, and was educated at Helmstädt and at Göttingen In 1811 he became professor of theology at Halle, where he remained until his death on Oct 23, 1842 To Gesenius, who was an exceptionally popular teacher, belongs in a large measure the credit of having freed Semitic philology from theological and religious prepossession, and of inaugurating the strictly scientific (and comparative) method

His chief work, the *Hebraisches u Chaldaisches Handworterbuch* (1810–12), has passed through several editions (15th ed 1910, Eng trans 1892)

See H Gesenius, *Wilhelm Gesenius* (1886), and the article in the *Allgemeine deutsche Biographie.*

GESNER, JOHANN MATTHIAS (1691–1761), German classical scholar and schoolmaster, was born at Roth, near Ansbach, and died at Gottingen, where he had become professor of rhetoric. His special merit lies in the attention he devoted to the explanation and illustration of the subject matter of the classical authors

His principal works are editions of the *Scriptores rei rusticae,* of Quintilian, Claudian, Pliny the Younger, Horace, and the Orphic poems (published after his death); *Primae lineae isagoges in eruditionem universalem* (1756), an edition of B. Faber's *Thesaurus eruditionis scholasticae* (1726), afterwards continued under title *Novus linguae et eruditionis Romanae thesaurus* (1749); *Opuscula minora varii argumenti* (1743–45), *Thesaurus epistolicus Gesnerianus* (ed Klotz, 1768–70); *Index etymologicus latinitatis* (1749) *See* C H Pohnert, *J M Gesner und sein Verhaltnis zum Philanthropinismus und Neuhumanismus* (1898), and Sandys, *Hist of Class Schol,* iii 5–9 (1908)

GESNER, KONRAD VON (1516–1565), German-Swiss writer and naturalist, called by Cuvier "the German Pliny," was born at Zurich He took his M D at Basle in 1541, and then practised at Zurich, where he became lecturer in physics at the Carolinum He died of plague on Dec 13, 1565.

To his contemporaries he was best known as a botanist, though his botanical mss. were not published till long after his death at Nuremberg, 1751–71, he himself issuing only the *Enchiridion historiae plantarum* (1541) and the *Catalogus plantarum* (1542) in four tongues. In 1545 he published his remarkable *Bibliotheca universalis* (ed J Simler, 1574), a catalogue (in Latin, Greek and Hebrew) of all past writers with the titles of their works, etc A second part, *Pandectarum sive partitionum universalium Conradi Gesneri Ligurini libri xxi,* with the exception of Bk 20, appeared in 1548–49 His great zoological work, *Historia animalium,* 4 vols. folio (Zurich, 1551–58), is the starting-point of modern zoology Gesner also published in 1555 his *Mithridates de differentiis linguis,* an account of about 130 known languages with the Lord's Prayer in 22 tongues, and his narrative (*Descriptio Montis Fracti sive Montis Pilati*) of his excursion to the Gnepfstein, and in 1556 his edition of the works of Aelian

See Lives by J Hanhart (Winterthur, 1824) and J. Simler (Zurich, 1566), *see* also Lebert's *Gesner als Arzt* (Zurich, 1854). A part of his unpublished writing, ed by Schmiedel, was published at Nuremberg in 1753

GESSLER, OTTO KARL (1875–), German statesman, was born at Ludwigsburg on Feb. 6, 1875, and entered the legal department in Bavaria in 1905 He was burgomaster of Regensburg in 1911, and of Nuremberg in 1914–19 He was a member of the German Democratic Party and was minister of reconstruction in the Reich from 1919–20, and from 1920–28 minister of defence. After the entry of German troops into the demilitarized zone in 1920, and the consequent occupation by French troops of Frankfurt, Darmstadt and Hamburg, General Noske resigned, and Gessler, following him, began his tenure of office as minister of war, faced with the necessity of allaying the suspicion of the Allies He had as his colleague General von Seeckt and in spite of difficulties succeeded in reorganizing the *Reichswehr.* Gessler became increasingly unpopular with the parties of the Left, and the social democrats asserted that relations were maintained between the patriotic unions and the *Reichswehr* He resigned on Jan 12, 1928

GESSNER, SALOMON (1730–1788), Swiss poet, painter and etcher, was born at Zurich on April 1, 1730, and died there on March 2, 1788 The first of his writings to attract attention was his *Lied eines Schweizers an sein bewafnetes Madchen* (1751); but most of his other work consisted of "Pastoral Idylls" in a rhythmical prose *Der Tod Abels* (1758) was translated into most European languages, including Welsh The English version ran through about a score of editions, was appreciated by Scott, Byron and Wordsworth, and is mentioned by Hood in his "Dream of Eugene Aram" This extraordinary popularity, not very intelligible now, was apparently due to the fact that he was one of the earliest poets to combine keen observation and love of nature, profound religious feeling and strong patriotism He translated some of Pope's *Pastorals* His etchings are better than his somewhat conventional landscapes

The final collected edition of his works was published at Zurich in 1841 Lives of him were written by *J J Hottinger* (1796) and *H Wolfflin* (1884). *See* also his *Briefwechsel mit seinem Sohn* (1861) and Bertha Reed, *The Influence of Salomon Gessner on English Literature* (Philadelphia, 1905)

GESSO, an Italian word (Lat *gypsum*) for "plaster of Paris," especially when used as a ground for painting, or for modelling or sculpture (*See* Sculpture: *Technique*)

GESTALT ("figure," "form," "shape"), an expression introduced into psychology by Christian Ehrenfels in 1890, to indicate the character of a perception as a unity Thus the seeing of a square does not consist in seeing four equal straight lines enclosing four right angles, but is the perception of the square as a whole. In the same way a melody is the totality of a series of tones, not the sum of the separate tones Bertrand Russell defines *Gestaltpsychologie* as the psychology of form, dealing with the apprehension of wholes He says that "reading is a case in point Whether we read black letters on white paper or white letters on a blackboard is a matter which we hardly notice; it is the forms of the letters that affect us, not their colour or their size." And again, "as we have already seen in connection with *Gestaltpsychologie* and with sentences, the causal unit is often a configuration which

cannot be broken up without losing its distinctive causal properties" He adds a personal illustration: "In writing a book, my own experience—which I know is fairly common, though by no means universal—is that for a time I fumble and hesitate, and then suddenly I see the book as a whole, and have only to write it down as if I were copying a completed manuscript" (*Philosophy*, 1927)

See W Kohler, *Die physischen Gestalten in Ruhe und im stationaren Zustand* (1920), G E. Muller, *Komplextheorie und Gestalttheorie* (1923).

GESTA ROMANORUM, a Latin collection of anecdotes and tales, probably compiled about the end of the 13th century or the beginning of the 14th; one of the most popular books of the time, and the source, directly or indirectly, of later literature, in Chaucer, Gower, Shakespeare and others. Of its authorship nothing certain is known, but it was evidently intended as a manual for preachers The name, *Deeds of the Romans,* is only partially appropriate to the collection, since it comprises fragments of very various origin, oriental and European The style is barbarous, and the narrative ability of the compiler seems to vary with his source, but he has managed to bring together a considerable variety of excellent material He gives us, for example, the germ of the romance of "Guy of Warwick"; the story of "Darius and His Three Sons," versified by Occleve, part of Chaucer's "Man of Lawe's Tale", and a tale of the emperor Theodosius, the same in its main features as that of Shakespeare's *Lear* Owing to the loose structure of the book, it was easy for a transcriber to insert any additional story into his own copy, and consequently the mss. of the *Gesta Romanorum* exhibit considerable variety The earliest editions are supposed to be those of Ketelaer and de Lecompt at Utrecht, of Arnold Ter Hoenen at Cologne, and of Ulrich Zell at Cologne—all of uncertain date

An English translation, probably based directly on the ms Harl 5,369, was published by Wynkyn de Worde about 1510–15, the only copy of which now known is preserved in the library of St John's college, Cambridge In 1577 Richard Robinson published a revised edition of Wynkyn de Worde, and the book proved highly popular Between 1648 and 1703 at least eight impressions were issued In 1703 appeared the first volume of a translation by B P, probably Bartholomew Pratt, "from the latin edition of 1514" A translation by the Rev C Swan forms part of Bohn's antiquarian library and was re-edited by Wynnard Hooper in 1877 Critical editions of the Latin text have been produced by A Keller (Stuttgart, 1842) and Oesterley (Berlin, 1872) *See* also Warton, "On the Gesta Romanorum," dissertation iii, prefixed to the *History of English Poetry,* Douce, *Illustrations of Shakespeare,* vol ii; F Madden, Introduction to the Roxburghe Club edition of *The Old English Versions of the Gesta Romanorum* (1838); *Gesta Romanorum,* trans by C Swan (1924), *Tales of the Monks from the Gesta Romanorum,* ed M Komroff (1928)

GESUALDO, DON CARLOS, Prince of Venosa (*c* 1560–1613), Italian composer, was born in Naples about the year 1560 He was a nephew of Alfonso Gesualdo, archbishop of Naples, and probably a pupil of Pomponio Nenna of Bari His fame as a lutenist in his own day was great and spread over all Italy, his madrigals have a peculiar interest to-day in view of their extreme modernness A dramatic incident in his life was the murder, in 1590, of his wife with her lover by his orders He afterwards went to the court of Alfonso d'Este at Ferrara, and in 1594 married Donna Eleonore d'Este In the same year he published his first two books of five-part madrigals These were followed at intervals by the third, fourth, fifth, and sixth books, and in 1613 there appeared the complete edition *Partitura delli sei libri de Madrigali a cinque Voci* The first four books were masterly in style, but the fifth and sixth showed an extraordinary advance in the direction of modern harmony and close affinity between music and words Gesualdo seems to have been a law unto himself, and to have written down such progressions and modulations as pleased him His instinct for harmonic effect was marvellous; not less wonderful was his grasp of the emotional possibilities in his texts The union of words and music was complete Short, exclamatory phrases and compressed harmony in the dramatic portions contrasted vividly with the smooth contrapuntal writing of quieter moments One of his most characteristic madrigals, *Moro lasso al mio duolo,* is printed in Dr Burney's *General History of Music* A volume of *Sacrae Cantiones* for five, six, and seven voices appeared in 1603

See Hawkins, *Hist of Music* (1776); Kroyer, *Anfange der Chromatik im italienischen Madrigal des XVI Jahrhunderts* (1902); Gray and Hesseltine, *Carlo Gesualdo* (1926), and Grove's *Dictionary of Music and Musicians,* edit "Gesualdo," by Scott Goddard (on which the present article is based)

Modern reprints of the madrigals will be found in *Raccolta nazionale* (Riccordi, Milan), vols lix–lxii, Barclay Squire, *Ausgewahlte Madrigale* (Breitkopf, Leipzig), L. Torchi, *L'Arte musicale in Italia,* vol. iv; Pr. de la Moskova, *Recueil des morceaux de musique ancienne*

GETA, PUBLIUS SEPTIMIUS (189–212), younger son of the Roman emperor Septimius Severus, was born at Mediolanum (Milan). In 198 he received the title of Caesar, and in 209 those of Imperator and Augustus Between him and his brother Caracalla there existed from their early years a keen rivalry On the death of their father in 211 they were proclaimed joint emperors; and after the failure of a proposed arrangement for the division of the empire, Caracalla pretended a desire for reconciliation He arranged a meeting with his brother in his mother's apartments, and had him murdered in her arms by some centurions

GETAE (gēt'ī), an ancient people of Thracian origin, closely akin to the Daci (*see* Dacia) Their original home seems to have been the district on the right bank of the Danube between the rivers Oescus (Iskr) and Iatrus (Yantra). The view that the Getae were identical with the Goths is not generally accepted Their name first occurs in connexion with the expedition of Darius Hystaspes (515 B C) against the Scythians (*see* Scythia), in the course of which they were brought under his sway, but they regained their freedom on his return to the East During the 5th century, they appear as furnishing a contingent of cavalry to Sitalces, king of the Odrysae, in his attack on Perdiccas II, king of Macedon, but the decay of the Odrysian kingdom again left them independent When Philip II of Macedon in 342 B C. reduced the Odrysae to the condition of tributaries, the Getae made overtures to the conqueror Their king Cothelas undertook to supply Philip with soldiers, and his daughter became the wife of the Macedonian About this time, perhaps being hard pressed by the Triballi (q v) and other tribes, the Getae crossed the Danube. Alexander the Great, before transporting his forces into Asia, decided to make his power felt by the Macedonian dependencies His operations against the Triballi not having met with complete success, he resolved to cross the Danube and attack the Getae. The latter, unable to withstand the phalanx, abandoned their chief town, and fled to the steppes, whither Alexander was unwilling to follow them. About 326, an expedition conducted by Zopyrion, a Macedonian governor of Thrace, against the Getae, failed disastrously In 292, Lysimachus declared war against them, alleging as an excuse that they had rendered assistance to certain barbarous Macedonian tribes He penetrated to the plains of Bessarabia, where his retreat was cut off and he was forced to surrender Although the people clamoured for his execution, Dromichaetes, king of the Getae, allowed him to depart unharmed, probably on payment of a ransom When the Gauls made their way into eastern Europe, they came into collision with the Getae, whom they defeated and sold in large numbers to the Athenians as slaves. From this time the Getae seem to have been usually called Daci, for their further history *see* Dacia

The Getae are described by Herodotus (iv 93–6) as the most valiant and upright of the Thracian tribes, but what chiefly struck Greek inquirers was their belief in the immortality of the soul and their worship of Salmoxis whom the euhemerists of the colonies on the Euxine made a pupil of Pythagoras They were experts in the use of the bow and arrow while on horseback

Bibliography.—*See* W. Tomaschek, "Die alten Thraker," in *Sitzungsberichte der k Akad der Wissenschaften, philosophisch-historische Classe,* cxxviii (Vienna, 1893), T Mommsen, *Hist of Rome* (Eng trans), bk v ch 7.

GETHSEMANE (*i e*, "oil-press"), the place to which Jesus withdrew with his disciples on the eve of the Crucifixion The

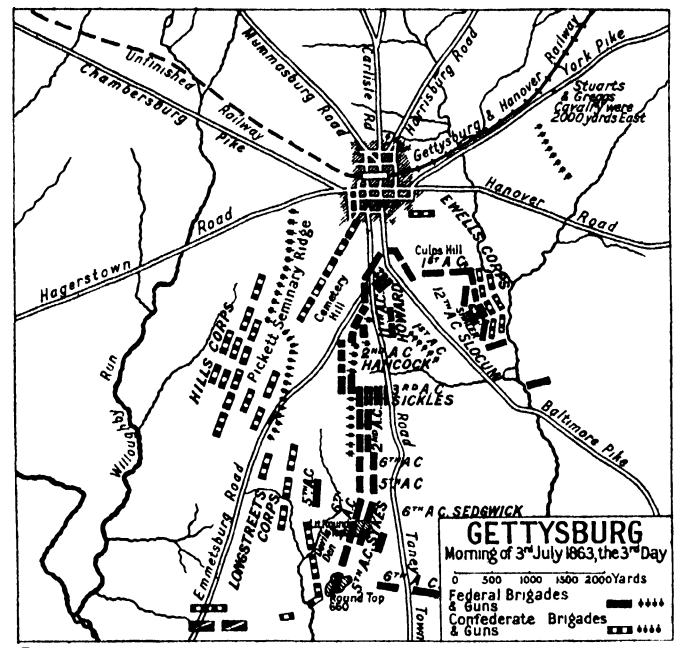
Greek terms used of it in the Gospels suggest that it was an enclosed piece of ground There was probably a house on it and presumably an oil-press It lay east of Kidron and was a part of the Mount of Olives The traditional site was secured by the Franciscans (1681), enclosed by them (1848), and laid out as an European flower garden The "garden" of Christ's time was an orchard The "Grotto of the Agony" was marked from the 4th century by a sanctuary which was later destroyed Another church was erected on the site in the 12th century In 1920 when the church was being rebuilt on the site of the 12th century building, the floor of the 4th century basilica was laid bare, disclosing a different orientation Plans were altered and re-erection proceeded on the site and along the lines of the primitive church The Greeks have a garden called Gethsemane distinct from the Latins

See J M Gibson, "The Gethsemane of the Fourth Gospel," *Expos Times*, 30 (1918–19), 76 *seq*; B Meistermann, *Gethsémani, notices historiques et descriptives* (1920), *ib*, *New Guide to the Holy Land* (1923) 223 *seq*, G Orfali, *Gethsémani au notice sur l'Église de l'Agonie . . . d'après les fouilles récentes* . 1909 et 1920 (1924)

(E Ro)

GETTYSBURG, a borough of southern Pennsylvania, U S A, 35m S W of Harrisburg, the county-seat of Adams county It is on Federal highways 15, 30 (the Lincoln) and 140, and is served by the Reading and the Western Maryland railways The population in 1920 was 4,439 (94% native white) It lies in a valley 1½m wide, at an altitude of 520ft, surrounded by beautiful rolling country and fertile farmlands In the national cemetery which was laid out soon after the Battle of Gettysburg (*q v*) are the graves of 3,747 Union soldiers, and the spot where Lincoln, at the dedication in November 1863, delivered his memorable "Gettysburg Address" is marked by a monument The battlefield (25,000 acres) has been since 1895 a National Park The lines of the battle have been laid out, miles of rifle pits and scores of lunettes have been preserved, and details of the battle are commemorated by hundreds of monuments, markers and tablets Five steel observatories provide views of the entire area Gettysburg was settled about 1740, became the county-seat in 1800, and was incorporated as a borough in 1806

Battle of Gettysburg.—The battle of July 1, 2 and 3, 1863, is often regarded by reliable historians as the turning-point of the American Civil War (*q v*) It arose from a chance encounter Lee, the commander of the Confederate army of Northern Virginia, had intended to concentrate his scattered forces at Cashtown while Meade, the Federal commander, although he had a cavalry division in Gettysburg, had no idea of holding the town prior to the battle on July 1 This cavalry division, supported by two weak army corps, was screening the concentration of his army of the Potomac in a selected position on Pipe Creek to the south-eastward On June 30, however, one of A P Hill's Confederate brigades, sent to Gettysburg to obtain fresh stocks of shoes, had found it occupied by Federal cavalry This led Hill, on his own initiative, to advance thither on July 1 to explore the situation At the same moment Ewell's corps was moving down towards Gettysburg from the north Lee's remaining corps, commanded by Longstreet, was in rear of Hill's corps Hill's leading brigades met a strenuous resistance from the Federal cavalry division of Gen John Buford, which was promptly supported by the infantry of the 1st Corps under Gen J F Reynolds The Federals so far held their own that Hill had to deploy two-thirds of his corps for action, and the western approaches of Gettysburg were still held when Ewell appeared to the northward Reynolds had already fallen, and the command of the Federals, after being held for a time by Gen Abner Doubleday, was taken over by Gen O O Howard, the commander of the 11th Corps, which took post to bar the way to Ewell on the north side But Ewell's attack, of which the decisive thrust at 3 30 P M was led by the fiery Jubal Early, swiftly drove back the 11th Corps to Gettysburg, the 1st Corps, with its flank thus laid open, fell back also, and the remnants of both Federal corps retreated through Gettysburg to the Cemetery Hill position. They had lost severely in the struggle against superior numbers, and there had been some disorder in the retreat Still a formidable line of defence was taken up on Cemetery Hill and both Ewell and Lee refrained from further attacks, for the Confederates had also lost heavily during the day and their concentration was not complete. In the meanwhile Meade had sent forward Gen W S Hancock, the commander of the Federal 2nd Corps, to examine the state of affairs, and on Hancock's report he decided to fight on the Cemetery Hill position Two corps of his army were still distant, but the 12th arrived before night, the 3rd was near, and Hancock



PLAN OF THE BATTLE OF GETTYSBURG MORNING OF THE THIRD DAY, JULY 3, 1863, SHOWING DISPOSITION OF UNION AND CONFEDERATE TROOPS

moved the 2nd Corps on his own initiative Headquarters and the artillery reserve started for Gettysburg on the night of July 1 On the other side, the last divisions of Hill's and Ewell's corps formed up opposite the new Federal position, and Longstreet's corps prepared to attack its left

Owing, however, to misunderstandings between Lee and Longstreet (*q v*), the Confederates did not attack early on the morning of the 2nd, so that Meade's army had plenty of time to make its dispositions The Federal line at this time occupied the horseshoe ridge, the right of which was formed by Culp's Hill, and the centre by Cemetery Hill, from which point the left wing stretched southward, the 3rd Corps on the extreme left, however, being thrown forward considerably The 12th held Culp's, the remnant of the 1st and 11th Cemetery Hill On the left was the 2nd, and in its advanced position—the famous "salient"—which was occupied contrary to Meade's orders, the 3rd, soon to be supported by the 5th; the 6th, with the reserve artillery, formed the general reserve It was late in the day when the Confederate attack was made, and valuable time had been lost, but Longstreet's troops advanced with great spirit The 3rd Corps salient was the scene of desperate fighting, and the "Peach Orchard" and the "Devil's Den" became as famous as the "Bloody Angle" of Spottsylvania or the "Hornets' Nest" of Shiloh While the Confederate attack was developing, the important positions of Round Top were unoccupied by the defenders—owing to the 3rd Corps having taken up its unduly advanced position This omission was repaired only in the nick of time The danger was perceived by the commanding engineer of the army, Gen G K Warren, who at once sent word of it Happily, even before his message could take effect, Vincent's brigade (of the 5th Corps) had marched up on its commander's initiative The attack of a Confederate division on Little Round Top was, after a hard struggle, repulsed The 3rd Corps in the meantime furiously attacked by troops of Hill's and Longstreet's corps, was steadily pressed back, and the Confederates actually penetrated the main line of the defenders, though for want of support Wright's brigade (Hill's corps) which

achieved this was quickly driven out. Ewell on the Confederate left waited for the sound of Longstreet's guns, and thus no attack was made by him until late in the day. Here Culp's Hill was carried with ease by one of Ewell's divisions, most of the Federal 12th Corps having been withdrawn to aid in the fight on the other wing; but Early's division was repulsed in its efforts to storm Cemetery Hill, and the two divisions of the centre (one of Hill's, one of Ewell's corps) remained inactive

That no decisive success had been obtained by Lee was clear to all, but Ewell's men on Culp's Hill, and Longstreet's corps below Round Top, threatened to turn both flanks of the Federal position, which was no longer a compact horseshoe but had been considerably prolonged, to the left, and many of the units in the Federal army had been severely handled in the two days' fighting Meade, however, after discussing the eventuality of a retreat with his corps commanders, made up his mind to hold his ground Lee now decided to alter his tactics The broken ground near Round Top offered so many obstacles that he decided not to press Longstreet's attack further Ewell was to resume his attack on Meade's extreme right, while the decisive blow was to be given in the centre (between Cemetery Hill and Trostle's) by an assault delivered in a pseudo-Napoleonic manner —Napoleon would scarcely have launched his characteristic decisive thrust with one fresh division against an "unstretched" line and strong front—by the fresh troops of Pickett's division, which belonged to the corps of Longstreet, who was put in charge of the central attack Meade, however, was not disposed to resign Culp's Hill, and with it the command of the Federal line of retreat to Ewell, and at early dawn on the 3rd a division of the 12th Corps, well supported by artillery, opened the Federal counter-attack, the Confederates made a strenuous resistance, but after four hours' hard fighting the other division of the 12th Corps and a brigade of the 6th, intervened with decisive effect, and the Confederates were driven off the hill The defeat of Ewell did not, however, cause Lee to alter his plans Pickett's division was to lead in the great assault, supported by the part of Hill's corps that had not already been engaged Col E P Alexander, Longstreet's chief of artillery, formed up one long line of 75 guns, and 65 guns of Hill's corps came into action on his left To the converging fire of these 140 guns the Federals, cramped for space, could oppose only seventy-seven The attacking troops formed up before 9 A M , yet it was long before Longstreet could bring himself to order the advance, upon which so much depended, and it was not till about 1 P M that the guns at last opened fire to prepare the grand attack The Federal artillery promptly replied, but after 30 minutes' cannonade its commander, Gen H J Hunt, ordered his batteries to cease fire in order to reserve their ammunition to meet the infantry attack Ten minutes later, in response to an appeal from Alexander, Pickett asked and received permission to advance, and the infantry moved forward to cross the 1,200–1,400yds which separated them from the Federal line Their own artillery was short of ammunition—hence Alexander's appeal; the projectiles of that day were not sufficiently effective to cover the advance at long ranges, and thus the Confederates, as they came closer to the enemy, met a tremendous fire of unshaken infantry and artillery

The charge of Pickett's division is one of the most famous episodes of military history In the teeth of an appalling fire from the rifles of the defending infantry, who were well sheltered, and from the guns which Hunt had reserved for the crisis, the Virginian regiments pressed on, and with a final effort broke Meade's first line But the strain was too great for the supporting brigades, and Pickett's men were left without assistance Hancock made a fierce counter-stroke, and the remnant of the Confederates retreated Of Pickett's own division over three-quarters, 3,393 officers and men out of 4,500, were left on the field, two of his three brigadiers were killed and the third wounded, and of 15 regimental commanders ten were killed and five wounded One regiment lost 90% of its numbers The failure of this assault practically ended the battle; but Lee's line was so formidable that Meade did not in his turn send forward the army of the Potomac—a reluctance for which he has been severely criticized By the morning of July 5, Lee's army was in full retreat for Virginia He had lost about 30,000 men in killed, wounded and missing out of a total force of perhaps 75,000 Meade's losses were over 23,000 out of about 82,000 on the field The main body of the cavalry on both sides was absent from the field, but a determined cavalry action was fought on July 3 between the Confederate cavalry under J E B Stuart and that of the Federals under D McM Gregg some miles east of the battlefield, and other Federal cavalry made a dashing charge in the broken ground south-west of Round Top on the third day, inflicting thereby, though at great loss to themselves, a temporary check on the right wing of Longstreet's infantry

See "Petersburg, Chancellorsville, Gettysburg," *Mil. Hist Soc of Mass Papers,* vol v (Boston, 1906), Abner Doubleday, *Chancellorsville and Gettysburg* (1908), P H Dalbiac, *The American War of Secession* (1911); and Walter Clark, *North Carolina at Gettysburg* (1921)

GEULINCX, ARNOLD (1624–1669), Belgian philosopher, was born at Antwerp on Jan 31, 1624 After studying and lecturing at Louvain, he became a Protestant, and in 1663, was made lecturer at the university of Leiden where he died in Nov 1669

His philosophical works, edited by J P. N Land (1891–93), include the more important *Metaphysica vera* (1691), the *Γνῶθι σεαυτόν, sive Ethica* (under the pseudonym "Philaretus," 1675), *Physica vera* (1688), *Logica restituta* (1662) and *Annotata in Principia philosophiae R Cartesii* (1691)

See J P N Land, *Arnold Geulincx und seine Philosophie* (1895); V van der Haeghen, *Geulincx Étude sur sa vie, sa philosophie, et ses ouvrages* (Ghent, 1886), E Grimm, *A Geulincx' Erkenntnisstheorie und Occasionalismus* (1875), E. Pfleiderer, *A G als Hauptvertreter der okkasionalistischen Metaphysik und Ethik* (1882), G Samtleben, *Geulincx, ein Vorganger Spinozas* (1885), G Monchamp, *Hist du Cartésianisme en Belgique* (Brussels, 1886).

GEUM, in botany, a genus of hardy perennial herbs (family Rosaceae), containing about 40 species, widely distributed in temperate and arctic regions The erect flowering shoots spring from a cluster of radical leaves, which are deeply cut or lobed, the largest division being at the top of the leaf The flowers are borne singly on long stalks at the end of the stem or its branches They are white, yellow or red in colour, and shallowy cup-shaped The fruit consists of a number of dry achenes, each bearing a hook formed from the persistent lower portion of the style, and admirably adapted for ensuring distribution Two species occur in Great Britain; avens, *G urbanum,* is a common hedge-bank plant with small yellow flowers, *G rivale* (water avens) is a rarer plant, found by streams, and has larger yellow flowers an inch or more across About 15 species, including *G rivale,* are natives of North America Several species are easy to cultivate and well adapted for borders or the rock-garden They are propagated by seeds or by division

GEVELSBERG, a town of Germany, in the Prussian province of Westphalia, 6 m S W from Hagen, on the railway to Dusseldorf It has hardware factories Pop (1925) 20,869

GEWANDHAUS CONCERTS, famous concerts given at Leipzig, probably those of the oldest standing in existence, since they date back to the time when Bach was cantor of the Thomasschule They acquired special fame under Mendelssohn (1835–43), while other conductors have included Niels Gade (1844–48), K Reinecke (1860–95), Arthur Nikisch (1895–1922) and W Furtwängler, their present director

GEX, a town of eastern France, chief town of the arrondissement of Nantua, in the department of Ain, formerly it was the chief town of the arrondissement of Gex which has since been included in that of Nantua, 10 m N N W of Geneva and 3 m from the Swiss frontier Pop (1926) 1,353 town; commune, 2,065 It gives its name to the old Pays de Gex, between Alps and Jura, at various times under Swiss, Genevese and counts of Savoy, until in 1601 it came into the possession of France, retaining, however, until the Revolution its old independent jurisdiction, with Gex as its chief town The Pays de Gex is isolated by the Jura from the rest of French territory, and until 1926 came within the circumscription of the Swiss customs, certain restrictions being imposed on its products by the French customs The town is situated 2,000 ft above sea-level at the base of the most east-

erly chain of the Jura.

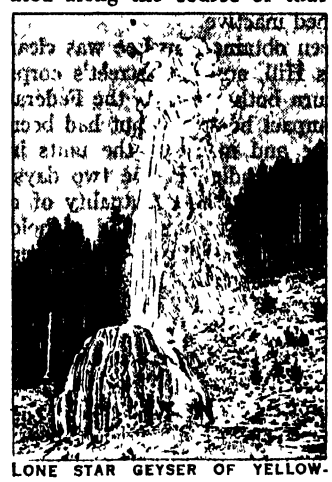
GEYSER, a natural spring or fountain which discharges into the air, at more or less regular intervals of time, a column of heated water and steam; it may consequently be regarded as an intermittent hot spring The word is the Icelandic *geysir,* gusher or rager, but in native usage it is the proper name of the Great Geyser—the general term *hver,* a hot spring, making the nearest approach to the more general sense of the word Geysers exist in many volcanic regions, as in the Malay Archipelago, Japan and South America; but the three localities where they attain their highest development are Iceland, New Zealand and the Yellowstone Park, U S A The very name by which we call them indicates the historical priority of the Iceland group

The Iceland geysers are situated about 30m N W. of Hekla, in a broad valley at the foot of a range of hills from 300 to 400ft in height Within a circuit of about 2m , upwards of one hundred hot springs may be counted, varying greatly both in character and dimensions. The Great Geyser in its calm periods appears as a circular pool about 60ft in diameter and 4ft in depth, occupying a basin on the summit of a mound of siliceous sinter; and in the centre of the basin is a shaft, about 10ft. in diameter and 70ft in depth, lined with the same siliceous material The clear sea-green water flows over the eastern rim of the basin in little runnels. On the surface it has a temperature of from 76° to 89° C, or from 168° to 188° F Within the shaft there is a continual shifting both of the average temperature of the column and of the relative temperatures of the several strata The results of the observations of Bunsen and A L O Descloizeaux in 1847 showed that the temperature of the column diminishes from the bottom upwards, that, leaving out of view small irregularities, the temperature in all parts of the column is found to be steadily on the increase in proportion to the time that has elapsed since the previous eruption, that even a few minutes before the great eruption the temperature at no point of the water column reached the boiling point corresponding to the atmospheric pressure at that part, and finally, that the temperature about half-way up the shaft made the nearest approach to the appropriate boiling point, and that this approach was closer in proportion as an eruption was at hand The Great Geyser has varied very much in the nature and frequency of its eruptions since it began to be observed In 1809 and 1810, according to Sir W J. Hooker and Sir George S Mackenzie, its columns were 100 or 90ft high, and rose at intervals of 30 hours, while, according to Henderson, in 1815 the intervals were 6 hours and the altitude from 80 to 150ft

About 100 paces from the Great Geyser is the *Strokkr* or churn, which was first described by Stanlay in 1789. The shaft in this case is about 44ft deep, and, instead of being cylindrical, is funnel-shaped, having a width of about 8ft at the mouth, but contracting to about 10in near the centre. By casting stones or turf into the shaft so as to plug the narrow neck, eruptions can be accelerated, and they often exceed in magnitude those of the Great Geyser itself. During quiescence the column of water fills only the lower part of the shaft, its surface usually lying from 9 to 12ft. below the level of the soil Unlike that of the Great Geyser, it is always in ebullition, and its temperature is subject to comparatively slight differences

The great geyser district of New Zealand is situated in the south of the province of Auckland in or near the upper basin of the Waikato river, to the north-east of Lake Taupo The scene presented in various parts of the districts is far more striking and beautiful than anything of the same kind to be found in Iceland, but this is due not so much to the grandeur of the geysers proper as to the bewildering profusion of boiling springs, steam-jets and mud-volcanoes, and to the fantastic effects produced on the rocks by the siliceous deposits and by the action of the boiling water. In about 1880 the geysers were no longer active, and this condition prevailed until the Tarawera eruption of 1886, when seven gigantic geysers came into existence; water, steam, mud and stones were discharged to a height of 600 to 800ft for a period of about four hours, when quieter conditions set in. Waikite near Lake Rotorua throws a column to a height of 30 or 35ft

In the Yellowstone National Park, in the north-west corner of Wyoming, the various phenomena of the geysers can be observed on a large scale. The geysers proper are about one hundred in number; the non-eruptive hot springs are much more numerous, there being more than 3000. The dimensions and activity of several of the geysers render those of Iceland and New Zealand almost insignificant in comparison The principal groups are situated along the course of that tributary of the Upper Madison which bears the name of Fire Hole River. Many of the individual geysers have very distinctive characteristics in the form and colour of the mound, in the style of the eruption and in the shape of the column. The "Giantess" lifts the main column to a height of only 50 or 60ft., but shoots a thin spire to no less than 250ft. The "Castle" varies in height from 10 or 15 to 250ft.; and on the occasion of greatest effort the noise is appalling, and shakes the ground like an earthquake "Old Faithful" owes its name to the regularity of its action. Its eruptions, which raise the water to a height of 100 or 150ft , last for about five minutes, and recur every hour or thereabouts The "Beehive" sometimes attains a height of 219ft., and the water, instead of falling back into the basin, is dissipated in spray.



LONE STAR GEYSER OF YELLOWSTONE PARK SOMETIMES CALLED THE "BEE-HIVE" BECAUSE OF ITS SHAPE

The eruptive action of geysers can be explained as follows. far down the pipe the water is at a temperature much above its boiling point in the open air, owing to the pressure of the column of water above it, and its temperature is constantly increasing owing to volcanic heat below The vapour pressure of the steam also increases, till eventually a point is reached when it exceeds the pressure due to the water above. The water at this point passes suddenly into steam, which by expanding raises the column of water above, causing an overflow at the surface. The consequent diminution of pressure allows more water to flash into steam, which blows out the whole column of water and causes the eruption

GEZELLE, GUIDO (1830–1899), Flemish poet, was born at Bruges, on May 1, 1830, and died at Bruges on Nov 27, 1899. He was one of the earliest and greatest leaders for the revival of Flemish as a literary language He wrote in the dialect of west Flanders patriotic and religious poems inspired by deep feeling and a philosophic spirit His first volumes of poetry appeared in 1862

His works were collected (*Volledige Gedichten*) in 6 vols in 1900. *See* C van Herwarden, *Guido Gezelle, leven en werken* (1911).

GEZER, a royal Canaanite city described in the Old Testament as on the boundary of Ephraim, in the maritime plain, and near the Philistine border According to Jerome, Gezer was four Roman miles north of Nicopolis ('Amwās). At this point, near the village of Abu Shūsheh, stands Tell Jezar, whose identification with Gezer was suggested by Clermont Ganneau in 1871 and subsequently confirmed by the discovery of boundary inscriptions with the name Gezer inscribed on rock-outcrops around the site.

History.—In the time of Papi I (*c.* 2500 B.C.) Gezer marked the high tide of Egyptian invasion of Palestine, and was an objective in the time of Sesostris I. (1980–1935 B.C). It is the Kazir of Thutmose III 's lists (*c* 1500 B C.) and three of the Tell-Amarna tablets came from Gezer (Gazri). Merneptah, in quelling the revolt of the Palestinian cities, evidently looked upon Gezer as formidable, for he proclaims himself "Binder of Gezer," and "Seized upon is Gezer" is a triumphal cry in his hymn of victory. Throughout the Maccabean wars Gazera, as it was known, was an important frontier post

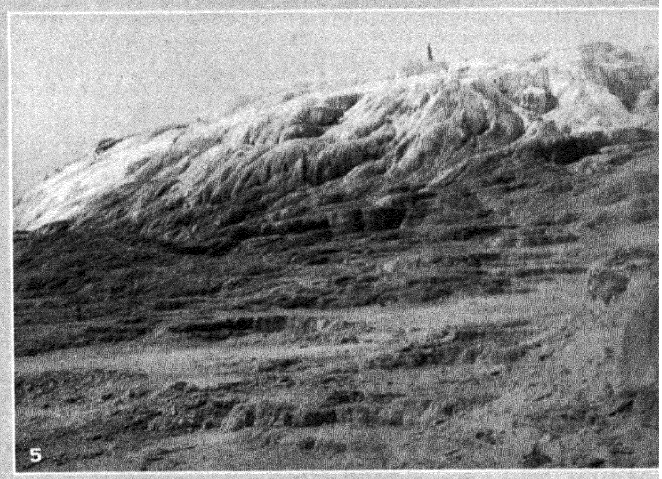
Archaeology.—The site was excavated systematically and thoroughly by Macalister for the Palestine Exploration Fund

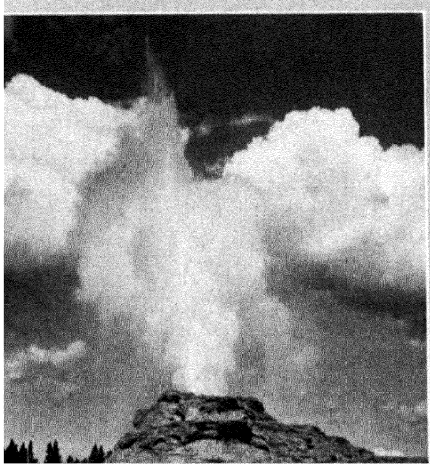


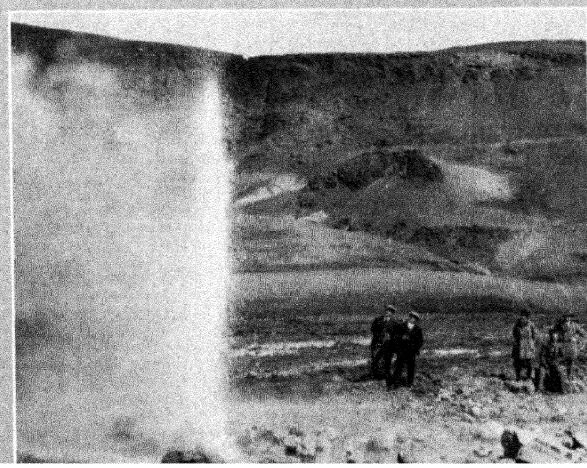














BY COURTESY OF (2, 8) THE NEW ZEALAND HIGH COMMISSION, (7) MAGNUS O'LAFSSON; PHOTOGRAPHS, (1, 3, 4, 5, 6) EWING GALLOWAY

GEYSERS IN ICELAND, NEW ZEALAND AND AMERICA

1. The Giant Geyser, upper geyser basin, Yellowstone National Park, U.S. This geyser lifts its main column of hot water to a height of 50 to 60 ft. and sends a thinner column of water to a height of 250 ft.
2. Waikite Geyser, New Zealand. This eruptive spring, situated close to Lake Rotorua, throws a column of water over 30 ft. high. Volcanic formations around the geyser are due to siliceous deposits from geyser in eruption
3. Old Faithful Geyser, Yellowstone National Park. Its eruptions last for five minutes and occur at regular intervals of about an hour
4. View of the crater of Waimauku Geyser, New Zealand, measuring 280x 400 ft., showing encrustations and erosions on surrounding walls
5. Geyserite formation at Mammoth Hot Springs, Yellowstone National Park. The hill of geyser encrustation resembling volcanic cone
6. Castle Geyser, Yellowstone National Park, showing mound of "castle"
7. Gyrla (Bogey) Geyser in Iceland, where these phenomena were first observed and named by white men, about 25m. from Reykjavik
8. Pohutu Geyser, Rotorua, New Zealand, beginning its eruptive action

from 1902–05 and 1907–09. The excavations revealed a whole series of strata covering all periods from the Neolithic age to the time of the Maccabees, together with a long series of structures and objects illustrative of a corresponding variety of cultures and cults. Amongst the discoveries of special interest are two cuneiform tablets of the 7th century B C, an alignment of monoliths (mazzēbōth), many instances of presumed infant sacrifice, a water tunnel cut to a vertical depth of 94 ft, an agricultural calendar for the year written on a limestone plaque, and a variety of cult objects. Part of the site, including the acropolis, was unfortunately not available for excavation. Fresh excavations were begun on the site in 1923–24, at the instigation of a private individual. Tombs and diverse epochs with furniture intact have been disclosed.

See R. A. S. Macalister, *Bible Sidelights from the Mound of Gezer* (1906), and *The Excavations of Gezer*, 3 vols. (1912); W. N. Stearns, "The Story of Gezer," *Bibliotheca Saera* 75 (1918) 104 *seq*

(E. Ro)

GFRÖRER, AUGUST FRIEDRICH (1803–1861), German historian, was born at Calw, Wurttemberg, on March 5, 1803 He was librarian at Stuttgart (1830–46), and professor of history at Gottingen (1846–61). In his *Kritische Geschichte des Urchristenthums* (3 vols., Stuttgart, 1838) Gfrörer developed opinions unfavourable to Protestantism, which were plainly avowed in his Church history (*Allgemeine Kirchengeschichte bis Beginn des 14ten Jahrhunderts*, Stuttgart, 1841–46). In 1848 he sat as a representative in the Frankfurt parliament, where he supported the "High German" party, and in 1853 he publicly went over to the Church of Rome. He was a bitter opponent of Prussia and an ardent controversialist. He died at Carlsbad on July 6, 1861.

Among his later historical works the most important is the *Geschichte der ost- u westfrankischen Karolinger* (Freiburg, 1848); but others, notably that on Hildebrand (*Papst Gregorius VII. u. sein Zeitalter*, 7 vols, 1859–61), are also of real value.

GHADAMES, GADAMES or **RHADAMES** (anc. Κιδάμη, Lat Cidamus or Cydamus), a town in an oasis of the same name, in that part of the Sahara which forms part of the Italian colony of Tripoli-Tamia It is about 300 m S W of the city of Tripoli and some 10 m E of the Algerian frontier, which closely follows the caravan route from Ghadames to Ghat The oasis, which stands on the cretaceous Tinghert plateau 1,200 ft above the sea, is enclosed by a circular rampart over 3 m. in circumference, the town being at the S W. corner. The mean temperature is 73°, the rainfall about 8 in, and the number of rainy days six. The streets of the town are narrow and vaulted and have been likened to the bewildering galleries of a coalpit. The roofs are laid out as gardens and preserved for the exclusive use of the women. The Ghadamsi merchants have been known for centuries as keen and adventurous traders. Ghadames itself is the centre of a large number of caravan routes, and in the early part of the 19th century about 30,000 laden camels entered its markets every year. Its prosperity was affected by the competition of the Tripolitan merchants about 1873 and by the invasion of Bornu by Rabah in 1893. The chief articles brought by the caravans are ostrich feathers, skins and ivory and one of the principal imports is tea In 1845 the population was estimated at 3,000, of whom about 500 were slaves and strangers, and upwards of 1,200 children; in 1905 it amounted in round numbers to 7,000. The inhabitants are chiefly Berbers and Arabs, while many Tuaregs (*q v*) live outside.

Before the Christian era Ghadames was a stronghold of the Garamantes, who took their name from Garama (*see* FEZZAN) There are remains of the old settlement of the Garamantes on the plateau near the town. In the 7th century Ghadames was conquered by the Arabs. It appears afterwards to have fallen under the power of the rulers of Tunisia, then to a native dynasty which reigned at Tripoli, and in the 16th century it became part of the Turkish vilayet of Tripoli. It has since then shared the political fortunes of that country.

GHALCHA, GHARCHA, a name applied by the Turki-speaking population to the group of tribes about the sources of the Oxus and the mountainous regions near them. These fall into three parts: (1) Yüdghāh, held by the Yidakh tribes, south of the Dōrāh Pass over the Hindu Kūsh, in the British sphere of influence, (2) Wakhān, the Wakhī tribe's seat on the upper Panj, Sanglīch and Minjān, on the valleys of the Warōj, in Afghanistan, and (3) Shignān, Roshān, about the confluence of the Panj and Oxus, Sarikōl on the eastern slope of the Pamīr, and Yaghnōb, on an upper affluent of the Zar-afshān—all in the Russian sphere.

Doubtless Iranian by origin, the Ghalchas are classed as an outlier of the shortheaded Alpine race, and the form Gharcha suggests that they may be akin to the Gharjis of Gharjistān They differ from the Tājiks of Baḍakhshān in type. They are tall, with hair black, chestnut or red, eyes brown to bluish grey, oval faces and nose slightly aquiline Converted at an early date to the Shi'a creed of Islam they still profess it, which fact separates them from their orthodox neighbours Wakhān used to export musk, gold, silver and slaves, and Minjān, lapis lazuli, from mines still worked, but little else is known of them, excepting their dialects which differ in each of the regions mentioned Of the languages four distinct forms are known. Wakhi, spoken in Wakhan, Shighni or Khigni in Shighnan and Roshan, Ish Kashmi and Murjani or Murgi These tongues possess some forms in common with the Dardic languages (*q v*), to the south, thus linking the latter with the Iranian tongues. Persian is the second language of these bilingual people

The Encyclopaedia of Islam, II, 1914, and the *Linguistic Survey of India*, vol X. (1921) pp. 455 *sqq.* and vol I. (1927), give full bibliographies.

GHARIAL (*Gavialis gangeticus*), also called the gavial, a relative of the crocodile (*q.v*), inhabiting northern India. The snout is very long and slender and the reptile feeds on fishes The false gharial (*Tomistoma*) of Borneo and Sumatra is very similar, but has fewer teeth (20 or 21, instead of 27 to 29, on each side of the upper jaw) (*See* CROCODILE)

GHATS, EASTERN AND WESTERN, ranges of mountains along the eastern and western shores of the Indian peninsula The word properly applies to the passes through the mountains, but from an early date was transferred by Europeans to the mountains themselves

The Eastern Ghats run in fragmentary spurs and ranges parallel with the Madras coast They begin in the Orissa district of Balasore, pass southwards through Cuttack and Puri, enter the Madras presidency in Ganjam, and sweep southwards They run at a distance of 50 to 150 m from the coast, except in Ganjam and Vizagapatam, where in places they almost abut on the Bay of Bengal. The rocks are granite, gneiss and mica slate, with clay slate, hornblende and primitive limestone overlying The average elevation is about 1,500 ft, but several hills in Ganjam reach 4,000 to 5,000 ft Their line is pierced by the Godavari, Kistna, Cauvery and other rivers.

The Western Ghats (Sahyadri in Sanskrit) start from the south of the Tapti valley and run south, meeting the Eastern Ghats at an angle near Cape Comorin The range is uninterrupted except by a valley 25 m across, known as the Palghat gap, through which runs the principal railway of the south of India. The length of the range is 800 m from the Tapti to the Palghat gap, and south of this about 200 m to the extreme south of the peninsula. In many parts there is only a narrow strip of coast between the hills and the sea The average elevation is 3,000 ft, precipitous on the western side facing the sea, but more gradual on the east down to the plateaux The highest peaks in the northern section are Kalsubai, 5,427 ft; Harischandragarh, 4,691 ft; and Mahabaleshwar, where is the summer capital of the government of Bombay, 4,700 ft South of Mahabaleshwar the elevation diminishes, but again increases, and attains its maximum towards Coorg, where the highest peaks vary from 5,500 to 7,000 ft, and where the main range joins the interior Nilgiri hills South of the Palghat gap, the peaks of the Western Ghats rise as high as 8,000 ft. The rocks are mainly trap in the northern and gneiss in the southern section.

GHAZALI or **ALGAZEL** [Mohammed ibn Mohammed Abu Ḥamid al-Ghazali] (1058–1111), Arabian philosopher and theologian, was born at Tus, and was educated in his native town,

in Jorjan and in Nishapur. In 1091 the celebrated vizier Nizam ul-Mulk appointed him professor in his college at Baghdad Here he was engaged in writing against the Isma'ilites (Assassins), but after four years he suddenly gave up his chair, left his family and devoted himself to an ascetic life This was due to a growing scepticism, which gradually gave way to mysticism, and to his attack on philosophers Some of their problems which he declared insoluble were the eternity of the world, the reality of the Divine attributes, God's knowledge of things outside of Himself and the independence and immortality of the soul Ghazali wandered through Damascus, Jerusalem, Hebron, Mecca, Medina and Alexandria until, at the wish of the sultan Malik Shah, he became professor in the college of Nizam ul-Mulk at Nishapur. He returned soon after to Täs, where he died in Dec 1111

Of the 69 works ascribed to Ghazali (*cf* C Brockelmann's *Gesch d arabischen Litteratur*, 1, Weimar, 1898), the chief are a treatise on eschatology called *Ad-durra ul-fākhira* ed L Gautier (Geneva, 1878), the great work, *Ihyā ul-'Ulūm* ("Revival of the sciences") (Bulaq, 1872, Cairo, 1889), a commentary by al-Murtada called the *Ithāf*, published in 13 vols at Fez, 1885–87, and in 10 vols. at Cairo, 1893, the *Bidayat ul-Hidāya* (Bulaq, 1870, and often at Cairo), a compendium of ethics, *Mizān ul-'Amal*, Heb trans, ed J Goldenthal (Paris, 1839), a popular treatise on ethics, the *Kimīya us-Sa'āda*, ed H A Homes as *The Alchemy of Happiness* (Albany, N Y, 1873), the ethical work *O Child*, ed by Hammer-Purgstall in Arabic and German (Vienna, 1838), the *Destruction of Philosophers* (*Tahafūt ul-Falāsifa*) (Cairo, 1885, and Bombay, 1887), the *Maqāsid ul-Falāsifa*, of which the Latin trans by Gundisalvi was pubd at Venice, 1506, later ed by G Beer (Leiden, 1888), the *Kitāb ul-Munqid*, describing the changes in his philosophy, ed by F A Schmolders in his *Essai sur les écoles philosophiques chez les Arabes* (1842), also at Constantinople, 1876, and translated into French by Meynard (1877), answers to questions ed in Arabic and Hebrew, with German trans by H Malter (Frankfort, 1896), Eng trans, *Confessions of al-Ghazzali*, by Claud Field (1909)

For Ghazālī's life *see* McG de Slane's translation of Ibn Khallikān, ii ff ; R Gosche's *Über Ghazāli's Leben und Werke* (1859), D B Macdonald's "Life of al-Ghazāli," in *Journal of American Oriental Society* (1899), Carra de Vaux's *Gazali* (1902) and bibliography in Überweg's *Gesch der Philosophie* (Bd 2, 1928), *see* ARABIAN PHILOSOPHY

GHĀZĪ (Arabic "warrior") A Mohammedan who has vowed to exterminate unbelievers by the sword It is also used by the Turks as a title of honour, generally translated "the Victorious," for military officers of high rank, who have distinguished themselves in the field against non-Muslim enemies, thus it was assumed by Mustafa Kemal Pasha, President of the Turkish Republic

GHAZIABAD, a town of British India in the Meerut district of the United Provinces Pop (1921) 12,353 The town was founded in 1740 by Ghazi-ud-din, son of Azaf Jah, first nizam of the Deccan, and takes its name from its founder It has considerably risen in importance as an important railway junction and does some trade in grain and hides

GHAZIPUR, a town and district of British India, in the Benares division of the United Provinces The town stands on the left bank of the Ganges, 44 m E of Benares It is the headquarters of the dwindling opium department, where all the opium grown under licence from Government used to be collected and manufactured There are also scent distilleries, using the produce of the rose-gardens in the vicinity Pop (1921) 24,708

The district of Ghazipur has an area of 1,392 sq m It forms part of the great alluvial plain of the Ganges, which divides it into two unequal portions The northern tract lies between the Gumti and the Gogra, whose confluences with the main stream mark its eastern and western limits respectively The southern tract is a much smaller strip of country, enclosed between the Karamnasa and the great river itself In 1921 the population was 832,289 Sugar refining is the chief industry, and provides the principal article of export

GHAZNI, a famous city in Afghanistan, the seat of an extensive empire under two mediaeval dynasties, and interesting in the modern history of British India Ghazni stands on the high tableland of central Afghanistan, in 68° 18′ E. 33° 44′ N., at a height of 7,280 ft., and on the direct road between Kandahar and Kabul, 221 m. by road N E. from the former, and 92 m S.W. from the latter A very considerable trade in fruit, wool, skins, etc, is carried on between Ghazni and India by the *povindah* merchants Ghazni, long in decay, is reviving since the opening of the Kabul road for motors It stands at the base of the terminal spur of a ridge of hills, an offshoot from the Gul-Koh, which forms the watershed between the Arghandáb, and Tarnak rivers The castle stands at the northern angle of the town next the hills, and is about 150 ft above the plain The town walls are on an elevation, partly artificial, and form an irregular square, partly of stone or brick laid in mud, and partly of clay built in courses, flanked by numerous towers with three gates The plain in the direction of Kandahar is bare except near the river, where villages and gardens are tolerably numerous Abundant crops of wheat and barley are grown, as well as of madder, besides minor products Snow lies 2 or 3 ft deep for about three months, and tradition speaks of the city as having been more than once overwhelmed by snowdrift Fuel consists chiefly of prickly shrubs In summer the heat is not like that of Kandahar or Kabul, but the radiation from the bare heights renders the nights oppressive, and constant dust-storms occur Probably the existing site formed the citadel only of the city of Mahmud The remarks of Ibn Batuta (*c* 1332) already suggest the present state of things, viz, a small town occupied, a large space of ruin; for a considerable area to the north-east is covered with ruins, or rather with a vast extent of mounds, spoken of as Old Ghazni The only remains retaining architectural character are two remarkable towers rising to the height of about 140 ft, and some 400 yd apart belonging, on a smaller scale, to the same class as the Kutb Minar at Delhi (*q v*) Arabic inscriptions in Cufic characters show the most northerly to have been the work of Mahmud himself, the other that of his son Masa'ud On the Kabul road, a mile beyond the Minaret of Mahmud, is a village called Rauzah Here, in a poor garden, stands the tomb of the famous conqueror The village stands among luxuriant gardens and orchards, watered by a copious aqueduct

History.—The city is not positively mentioned by any ancient author but it is possibly the *Gazaca* which Ptolemy places among the *Paropamisadae*, and this may not be inconsistent with Sir H Rawlinson's identification of it with *Gazos*, an Indian city spoken of by two obscure Greek poets as an impregnable place of war We seem to have definite evidence of the existence of the city before Mohammedan times (644) in the travels of the Chinese pilgrim, Hsüan Tsang, who speaks of *Ho-si-na* (*i e*, probably *Ghazni*) as one of the capitals of *Tsaukuta* or Arachosia, a place of great strength. In early Mohammedan times the country adjoining Ghazni was called *Zābul* When the Mohammedans first invaded that region Ghazni was a wealthy entrepôt of the Indian trade. Of the extent of this trade some idea is given by Ibn Haukal, who states that at Kabul, then a mart of the same trade, there was sold yearly indigo to the value of two million dinars (£1,000,000) The provinces on the Helmund and about Ghazni were invaded as early as the caliphate of Moawiya (662–680) The arms of Yaqub b Laith swept over Kabul and Arachosia (Al-Rukhaj) about 871, and the people of the latter country were forcibly converted Though the Hindu dynasty of Kabul held a part of the valley of Kabul river till the time of Mahmud, it is probably to the period just mentioned that we must refer the permanent Mohammedan occupation of Ghazni In the latter part of the 9th century the family of the Samanid, sprung from Samarkand, reigned in splendour at Bokhara Alptagin, originally a Turkish slave, and high in the service of the dynasty, about the middle of the 10th century, losing the favour of the court, wrested Ghazni from its chief (who is styled Abu Bakr Lawik, wali of Ghazni), and established himself there His government was recognized from Bokhara and held till his death. In 977 another Turk slave, Sabuktagin, who had married the daughter of his master Alptagin, obtained rule in Ghazni. He made himself lord of nearly all the present territory of Afghanistan and of the Punjab In 997 Mahmud, son of Sabuktagin, succeeded to the government, and with his name Ghazni and the Ghaznevid dynasty have become perpetually associated. Issuing forth year after year from that capital, Mahmud (*q v.*) carried fully 17 expeditions

of devastation through northern India and Gujarat, as well as others to the north and west The wealth brought back to Ghazni was enormous, and contemporary historians give glowing descriptions of the magnificence of the capital as well as of the conqueror's munificent support of literature. Mahmud died in 1030, and some 14 kings of his house came after him, but though there was some revival of importance under Ibrahim (1059–99), the empire never reached anything like the same splendour and power. It was overshadowed by the Seljuks of Persia and by the rising rivalry of Ghor (*q v*), the hostility of which it had repeatedly provoked Bahram Shah (1118–52) put to death Kutbuddin, one of the princes of Ghor, called king of the Jibal or hill country, who had withdrawn to Ghazni This prince's brother, Saifuddin Suri, came to take vengeance and drove out Bahram But the latter, recapturing the place (1149), paraded Saifuddin and his vizier ignominiously about the city and then hanged them on the bridge Ala-uddin of Ghor, younger brother of the two slain princes, then gathered a great host and came against Bahram, who met him on the Helmund The Ghori prince, after repeated victories, stormed Ghazni and gave it over to fire and sword The dead kings of the house of Mahmud, except the conqueror himself and two others, were torn from their graves and burnt, whilst the bodies of the princes of Ghor were solemnly disinterred and carried to the distant tombs of their ancestors. It seems certain that Ghazni never recovered the splendour that perished then (1152). Ala-uddin, who from this deed became known in history as *Jahān-soz* (Burn-all), returned to Ghor, and Bahram reoccupied Ghazni; he died in 1157. In the time of his son Khusru Shah, Ghazni was taken by the Turkish tribes called Ghuzz (generally believed to have been what are now called Turkomans) The king fled to Lahore, and the dynasty ended with his son In 1173 the Ghuzz were expelled by Ghiyasuddin, sultan of Ghor (nephew of Ala-uddin Jahansoz), who made Ghazni over to his brother Muizuddin This famous prince, whom the later historians call Mohammed Ghori, shortly afterwards (1174–75) invaded India, taking Multan and Uchh This was the first of many successive inroads on western and northern India, in one of which Lahore was wrested from Khusru Malik, the last of Mahmud's house, who died a captive in the hills of Ghor In 1192, the king of Ajmere being defeated and slain near Thanewar, the whole country from the Himalayas to Ajmere became subject to the Ghori king of Ghazni On the death of his brother Ghiyasuddin, with whose power he had been constantly associated and of whose conquests he had been the chief instrument, Muizuddin became sole sovereign over Ghor and Ghazni, and the latter place was then again for a brief period the seat of an empire nearly as extensive as that of Mahmud the son of Sabuktagin Muizuddin crossed the Indus once more to put down a rebellion of the Khokhars in the Punjab, and on his way back was murdered by a band of them, or, as some say, by one of the *Mulāhidah* or Assassins The slave lieutenants of Muizuddin carried on the conquest of India, and as the rapidly succeeding events relieved their dependence on any master they established at Delhi that monarchy of which the shadow was still surviving in 1857 The death of Muizuddin was followed by struggle and anarchy, ending for a time in the annexation of Ghazni to the empire of Khwarizm by Mohammed Shah, who conferred it on his famous son, Jelaluddin, and Ghazni became the headquarters of the latter After Jenghiz Khan had extinguished the power of his family in Turkestan, Jelaluddin defeated the army sent against him by the Mongol at Parwan, north of Kabul Jenghiz then advanced and drove Jelaluddin across the Indus, after which he sent Ogdai, his son, to besiege Ghazni Henceforward Ghazni is much less prominent in Asiatic history It continued subject to the Mongols, sometimes to the house of Hulagu in Persia, and sometimes to that of Jagatai in Turkestan.

Ibn Batuta (*c* 1332) says the greater part of the city was in ruins, and only a small part continued to be a town. Timur seems never to have visited Ghazni, but we find him in 1401 bestowing the government of Kabul, Kandahar, and Ghazni on Pir Mohammed, the son of his son Jahangir At the end of the century it was still in the hands of a descendant of Timur, Ulugh Beg Mirza, who was king of Kabul and Ghazni The illustrious nephew of this prince, Baber, got peaceful possession of both cities in 1504, and has left notes on both in his own inimitable Memoirs "It is," he says, "but a poor mean place, and I have always wondered how its princes, who possessed also Hindustan and Khorasan, could have chosen such a wretched country for the seat of their government, in preference to Khorasan" He commends the fruit of its gardens, which still contribute largely to the markets of Kabul Ghazni remained in the hands of Baber's descendants, reigning at Delhi and Agra, till the invasion of Nadir Shah (1738), and became after Nadir's death a part of the new kingdom of the Afghans under Ahmad Shah Durani The historical name of Ghazni was brought back from the dead, as it were, by the news of its capture by the British army under Sir John Keane, July 23, 1839, at the cost of 182 killed and wounded Two years and a half later the Afghan outbreak against the British occupation found Ghazni garrisoned by a Bengal regiment of sepoys, but neither repaired nor provisioned They held out under great hardships from Dec 16, 1841, to Mar 6, 1842, when they surrendered In the autumn of the same year General Nott, advancing from Kandahar upon Kabul, reoccupied Ghazni, destroyed the defences of the castle and part of the town, and carried away the famous gates of Somnath (*q v*)

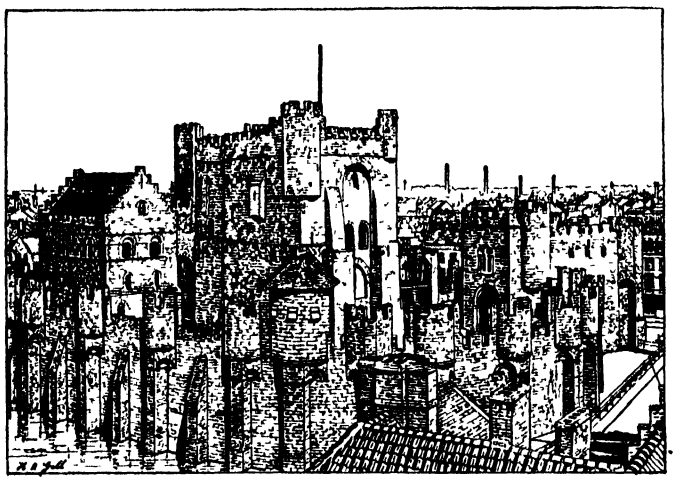
GHEE, clarified butter used in India (Hindu, *ghi*) The best is prepared from butter of the milk of cows, the less esteemed from that of buffaloes The butter is melted over a slow fire and set aside to cool; the thick, opaque, whitish, and more fluid portion, or ghee, representing the greater bulk of the butter, is then removed The less liquid residue, mixed with ground-nut oil, is sold as an inferior kind of ghee It may be obtained also by boiling butter over a clear fire, skimming it the while, and, when all the water has evaporated, straining it through a cloth Ghee which is rancid or tainted, as is often that of the Indian bazaars, is said to be rendered sweet by boiling with leaves of the *Moringa pterygosperma* or horse-radish tree

In India, ghee is one of the commonest articles of diet, and indeed enters into the composition of everything eaten by the Brahmans It is also extensively used in Indian religious ceremonies, being offered as a sacrifice to idols, which are at times bathed in it Sanskrit treatises on therapeutics describe ghee as cooling, emollient, and stomachic, as capable of increasing the mental powers, and of improving the voice and personal appearance, and as useful in eye-diseases, tympanitis, painful dyspepsia, wounds, ulcers, and other affections Old ghee is in special repute among the Hindus as a medicinal agent, and its efficacy as an external application is believed by them to increase with its age Ghee more than ten years old, the *purāna ghrita* of Sanskrit *materia medicas,* has a strong odour and the colour of lac Some specimens which have been much longer preserved—and "clarified butter 100 years old is often heard of"—have an earthy look, and are quite dry and hard, and nearly inodorous Medicated ghee is made by warming ordinary ghee to remove contained water, melting, after the addition of a little turmeric juice, in a metal pan at a gentle heat, boiling with the prepared drugs till all moisture is expelled and straining through a cloth

GHEEL or **GEEL,** a town of Belgium, about 30 m E of Antwerp and in the same province Pop (1925) 18,104 It is remarkable on account of its colony of insane persons The legend reads that in the year 600 Dymphna, an Irish princess, was executed here by her father, in consequence of certain miracles she was canonized and made patron saint of the insane The old Gothic church is dedicated to her, and in the choir is her shrine, with fine panel paintings by, probably, a contemporary of Memling The colony of the insane is in farms and houses round the little place within a circumference of 30 m and is said to have existed since the 13th century This area is divided into four sections, each having a doctor and a superintendent attached to it The Gheel system is regarded as the most humane method of dealing with the insane

GHENT, the capital of East Flanders, Belgium, at the junction of the Scheldt and the Lys (Ley) Pop (1925) 163,364 The city is divided by the rivers (including the small streams Lieve and Moere) and by canals, some navigable, into numerous

islands connected by over 200 bridges of various sorts; there are fine quays and docks. The cathedral of St. Bavon has a rich interior, its crypt dates from 941, the choir from 1274–1300, the Late Gothic choir chapels from the 15th century, and the nave and transept from 1533–54. Among the treasures of the church is the famous "Worship of the Lamb" by Hubert and Jan van Eyck. The original 12 panels, dispersed since 1816, were brought together again in 1920 under the provisions of the Treaty of Versailles. Among the other 55 churches may be mentioned that of St.



BY COURTESY OF THE BELGIAN NATIONAL RAILWAYS

THE OUDEBURG OR CHÂTEAU DES COMTES, DATING FROM 1180

This mediaeval fortress, the stronghold of the early counts of Flanders, was restored by the city after serving for nearly 100 years as a factory

Nicholas, an Early Gothic building, the oldest church in date of foundation in Ghent, and that of St Michael, completed in 1480, with an unfinished tower. In the centre of the city stands the unfinished Belfry (*Beffroi*), a square tower some 300 ft. high, built 1183–1339 It has a cast-iron steeple (restored in 1854), on the top of which is a gold dragon which, according to tradition, was brought from Constantinople either by the Varangians or by the emperor Baldwin after the Latin conquest Close to it is the former Cloth-hall, a Gothic building of 1325 The hôtel-de-ville consists of two distinct parts The northern façade, a magnificent example of Flamboyant Gothic, was erected between 1518 and 1533, restored in 1829 and again some 50 years later. The eastern façade overlooking the market-place was built in 1595–1628, in the Renaissance style, with three tiers of columns It contains a valuable collection of archives, from the 13th century onwards On the left bank of the Lys is the Oudeburg, the former castle of the first counts of Flanders, dating from 1180 and now restored

To the north of the Oudeburg, on the other side of the Lys, is the Marché du Vendredi, the principal square of the city. This was the centre of the life of the mediaeval city, the scene of all great public functions, such as the homage of the burghers to the counts, and of the auto-da-fés under the Spanish regime On the Scheldt, near the Place Laurent, is the Geerard-duivelsteen (château of Gerard the Devil), a 13th-century tower formerly belonging to a patrician family, now restored and used as the office of provincial records In the park on the site of the citadel erected by Charles V are some ruins of the ancient abbey of St. Bavon and of a 12th-century octagonal chapel dedicated to St. Macharius In the park is also situated the Museum of Fine Arts, completed in 1902 One of the most interesting institutions of Ghent is the great Béguinage (Begynhof) which, originally established in 1234 by the Bruges gate, was transferred in 1874 to the suburb of St Amandsberg It constitutes a little town of itself, surrounded by walls and a moat, and contains numerous small houses, 18 convents and a church It is occupied by some 700 Béguines, women devoted to good works (*see* BÉGUINES). Near the station is a second Béguinage with 400 inmates

The main industries are cotton-spinning, flax-spinning, cotton-printing, tanning and sugar refining; in addition to which there are iron and copper foundries, machine-building works, breweries and factories of soap, paper, tobacco, etc. As a trading centre the city is even more important It has direct communication with the sea by a ship-canal, greatly enlarged and deepened since 1895, which connects the Grand Basin, stretching along the north side of the city, with a spacious harbour excavated at Terneuzen on the Scheldt, 21½ m. to the north, thus making Ghent practically a sea-port; while a second canal, from the Lys, connects the city via Bruges with Ostende A new lock at Terneuzen enables vessels up to 26 ft draught to pass at any tide into or out of the canal between that port and Ghent.

Among the many educational establishments is the State university founded by King William I. of the Netherlands in 1816, actually a Flemish university With it are connected a school of engineering, a school of arts and industries and the famous library (about 300,000 printed volumes and 2,000 mss) formerly belonging to the city. The art academy has a fine collection of pictures taken from religious houses on their suppression in 1795 Ghent has more than 700 horticultural establishments Every five years her great flower shows, "*Floralies*" attract visitors from all parts of the world.

Ghent was in the hands of the Germans from Oct. 1914 till Armistice day, Nov. 11, 1918 The west part of the town suffered some damage in the final operations. The university was reopened in Oct 1923

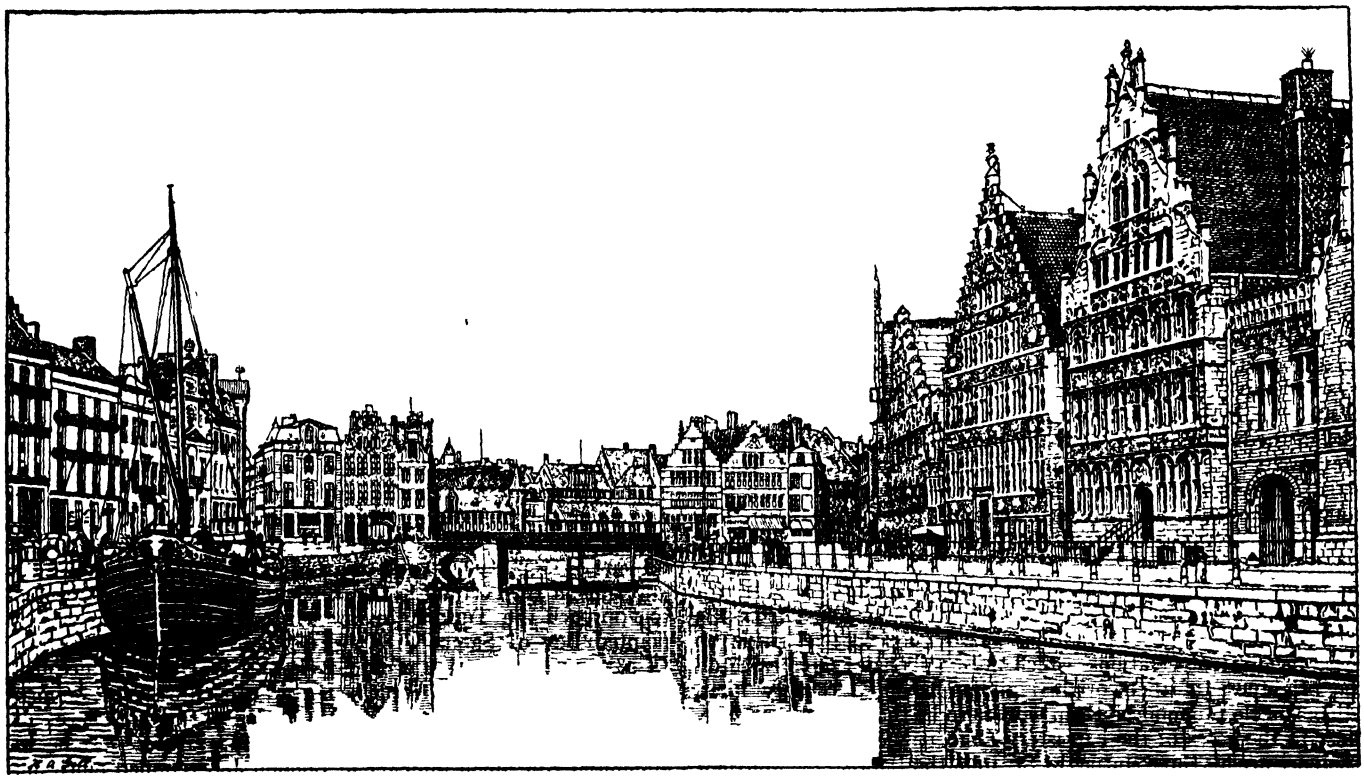
History.—The history of the city is closely associated with that of the countship of Flanders (*q v*), of which it was the seat. It is mentioned as early as the 7th century, and in 868 Baldwin of the Iron Arm, first count of Flanders, who had been entrusted by Charles the Bald with the defence of the northern marches, built a castle here against the Normans raiding up the Scheldt. This was captured in 949 by the emperor Otto I and was occupied by an imperial burgrave for some 50 years, after which it was retaken by the counts of Flanders Under their protection, and favoured by its site, the city rapidly grew in wealth and population, the zenith of its power and prosperity being reached between the 13th and 15th centuries, when it was the emporium of the trade of Germany and the Low Countries, the centre of a great cloth industry, and could put some 20,000 armed citizens into the field The wealth of the burghers during this period was equalled by their turbulent spirit of independence; feuds were frequent—against the rival city of Bruges, against the counts, or, within the city itself, between the plebeian crafts and the patrician governing class. Of these risings the most notable was that in the earlier half of the 14th century, against Louis de Crécy, count of Flanders, under the leadership of Jacob van Artevelde (*q v*).

The earliest charter to the citizens of Ghent was that granted by Count Philip of Flanders between 1169 and 1191 It did little more than arrange for the administration of justice by nominated jurats (*scabini*) under the count's *baulli*. Far more comprehensive was the second charter, granted by Philip's widow Mathilda, after his death on crusade in 1191 The magistrates of the city were still nominated *scabini* (fixed at 13), but their duties and rights were strictly defined and the liberties of the citizens safeguarded; the city, moreover, received the right to fortify itself and even individuals within it to fortify their houses This charter was confirmed and extended by Count Baldwin VIII., and the burghers attained to a very considerable measure of self-government. A charter of 1212 of Count Ferdinand (of Portugal) and his wife Johanna introduced a modified system of election for the *scabini*.

By the 14th century the democratic craft guilds, notably that of the weavers, had asserted themselves; the citizens were divided for civic and military purposes into three classes—the rich (*i.e* , those living on capital), the weavers, and the members of the 52 other gilds In the civic executive, as it existed to the time of Charles V., the deans of the two lower classes sat with the *scabini* and councillors

In the long struggle of the Netherlands against Spain, Ghent took a conspicuous part, and it was here that, on Nov 8, 1576, was signed the instrument known as the Pacification of Ghent, which established the league against Spanish tyranny.

War, persecution and the emigration or expulsion of its people



BY COURTESY OF THE BELGIAN NATIONAL RAILWAYS

THE OLD PORT AT GHENT. THE CAPITAL OF EAST FLANDERS IS AN IMPORTANT TRADING CENTRE AND HAS DIRECT SEA COMMUNICATION BY TWO SHIP CANALS THE MAIN CANAL, 21½ MILES LONG, ENLARGED AND DEEPENED SINCE 1895, RUNS TO TERNEUZEN, ON THE SCHELDT, WHERE A SPACIOUS HARBOUR HAS BEEN EXCAVATED THE OTHER RUNS TO OSTEND VIA BRUGES

wrecked the prosperity of Ghent, the recovery of which was made impossible by the closing of the Scheldt After 1714 it formed part of the Austrian Netherlands, and in 1794 became the capital of the French department of the Scheldt In 1814 it was incorporated in the kingdom of the United Netherlands, and after 1830 became part of Belgium

For a comprehensive bibliography, *see* Ulysse Chevalier, *Répertoire des sources hist. topo bibliogr., s.v* "Gand"

GHERARDESCA, UGOLINO DELLA (*c* 1220–1289), count of Donoratico, was the head of the powerful family of Gherardesca, the chief Ghibelline house of Pisa He allied himself by marriage with the Visconti, leaders of the Guelph faction in the city For his share in the defeat of the Pisans by the Genoese at the battle of Meloria (1284) *see* MELORIA and PISA· *History* He was accused of treachery, and increased his own unpopularity by ceding castles to Florence and Lucca, and by his hesitation to make peace with Genoa, lest the return of the Pisan prisoners, including the leading Ghibellines, should diminish his power Civil war broke out in Pisa in 1288, stirred up by Gherardesca's rival the archbishop Ruggieri, who captured the count, his two sons, Gaddo and Uguccione, and his grandsons, and starved them to death in the Muda, a tower belonging to the Gualandi family Dante, in a terrible but magnificent passage, placed Ugolino and Ruggieri in the second ring of the lowest circle of the *Inferno*

See P Tronci, *Annali Pisani* (2 vols, Pisa, 1868–71); S de Sismondi, *Histoire des républiques italiennes* (Brussels, 1838), also the various annotated editions of Dante, especially W W Vernon's *Readings from the Inferno*, vol. II. (2nd ed, 1905).

GHETTO, formerly the street or quarter of a city in which the Jews were compelled to live The term is now used loosely of any locality where they congregate

The mediaeval *Jewry* (*Juiverie, Juderia,* etc) was the inevitable social expression of Jewish solidarity and Gentile aversion, and did not necessarily have any legal implication The third Lateran Council (1179), which prohibited true believers even from lodging amongst the infidels, laid the foundations of a stricter control, which was sporadically enforced It was not, however, reduced to a system until the counter-Reformation, when the bull *cum nimis absurdum* of Paul IV (1555) enjoined for the first time the consistent enforcement of the mediaeval principles of segregation, the Ghetto of Rome being established in the following year The Papal example ultimately prevailed in almost every city of Italy; and the name *Ghetto,* originally found in Venice, was generally applied to the new quarter thus created In Germany, where a similar system obtained, the names *Judengasse,* etc, were used instead In the Papal territories in France the term *Carrière* (*des Juifs*) was employed In the rest of Europe the formal institution never generally prevailed. Among the most important examples of it in the north were Frankfort and Prague, in the south, Avignon, Rome and Venice, where the old buildings may still be seen

Within their Ghettos the Jews enjoyed a considerable degree of autonomy under their own authorities, who were responsible for the collection of the oppressive communal taxation The Jewish quarter thus formed to some extent an independent corporation, with its own officials, purveyors, guilds, amusements, and courts Economic activity was however restricted by law to money-lending and a few more of the meanest occupations The houses tended to be of unusual height, being compelled to extend vertically since there was no room for them to do so laterally In order to prevent exploitation by Gentile landlords (the Jew was forbidden to hold real estate), security of tenure was guarded by an extension of the old Jewish principle of *Hazakah,* or prescriptive right In Italy this ultimately acquired full legal status as the *jus gazaga* The Ghettos were enclosed with walls and gates, which were kept locked at night and on certain church festivals, *e g*, from Thursday to Saturday in Holy Week Outside, and sometimes inside as well, a badge or hat of distinctive colour had to be worn The French Revolution temporarily swept away the infamous system, though it was widely restored in the reaction that followed. It was abolished however for good by the liberal movements of the 19th century, the last vestige disappearing with the capture of Rome in 1870

See D Philipson, *Old European Jewries* (1894), Israel Abrahams,

Jewish Life in the Middle Ages (1896); S. Kahn, article "Ghetto" in the *Jewish Encyclopedia.*

GHIBERTI, LORENZO (1378–1455), Italian sculptor, was born at Florence in 1378 His father was Cione di Ser Buonaccorso He learned the trade of a goldsmith under his stepfather Bartoluccio; but the goldsmith's art at that time included all varieties of plastic arts, and required from those who devoted themselves to its higher branches a general and profound knowledge of design and colouring In 1400 when Florence was visited by the plague, he left for the Romagna and assisted in painting frescoes in Pesaro in the castle of Carlo Malatesta He returned to Florence on the urgent entreaties of his stepfather, who informed him that a competition was to be opened for designs of a second bronze gate in the baptistery, and that he would do wisely to take part in this artistic contest The subject for the artists was the sacrifice of Isaac, and the competitors were required to observe in their work a certain conformity to the first bronze gate of the baptistery, executed by Andrea Pisano about 100 years previously Of the six designs presented by different Italian artists, those of Donatello, Brunelleschi and Ghiberti were pronounced the best, and Ghiberti received the commission This great work occupied him for fully twenty years The unbounded admiration called forth by Ghiberti's first bronze gate led to his receiving from the chiefs of the Florentine gilds the order for the second, of which the subjects were likewise taken from the Old Testament The Florentines gazed with especial pride on these magnificent creations, which must still have shone with all the brightness of their original gilding when, a century later, Michelangelo pronounced them worthy to be the gates of paradise Next to the gates of the baptistery Ghiberti's chief works still in existence are his three statues of St John the Baptist, St Matthew and St Stephen, executed for the church of Or San Michele, two reliefs for the baptistery in Siena and the bas-relief of the coffin of St Zenobius, in the Florence cathedral As an architect he was employed on the Florence cathedral As a painter he furnished designs for the painted glass windows of the same building He died at Florence on Dec 1, 1455

Ghiberti's writings known by the name of "Commentarii" are invaluable for the study of art history The first section gives an account of ancient art founded on Pliny, the second is devoted to mediaeval art and contains biographies of artists, mainly Tuscans of the 14th century, the third deals with optics and proportions

See Vasari-Milanesi II; C Frey, *Sammlung ausgewahlter Biographien Vasaris III* (1886), Ch Perkins, *History of Tuscan Sculpture* (1864), Lord Balcarres, *The Evolution of Italian Sculpture* (1909), Ghiberti's writings were published in 1912 by Julius von Schlosser

GHICA, GHIKA or **GHYKA,** a family which played a great part in the modern development of Rumania, many of its members being princes of Moldavia and Walachia According to Rumanian historians the Ghicas were of humble origin, and came from Kiupru in Albania

1 GEORGE (*c* 1600–1664), the founder of the family, is said to have been a playmate of Kupruli Aga, the famous vizier, who recognized George while he was selling melons in the streets of Constantinople, and helped him on to high positions George became prince of Moldavia in 1658 and prince of Walachia in 1659–60 He moved the capital from Tîrgovishtea to Bucharest From him are derived branches of the family which became so conspicuous in the history of Moldavia and Walachia

2 The Walachian branch starts afresh from the great ban DEMETRIUS or DUMITRU GHICA (1718–1803), who was twice married and had 14 children (*See* RUMANIA *History*) One of these, Gregory, prince of Walachia 1822–28, starts a new era of civilization, by breaking with the traditions of the Phanariot (Greek) period and assisting in the development of a truly national Rumanian literature His brother, Prince Alexander Ghica, appointed jointly by Turkey and Russia (1834–42) as hospodar of Walachia, died in 1862 Under him the so-called *règlement organique* had been promulgated; an attempt was made to codify the laws in conformity with the institutions of the country and to secure better administration of justice Prince Demetrius Ghica, who died as president of the Rumanian senate in 1897, was the son of the Walachian prince Gregory.

3 MICHAEL (1794–1850) was the father of ELENA (1827–1888), a well-known novelist, who wrote under the name of Dora d'Istria She married a Russian prince, Koltsov Mazalskiy, in 1849, but the marriage was unhappy, and in 1855 she left St. Petersburg for Florence, where she died in 1888 There she published works characterized by lightness of touch and brilliance of description, such as *Pèlerinage au tombeau de Dante, La Vie monastique dans les églises orientales* (1844), *La Suisse allemande,* etc One of her last works was devoted to the history of her own family, *Gli Albanesi in Roumenia Storia dei Principi Ghika nei secoli XVII–XIV* (Florence, 1873)

4 SCARLAT GHICA (1750–1802) was twice prince of Walachia His grandson JOHN (IOAN) GHICA (1817–1897), a lifelong friend of Turkey, was educated in Bucharest and in the West, and studied engineering and mathematics in Paris (1837–40); returning to Moldavia he was involved in the conspiracy of 1841, which was intended to bring about the union of Walachia and Moldavia under one native prince (Michael Sturdza) The conspiracy failed and John Ghica became a lecturer on mathematics at the university which was founded by Prince Sturdza in Jassy In 1848 he joined the party of revolution and in the name of a provisional government then established in Bucharest went to Constantinople to approach the Turkish government Whilst there he was appointed Bey of Samos (1853–59), where he extirpated piracy. In 1859 after the union of Moldavia and Walachia, Prince Cuza induced John Ghica to return He was the first prime minister under Prince (afterwards King) Charles of Hohenzollern He joined the anti-dynastic movement of 1870–71 In 1881 he was appointed Rumanian minister in London and retained office until 1889 He died on May 7, 1897 in Gherghani

GHILZAI, a large and widespread Afghan tribe, who extend from Kalat-i-Ghilzai on the S to the Kabul river on the N, and from the Gul Koh range on the W to the Indian border on the E, in many places overflowing these boundaries They are of the same stock as the Isa' Khel and Lodi Pathans The Ghilzai clans now rank collectively as second to none in strength of military and commercial enterprise They are a fine, manly race of people, and it is from some of their most influential clans (Suliman Khel, Nasir Khel, Kharotis, etc) that the main body of *povindah* merchants is derived

See *Tribes and Castes of the Punjab and North-west Frontier Province,* vol II (1911)

GHIRLANDAJO, DOMENICO (1449–1494), Florentine painter His father, Tommaso Bigordi, was a goldsmith, and Domenico was at first apprenticed in that craft, and afterwards placed with Alesso Bigordi to study painting and mosaic Unfortunately his early works in Florence were destroyed, his earliest extant paintings being at San Gimignano, where he was commissioned to decorate the chapel of S Fina in the Collegiata in the year 1475 The frescoes representing the death of the local saints already display the characteristics for which his art was to become famous balanced composition, well-ordered spatial arrangements, fine grouping, characteristic portraiture and clear and powerful draughtsmanship Here, as in all his larger works, he employed assistants of whom the most distinguished were his two brothers Daniele and Benedetto and his brother-in-law Bastiano Mainardi. Domenico was essentially a fresco painter, being a consummate master of design, and an insatiate worker, he is said to have expressed a wish to have the entire circuit of the walls of Florence to paint upon In 1480 he painted the fresco of "St. Jerome" in the church of Ognissanti at Florence His "Last Supper" in its refectory is notable for individual action and expression In 1481 he was called to Rome by Pope Sixtus IV, and asked to co-operate in a series of frescoes in the Sistine chapel with his compatriots Cosimo Roselli and Sandro Botticelli Ghirlandajo undertook two of the series but only one has survived. the "Christ calling the first Apostles" The figures are set against a landscape background of lake and mountain scenery, extending into the far distance; on both sides are groups of onlookers—statuesquely conceived figures portraying contemporary person-

ages. From 1482 to 1485 he and his assistants were employed on frescoes in the Sala dell' Orologio of the Palazzo Vecchio. The expansive wall surfaces are covered with representations of Roman heroes and with the "Apotheosis of St. Zenobius" The architectural settings, which successfully sustain the composition, prove that Ghirlandajo, like so many Florentine artists, had profited during his sojourn in Rome by studying the ancient architecture of that city In 1485 followed the commission to decorate the chapel of the Sassetti family in the church of S Trinita with scenes from the life of St Francis Three of the principal incidents are "St Francis obtaining from Pope Honorius the approval of the Rules of his Order," his "Death and Obsequies" and the "Resuscitation of a child of the Spini family" A number of contemporary portraits are introduced Some of the backgrounds display views of Florence Ghirlandajo also painted an altarpiece for the chapel representing the "Adoration of the Shepherds" In the same year he was asked by Giov Tornabuoni to renew the frescoes in the choir of S Maria Novella, a work which has set the seal on his celebrity The frescoes, in the execution of which many assistants were employed, are arranged in four courses on the three walls, the leading subjects being the lives of the Virgin and of the Baptist It is suggested that the lower course was undoubtedly painted by the master himself, the "Birth of the Virgin" being one of the finest of the series These grand and dignified compositions show us the stately life of Florence at the glorious time of Lorenzo the Magnificent and contain portraits of many distinguished men, including members of the Tornabuoni family, the artist and his brothers The altarpiece of S Maria Novella, representing the "Virgin in Glory," was also painted by Ghirlandajo, and is now in Munich Other pictures by the master are the "Virgin and Saints" (1484) in the Uffizi gallery, Florence, the "Adoration of the Magi" (1488) in the Innocenti, Florence, the "Visitation" (1491) in the Louvre, Paris, and "Christ in Glory" (1492) in the Badia of Volterra bearing the latest date Domenico died of fever on Jan 11, 1494, and was buried in Santa Maria Novella Although fine portraits abound in his frescoes, there are but few single portraits by him extant, one is the fine profile of Giovanna Tornabuoni in the Morgan collection, another, the "Old man with his grandson," in the Louvre The Uffizi gallery contains fine drawings and sketches by the master Domenico Ghirlandajo contributed greatly to the development of his art His great fresco compositions prepared the way for the classic art of the cinquecento, he may be regarded as an innovator in more than one respect, his art leading towards realism when compared with that of his predecessors, the plastic conception of his figures, the individualistic tendency in his portraits, his rendering of folds in drapery, his representation of three dimensional space, and his treatment of backgrounds and interiors all point in that direction Being one of the most popular masters of his time, his influence was widespread, and he was surrounded by pupils and assistants Michelangelo is said to have studied under him

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GHIRLANDAJO, RIDOLFO (1483–1561), son of Domenico Ghirlandajo, Florentine painter, was born on Jan 4, 1483, and was brought up by his uncle David But he owed more in the way of professional training to Granacci, Piero di Cosimo and perhaps Cosimo Rosselli Vasari says that Ridolfo studied under Fra Bartolommeo He was one of the earliest students of the famous cartoons of Leonardo da Vinci and Michelangelo His works between the dates 1504 and 1508 show a marked influence from Fra Bartolommeo and Raphael, with the latter of whom he was on terms of familiar friendship He was prominent in the execution of vast scenic canvases for various public occasions, such as the wedding of Giuliano de' Medici, and the entry of Leo X into Florence in 1515 In his prime he was honest and conscientious as an artist; but from about 1527 he declined and his style became mannered He died in Florence on Jan 6, 1561.

The following are some of his leading works: An "Annunciation" in the Abbey of Montoliveto near Florence, Leonardesque in style; in 1504, the "Coronation of the Virgin," now in the Louvre, Paris; a "Nativity," very carefully executed, now in the Hermitage, Leningrad, a "Predella," in the Bigallo, Florence, five panels, of the Nativity and other subjects, charmingly finished, in 1514, on the ceiling of the chapel of St Bernard in the Palazzo Vecchio, Florence, a fresco of the "Trinity," with heads of the 12 apostles and other accessories, and the "Annunciation"; also the "Assumption of the Virgin, who bestows her girdle on St. Thomas," in the choir loft of Prato cathedral; in 1517 two pictures, which display his highest skill, replete with expression, vigorous life and firm accomplished pictorial method, now in the gallery of the Uffizi, Florence "St Zenobius resuscitating a child", also the translation of the remains of the same Saint In the National Gallery, London, is "The Procession to Calvary," painted 1506 for the Antinovi family

GHOR or **GHUR,** an ancient kingdom in the southern portion of that great peninsula of strong mountain country which forms the western part of modern Afghanistan

Ghor is mentioned in the Shahnama of Firdousi (AD 1010), and in the Arab geographies of that time, but the people and princes of Ghor first became known to us in connection with the Ghaznevid dynasty, and the early mediaeval histories of Ghor and Ghazni are so intertwined that nothing need be added to what will be found under GHAZNI (*q v*)

About AD 1100 one of the princely families of Ghor, deriving the appellation of Shansabi, or Shansabaniah, from a certain ancestor Shansab, of local fame, acquired predominance in all the country, and Malik 'Izzuddin al Hosain of this family was known afterwards as "the Father of Kings," from the honour to which several of his seven sons rose Three of these were—(1) Amir Kutbuddin Mahommed, called the lord of the Jibal or mountains; (2) Sultan Saifuddin Suri, for a brief period master of Ghazni, both of whom were put to death by Bahram the Ghaznevid, and (3) Sultan Alauddin Jahansoz, who wreaked vengeance upon Ghazni and began the conquests which were afterwards immensely extended both in India and in the West by his nephews Ghiyasuddin Mahommed b Sam and Mahommed Ghori For a brief period during their rule it was boasted, with no great exaggeration, that the public prayer was read in the name of the Ghori from the extremity of India to the borders of Babylonia, and from the Oxus to the Straits of Ormus After the death of Mahommed Ghori the Indian dominion became independent, and the whole kingdom fell to pieces before the power of Mahommed Shah of Khwarizm and his son Jelaluddin (*c* 1214–15), a power in its turn speedily shattered by the Mongol flood

The princes of Ghor experienced, about the middle of the 13th century, a revival of power, which endured for 140 years This later dynasty bore the name of Kurt or Kärt The first of historical prominence was Malik Shamsuddin Kurt, who in 1245 held the lordship of Ghor in some kind of alliance with, or subordination to, the Mongols, and in 1248 received from the Great Khan Mangu an investiture of all the provinces from Merv to the Indus, including by name Seistan, Kabul, Tirah (adjoining the Khyber pass), and Afghanistan, which he ruled from Herat He stood well with Hulagu, and for a long time with his son Abaka, but at last incurred the latter's jealousy, and was poisoned when on a visit to the court at Tabriz (1276) His son Ruknuddin Kurt was, however, invested with the government of Khorasan (1278), but after some years, mistrusting his Tatar suzerains, he withdrew into Ghor, and abode in his strong fortress of Kaissar till his death there in 1305 The family held on through a succession of eight kings in all, sometimes submissive to the Mongol, sometimes aiming at independence But in 1380 Timur came against Herat, and carried away the king and the treasures of his dynasty A revolt and massacre of his garrison provoked Timur's vengeance, he put the captive king to death, came against the city a second time, and showed it no mercy (1383) Ghor has since been obscure in history

The valleys of the Taimani tribes though narrow are fertile and well cultivated, and there are many walled villages and forts about

Parjuman and Zarni in the south-eastern districts The peak of "Chalap Dalan" (described by Ferrier as "one of the highest in the world") is the Koh-i-Kaisar, which is a trifle over 13,000ft. in height. All the country now known as Ghor was mapped during the progress of the Russo-Afghan boundary delimitation

See the "Tabakât-i-Nâsiri," in the *Bibl. Indica,* transl. by Raverty; *Journal asiatique,* ser v tom xvii, "Ibn Haukal," in *J As Soc. Beng.,* vol xxii, Ferrier's *Caravan Journeys,* Hammer's *Ilkhans.*

GHOSE, LALMOHUN (1849–1909), lawyer, statesman, orator and scholar, was born at Krishnagur, Bengal, on Dec 17, 1849. He was the second son of Rai Ram Lochun Ghose Bahadur, Principal Sadar Amin of the district Ghose was called to the bar in England in 1873, and on his return to India began to practise in the Calcutta High Court Ghose was honorary secretary and principal speaker of a deputation on Indian administration to the Marquess of Hartington. The result was repeal of the Vernacular Press Act and the establishment of a Statutory Indian Civil Service.

Early in 1880, he returned to India, but two months later the Indian Association again sent him to England to continue their opposition to Lord Lytton's policy. Returning in November the same year, he resumed practice at the Bar, and devoted the next two years to various political measures, such as the Vernacular Press Act, Criminal Procedure Code Amendment Bill, etc

In 1883, he again proceeded to England in order to assist in an appeal of Surendranath Banerjea before the Privy Council. From August 1883 to August 1884, he addressed meetings in London and elsewhere in support of Ripon's policy in the Ilbert Bill and the representation of Indian interests in Parliament. He was the first Indian to seek election to Parliament, in 1885 and again in 1886 the Liberals of Deptford invited him to become their candidate, but on both occasions he was defeated—the second time owing to his support of the Irish Home Rule Bill He returned to India in 1887

In 1892, he was elected a member of the Bengal Legislative Council from which he retired in 1895. In 1903, he was elected president of the Indian National Congress at Madras and for some years took an important part in its deliberations Ghose's last political speech was delivered as chairman of a public meeting called in 1906 at Calcutta to protest against Lord Curzon's partition of Bengal Ill-health prevented him from taking any further active part in political work, and he died at Calcutta on Sept 18, 1909

Ghose was a thorough Constitutionalist and the whole spirit of his utterances was loyal to the British Government He was the greatest orator of his time in India As a member of the Bar he was rather an advocate than a lawyer, and commanded the fullest respect of Bench and Bar alike

Bibliography—*Speeches of Lalmohun Ghose,* Parts I–II, edited by A Banerjea, 1883–84 (H Da)

GHOST, the spirit of a dead person considered as appearing in some visible or sensible form to the living (O E *goest*) (*see* Apparitions, Psychical Research, Spiritualism) The language of the Authorized Version of the Bible has preserved the phrase "to give up the ghost," still sometimes used of dying The Spirit of God, the third person of the Trinity, is still called the Holy Ghost

GHOST DANCE. In 1870 there started among the Paiute (Paviotso) of Western Nevada a new faith—the Ghost Dance religion—which in most cases spread rapidly because of the wide feeling, founded on solid fact, that the westward movement of white culture was destined to destroy the native culture In some cases "the new cult was encouraged by the chiefs as a check to the rival powers of the Shamans" (Spier, *see* bibliography). The Modoc war of 1873 saw the immediate disappearance of the cult, but it may still survive, or more probably there may survive separate cult-elements which, if re-stimulated and recombined, would present a very close resemblance to the complex of ideas, beliefs and rites which constitute the Ghost Dance religion

In 1890 changes in the administration with the appointment of inexperienced men in charge of the reserves, led to discontent, notably among the Sioux of Pine Ridge Pledges had been broken Messianic ideas of a deliverer who shall restore the world to the godly and punish the transgressors of his ordinances are found in Indian thought, and there is a continuity of idea, inspired by, and probably based on, political conditions, between the ideals of Pontiac, the Paiute dreamer of 1870 named Ta'vibo, Smohalla, the dreamer of the Columbia region whose oratory, activities and personality made him a man of wide influence, the Shaker teachers of Puget Sound; and the doctrines of Wovoka the Messiah, the Paiute who is known as Jack Wilson The new teaching—in reality the old teaching—reached the Sioux in 1889 and took the form of a prophecy of a new world Even progressive and intelligent Indians held the belief in the close advent of a liberator who should restore the Indian race, living and dead, to a regenerated earth where the pristine conditions of life should prevail Administration of Indian reserves had been adequate, intelligent, sympathetic and satisfactory in many cases The prophecy sometimes allowed the white man to share the predicted felicity The movement took hostile expression among the discontented Sioux, whose leaders, Sitting Bull and Red Cloud, were irreconcilable enemies of the whites Sitting Bull, a medicine man rather than a secular chief, was killed on Dec. 15, 1890. By Jan 16, 1891, the outbreak ended, as a result of the military and political operations conducted by Gen Miles, who put the agencies in charge of military officers known to and respected by the Indians

The Ghost Dance begins in the middle of the afternoon or later No musical instrument is used except by individual dancers. The Sioux wore a "ghost shirt," almost always made of white cloth, tailored in Indian fashion No metal was allowed to be worn The ghost stick carried by the leader was a staff about 6 ft. long, with red cloth and red feathers Other articles used were arrows with bone heads, a bow, a gaming wheel and sticks. The ground was consecrated The priests were ordained by the conferment of a consecrated feather, either of a crow, the sacred bird of the Ghost Dance, or of the eagle, sacred in Indian lore, given to the candidates by the apostle The feathers were painted The dancers were ceremonially painted on the face with elaborate designs, in red, yellow, green and blue, suggested in trances, and were thus strengthened in spiritual vision and physical health. All went to bathe—to wash away all evil, spiritual and material. Attendance was compulsory, as those who stayed away would be turned to stone or punished Songs, adapted to the simple dance step, were carefully rehearsed. Participants fell into trances and on regaining consciousness narrated their visions The general psychology of the dance as an element in religious and social life, and as it functions in the lives of primitive people, forms a topic of importance as, in general, sexual display takes place and selection is encouraged—a feature sternly and successfully repressed in the Ghost Dance, in which the whole attention of the performers, the whole community, was successfully concentrated upon the purpose of the dance and upon the message of salvation which it conveyed

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GIACOMETTI, PAOLO (1816–1882), Italian dramatist, born at Novi Ligure, was educated in law at Genoa, but at the age of twenty had some success with his play *Rosilda* and then devoted himself to the stage Among the best of his plays, most of which were written for various touring companies to which he was attached, were *La Donna* (1850), *La Donna in seconde nozze* (1851), *Giuditta* (1857), *Sofocle* (1860), *La Morte civile* (1880)

A collection of his works was published at Milan in eight volumes (1859 *et seq*).

GIAMBELLI or **GIANIBELLI, FEDERIGO** (*fl.* 16th century), Italian military engineer, a native of Mantua, who, during the siege of Antwerp by the duke of Parma in 1584, put himself in communication with Queen Elizabeth, who engaged him as an adviser in the defence The senate agreed to a modification of his scheme for destroying the bridge which closed the

entrance to the town from the side of the sea, by the conversion of two ships of 60 and 70 tons into infernal machines. One of these exploded, killed more than 1,000 soldiers, effected a breach more than 200ft wide, by which, but for the hesitation of Admiral Jacobzoon, the town might at once have been relieved After the surrender of Antwerp Giambelli went to England, where he fortified the river Thames, and when the Spanish Armada was attacked by fireships in the Calais roads, the Spaniards were persuaded that the fireships were infernal machines constructed by Giambelli He is said to have died in London

GIAMBONO (MICHELE DI TADDEO BONO) (*fl.* 1420–1462), Italian painter and mosaicist, active in Venice from 1420–62. His grandfather was a painter of Treviso called Giam Bono (also Zambono) and he himself is generally called by this name He was the most distinguished member of a large family of artists working chiefly in Venice for nearly a century and a half, from 1396 to 1546 The decorations of the Cà Doro and of the celebrated Porta della Carta leading into the court of the doge's palace, most accomplished examples of the highly ornate Late Gothic architecture in Venice, were executed by members of the family at the time when Michele was painting his altar pieces which embody the same taste in another medium and are enclosed in elaborate Gothic architectural framework Giambono belonged to the generation preceding that of Giovanni and Gentile Bellini. It is not known in whose studio he was trained

There are but few fully authenticated works by this master extant The Venice academy has a large polyptych representing the Saviour and four Saints, signed "Michel Cambono pinxit," and a "Coronation of the Virgin" which, according to documentary evidence, was copied by the artist from a work by Giovanni d'Alemagna and Antonio Vivarini There is an exquisite "Virgin and Child," signed by the artist, in Rome (Hertz bequest) Among the works attributed to him are the "St Mark" in the National Gallery (Mond bequest), London, the St Michael in Berenson's collection, and a "Pietà" in the Metropolitan Museum of Art, New York After the death of Jacobello del Fiore in 1423, Giambono was made director of the mosaic works in the church of St. Mark's, and he there composed the mosaics on the left side of the vault in the Capella dei Mascoli, representing the Nativity and the Presentation in the Temple The figures are set against a background of Gothic architecture, and there is a first attempt to introduce three-dimensional representation in a technique, where up till that time the monumental two-dimensional design of the Byzantine tradition had reigned supreme

See Paoletti di Oswaldo, *Raccolte di Documenti inediti* (Padua, 1895), J R Richter, *Mond Collection* (1910), L Testi, *La Storia della Pittura Veneziana* (Bergamo, 1915)

GIANNONE, PIETRO (1676–1748), Italian historian, was born at Ischitella, in Capitanata, on May 7, 1676 He spent 20 years on his great work, the *Storia civile del regno di Napoli* (1723) In this work he espoused the side of the civil power in its conflicts with the Roman Catholic hierarchy Hooted by the mob of Naples, and excommunicated by the archbishop's court, he left Naples and went to Vienna Meanwhile his history was put on the *Index* At Vienna he received a pension and facilities for the prosecution of his historical studies Of these the most important result was *Il Triregno, ossia del regno del cielo, della terra, e del papa* On the transfer of the Neapolitan crown to Charles of Bourbon, Giannone lost his Austrian pension and was compelled to remove to Venice Unhappily there arose a suspicion that his views on maritime law were not favourable to the pretensions of Venice, and this suspicion, together with clerical intrigues, led to his expulsion from the State On Sept 23, 1735, he was seized and conveyed to Ferrara After wandering under an assumed name for three months through Modena, Milan and Turin, he at last reached Geneva But while on a visit to a Catholic village within Sardinian territory in order to hear mass on Easter day, he was kidnapped by the agents of the Sardinian Government, conveyed to the castle of Miolans and thence successively transferred to Ceva and Turin In the fortress of Turin he spent the remaining 12 years of his life, although part of his time was spent in composing a defence of the Sardinian interests as opposed to those of the papal court, and he was led to sign a retractation of the statements in his history most obnoxious to the Vatican (1738). He died on March 7, 1748, in his 72nd year.

See the notice by L Panzini, based on Giannone's unpublished *Autobiografia*, in the Milan edition of the historian's works (1823), and *Opere inedite* (Turin, 1859), containing the works written by him in his Turin prison, and edited by P S Mancini G Bonacci, *Saggio sulla Storia civile del Giannone* (Florence, 1903) is a bitter attack on Giannone, and although the writer's remarks on the plagiarisms in the *Storia civile* are justified, the charge of servility is greatly exaggerated.

GIANT. In classic mythology the word meant beings more or less manlike, but monstrous in size and strength, like the Titans and the Giants sung by Hesiod in the *Theogony*, who can heap up mountains to scale the sky and war beside or against the gods (O E *geant* through Fr *géant* by assimilation from *gigantem*, acc of Lat. *gigas*.) But there also appear in the legends of giants some with historic significance The idea that the giants were earth-born or indigenous races was familiar to the ancient Greeks (*see* Welcker, *Griechische Gotterlehre*, 1 787) The Bible records the traditions of the Israelites of fighting in Palestine with tall races of the land such as the Anakim (Numb xiii 33, Deut ii 10, iii, I Sam xvii 4). In Homer "the Cyclops and the wild tribes of the Giants" seem dim traditions of pre-Hellenic barbarians, godless, cannibal, skin-clothed, hurling huge stones in their rude warfare Giant-legends of this class are common in Europe and Asia In early times it was usual for cities to have their legends of giants. Thus London had Gog and Magog, whose effigies (14ft high) still stand in the Guildhall (*see* Gog), Antwerp had her Antigonus, 40ft high, Douai had Gayant, 22ft high, and so on

It was a common opinion that the human race had itself degenerated, the men of primeval ages having been of far greater stature and strength, in fact gigantic Yet so far as can be judged from actual remains, it does not appear that giants, in the proper sense, ever existed, or that the men of ancient time were on the whole taller than those now living It is now usual to apply the word giant merely to unusually tall men and women In every race of mankind the great mass of individuals do not depart far from a certain mean or average height, while the very tall or very short men become less and less numerous as they depart from the mean standard, till the utmost divergence is reached in a very few giants on the one hand, and a very few dwarfs on the other

See P Lohmann, Archaologisches von en-nebi Samwil *Zeitschr.* (1904), E J. Wood, *Giants and Dwarfs* (1860)

GIANT ORDER or **COLOSSAL ORDER,** in architecture, an order used decoratively on the face of a building whose columns or pilasters extend through two or more storeys in height.

GIANT'S CAUSEWAY, a promontory of columnar basalt, on the north coast of Co Antrim, Ireland It is divided by whindykes into the Little Causeway, the Middle Causeway and the Larger or Grand Causeway The pillars composing it are for the most part irregular hexagons In diameter they vary from 15 to 20 in, and some are 20 ft in height The Great Causeway is in some places nearly 40 ft in breadth and is highest at its narrowest part. It extends outwards into a platform and for nearly 100 yd is above water The neighbouring cliffs, particularly in the bay to the east, exhibit in many places similar columns The most remarkable of the cliffs is the Pleaskin, the upper pillars of which are 60 ft. in height, beneath these is a mass of coarse black amygdaloid, of the same thickness, underlain by a second range of basaltic pillars, from 40 to 50 ft in height Near the Giant's Causeway are the ruins of the castles of Dunseverick and Dunluce, situated on isolated crags In 1883 an electric railway, the first in the United Kingdom, was opened, connecting the Causeway with Portrush and Bushmills

GIANT'S KETTLE, GIANT'S CAULDRON, a glacial pot-hole, *i e*, a deep cylindrical hole in solid rock drilled out by eddying currents of water of sub-glacial streams, bearing stones, gravel and other detrital matter The size varies from a few inches to several feet in depth and diameter and upon the retreat of the ice, the whole frequently contains the sand, gravel or

boulders which have assisted in its formation Good examples occur in the Alps (Lucerne), Germany, Norway and U S A These must not be confused with true pot-holes which occur in river beds and at the base of sea cliffs

GIAOUR, a word used by the Turks to describe all who are not Mohammedans, especially Christians The word, first employed as a term of contempt, has become so general that in most cases no insult is intended in its use It is a Turkish adaptation of the Persian *gaur*

GIARDINO, GAETANO (1864–), Italian soldier, was born at Montemagno, Italy, on Jan 24, 1864 He joined the army in 1882 and saw service in Eritréa (1889–94) and in Tripoli (1911–12) On Italy's intervention in the World War he was appointed chief of staff to the II Army and was promoted brigadier-general in Aug, 1915 In June, 1916, he was given command of the 48th Brigade and played an important part in the attack on Gorizia In June, 1917, he was promoted lieutenant-general, but a few days later was chosen minister of war and made a senator He held office until after Caporetto, when he was appointed assistant chief of staff to the new commander-in-chief, Gen Diaz In April, 1918, he was given the command of the IV Army in the Grappa sector At the battle of Vittorio Veneto (Oct 24–Nov 3, 1918) he delivered a general attack on the Austrian lines and after a hard struggle forced the enemy to retreat In 1919 he was promoted *general d'esercito* In Sept, 1923, as the Government of Fiume was unable to carry on, Giardino was sent to take charge of the town, where he remained until its annexation by Italy under the terms of the treaty between Italy and Yugoslavia in Jan, 1924

GIB, ADAM (1714–88), Scottish divine and leader of the Antiburgher section of the Scottish Secession Church, was born on April 14, 1714 in the parish of Muckhart, Perthshire, and, on the completion of his literary and theological studies at Edinburgh and Perth, was licensed as a preacher in 1740 In 1741 he was ordained minister of the large Secession congregation of Bristo street, Edinburgh In 1745 he was almost the only minister of Edinburgh who continued to preach against rebellion while the troops of Charles Edward were in occupation of the town When in 1747 "the Associate Synod," by a narrow majority, decided not to give full immediate effect to a judgment which had been passed in the previous year against the lawfulness of the "Burgess Oath," Gib led the protesting minority, who separated from their brethren and formed the Antiburgher Synod (April 10) in his own house in Edinburgh It was chiefly under his influence that it was agreed by this ecclesiastical body at subsequent meetings to summon to the bar their "Burgher" brethren, and finally to depose and excommunicate them for contumacy Gib's action in forming the Antiburgher Synod led, after prolonged litigation, to his exclusion from the church in Bristo street From 1753 till within a short period of his death, which took place on June 18, 1788, he preached in Nicolson street church, to an audience of 2,000 persons He was nicknamed "Pope Gib"

GIBARA or **JIBARA** (once *Punta del Yarey* and *Yarey de Gibara*), a north-coast city of Oriente province, Cuba, 80 m N W of Santiago de Cuba Pop (1919) 6,868 It is served by railway to the south-south-west, to Holguín and Cacocum (where it connects with the main line between Santiago and Havana), and is a port of call for the American Munson line It lies on a circular harbour, about 1 m in diameter, which, though open to the north, affords fair shelter At the entrance to the harbour is San Fernando, an old fort (1817), and the city is very quaint in appearance At the back of the city are three stone-topped hills, Silla, Pan and Tabla, reputed to be those referred to by Columbus in his journal of his first voyage Enclosing the town is a stone wall, built by the Spaniards as a defence against attack during the rebellion of 1868–78 Gibara is the port of Holguín It exports cedar, mahogany, tobacco, sugar, tortoise-shell, Indian corn, cattle products, coco-nuts and bananas; and is the centre of the banana trade with the United States Gibara is an old settlement, but its importance dates from the opening of the port to commerce in 1827.

GIBBET, a primitive form of gallows. It was a custom at one time—though not part of the legal sentence—to hang the body in chains, this being known as gibbeting *See* HANGING and GALLOWS

GIBBON, EDWARD (1737–1794), English historian, was born at Putney on April 27 (O S), 1737 His father, who was also named Edward Gibbon, was M P for Petersfield and Southampton until 1747, he married Judith, daughter of James Porten, by whom he was the father of seven children Edward was the only one to survive childhood, and he was so delicate as a child that his life was often despaired of He first attended a day-school in Putney, and studied Latin with John Kirkby, author of *Authomates* (1745) He went in 1746 to a school at Kingston-on-Thames, where "at the expense of many tears and some blood, I purchased the knowledge of the Latin syntax" Meanwhile he was reading Pope's *Homer* and Dryden's *Virgil* His mother died in 1747, and his father moved into Hampshire, but Gibbon lived under the care of his aunt, chiefly at his grandfather's house at Putney Here he developed his great love of reading, and had the run of his grandfather's library His 12th year, 1748, he records as "the most propitious to the growth of my intellectual stature" At the end of that year, his aunt, Catherine Porten, opened a boarding-house for Westminster school Gibbon went with her, and entered the school in Jan 1749 His health broke down again, and he was taken in 1750 to Bath and Winchester, without much effect He made one more attempt at Westminster, but it was evident that his health would never stand it, and after this he studied under various tutors. Meanwhile his appetite for history was developing, and he read widely, ranging over every period On a visit to his father he first discovered later Roman history

Oxford and Lausanne.—About his 16th year his health rapidly improved, and on April 3, 1752, he went to Magdalen college, Oxford, as a gentleman commoner, "with a stock of erudition which might have puzzled a doctor, and a degree of ignorance of which a schoolboy might have been ashamed" He disliked the university and his tutors, and they disliked him "I spent 14 months at Magdalen college," he says, "they proved the 14 months the most idle and unprofitable of my whole life" While at Oxford he was influenced by Middleton's *Free Inquiry* (1749) to join the church of Rome, and his conversion was completed by Bossuet's *Variations of Protestantism* and *Exposition of Catholic Doctrine* Gibbon was received into the church on June 8, 1753 He announced his decision in a letter to his father, who became exceedingly annoyed and removed him from Oxford Soon afterwards he was sent to live at Lausanne, with M Pavilliard, a Calvinist minister Here he learned French of necessity, and after five years "spontaneously thought" in that language, which influenced his style to the last He studied the logic of Crousaz, and "the articles of the Romish creed disappeared like a dream" In less than two years he had returned to Protestantism He studied widely, classics, philosophy and mathematics, which last he soon abandoned In 1755 he travelled in Switzerland, studying the Swiss political institutions In 1757 he met Voltaire In the same year he fell in love with Susan Curchod, daughter of the pastor of Crassier, who afterwards became Madame Necker On his return to England his father objected to the marriage, and Gibbon "sighed as a lover," but "obeyed as a son" He found that his father had married again At this time he met Mallet, who introduced him to Lady Hervey's circle, where his French accomplishments made him welcome Mallet advised him to counteract the influence of French on his style by reading Addison and Swift In 1761 Gibbon published his *Essai sur l'étude de la littérature,* begun in Lausanne in 1758 His father urged its publication, hoping that it might introduce him to public notice, but it was more successful abroad than in England It was translated into English in 1764

His Later Life.—He was already contemplating a history, but had not chosen his period In 1763 he left for a tour on the continent He went first to Paris, where he found the circle of d'Alembert and Diderot congenial, and was tempted to stay there permanently, then to Switzerland, staying a year at Lau-

sanne, and in April 1764 to Italy Rome was the main object of his visit, and it was in Rome he records "on the fifteenth of October 1764, as I sat musing amidst the ruins of the Capitol that the idea of writing the decline and fall of the city first started to my mind" He returned from the tour in June 1765, visiting Naples, Venice, and Verona on the return journey. The next five years were uneventful Gibbon lived chiefly at Buriton. He projected and abandoned a history of the Swiss revolution, and in 1770 successfully exposed Warburton's Virgilian theories in *Critical Observations on the Sixth Book of the Aeneid* But he had by now formed the plan of his history, and settled down to the vast researches it involved His studies were interrupted in 1770 by his father's death, and his own consequent move to London, but by Oct 1772 he was fairly started At first he moved slowly and with hesitation, after the first few chapters, swiftly and without corrections or alterations In Feb 1776 the first volume was published, and met with an unprecedented success, passing rapidly through three editions He was allowed by his publishers two-thirds of the profits on the first edition, which amounted to £490 Hume, in the midst of his congratulations, warned him that he was provoking a controversy in the chapters on the growth of Christianity, and the controversy was not slow in following His only reply was the *Vindication* (1779), a complete and crushing reply to Davies and others who had attacked him (for a full account see *Bibliographers' Manual,* 1858, pp 885–886)

In 1774 he became M P for Liskeard, which did not interrupt his work, except for an interval in 1779 when he was employed to write a *Mémoire justificatif* in answer to a French manifesto For this service he was rewarded with a seat at the Board of Trade and plantations worth £800 a year Gibbon lost his seat in Sept 1780, but was returned for Lymington in a by-election in June 1781 In April 1781 the second and third volumes of his history appeared, which caused no excitement, but sold fast Then followed a critical event in his life, Lord North's ministry fell, and Burke abolished the Board of Trade Gibbon gave up his parliamentary career, which had been mute and inglorious indeed, but had acted as "a school of civil prudence, the first and most essential virtue of an historian," sold everything but his library, and moved to Lausanne in Sept 1783, where he joined his friend Deyverdun Here, in a house with a charming garden and a wonderful view, the history was quickly finished; the fourth volume was finished in 1784, the fifth two years later, and, he says, "it was on the day, or rather night, of the 27th of June 1787, between the hours of 11 and 12, that I wrote the last line of the last page in a summer-house in my garden After laying down my pen, I took several turns in a *berceau,* or covered walk of acacias, which commands a prospect of the country, the lake and the mountains The air was temperate, the sky was serene, the silver orb of the moon was reflected from the waters, and all nature was silent I will not dissemble the first emotions of joy on the recovery of my freedom, and, perhaps, the establishment of my fame But my pride was soon humbled, and a sober melancholy was spread over my mind by the idea that I had taken an everlasting leave of an old and agreeable companion, and that whatsoever might be the future fate of my history, the life of the historian must be short and precarious"

He took the manuscript to London in 1787, and in April 1788 the last three volumes were published, with as great success as before He returned to Lausanne, where he suffered greatly from the loss of his friend Deyverdun, who died on July 4, 1789 The provisions of Deyverdun's will enabled Gibbon to remain in the same house, and there he wrote his *Memoirs of my Life and Writings* in 1789 In 1793 he came back to England and later in the year was obliged to undergo several operations He never recovered his strength, and died on Jan 16, 1794 He was buried at Flitching, Sussex (J S B , X)

The Value of His Work.—Gibbon's literary art, the sustained excellence of his style, his piquant epigrams and his brilliant irony, would perhaps not secure for his work the immortality which it seems likely to enjoy, if it were not also marked by ecumenical grasp, extraordinary accuracy and striking acuteness of judgment. It is needless to say that in many points his statements and conclusions must now be corrected. He was never content with second hand accounts when the primary sources were accessible, "I have always endeavoured," he says, "to draw from the fountain-head, my curiosity, as well as a sense of duty, has always urged me to study the originals, and if they have sometimes eluded my search, I have carefully marked the secondary evidence on whose faith a passage or a fact were reduced to depend" Since he wrote, new authorities have been discovered or rendered accessible, works in Greek, Latin, Slavonic, Armenian, Syriac, Arabic and other languages, which he was unable to consult, have been published Again, many of the authorities which he used have been edited in superior texts The relative weights of the sources have been more nicely determined by critical investigation Archaeology has become a science In the immense region which Gibbon surveyed there is hardly a section which has not been submitted to the microscopic examination of specialists

But apart from the inevitable advances made in the course of a century during which historical research entered upon a new phase, the reader of Gibbon must be warned against one capital defect In judging the *Decline and Fall* it should carefully be observed that it falls into two parts which are heterogeneous in the method of treatment The first part, a little more than five-eighths of the work, supplies a very *full* history of 460 years (A D 180–641), the second and smaller part is a summary history of about 800 years (A D 641–1453) in which certain episodes are selected for fuller treatment and so made prominent To the first part unstinted praise must be accorded, it may be said that, with the materials at the author's disposal, it hardly admitted of improvement, except in trifling details But the second, notwithstanding the brilliancy of the narrative and the masterly art in the grouping of events, suffers from a radical defect which renders it a misleading guide The author designates the story of the later empire at Constantinople (after Heraclius) as "a uniform tale of weakness and misery," a judgment which is entirely false, and in accordance with this doctrine, he makes the empire, which is his proper subject, merely a string for connecting great movements which affected it, such as the Saracen conquests, the crusades, the Mongol invasions, the Turkish conquests He failed to bring out the momentous fact that up to the 12th century the empire was the bulwark of Europe against the East, nor did he appreciate its importance in preserving the heritage of Greek civilization He compressed into a single chapter the domestic history and policy of the emperors from the son of Heraclius to Isaac Angelus, and did no justice to the remarkable ability and the indefatigable industry shown in the service of the State by most of the sovereigns from Leo III to Basil II He did not penetrate into the deeper causes underlying the revolutions and palace intrigues His eye rested only on superficial characteristics which have served to associate the name "Byzantine" with treachery, cruelty, bigotry and decadence It was reserved for Finlay to depict, with greater knowledge and a juster perception, the lights and shades of Byzantine history Thus the later part of the *Decline and Fall,* while the narrative of certain episodes will always be read with profit, does not convey a true idea of the history of the empire or of its significance in the history of Europe It must be added that the pages on the Slavonic peoples and their relations to the empire are conspicuously insufficient, but it must be taken into account that it was not till many years after Gibbon's death that Slavonic history began to receive due attention, in consequence of the rise of competent scholars among the Slavs themselves

His Attack on Christianity.—The most famous chapters of the *Decline and Fall* are the 15th and 16th, in which the historian traces the early progress of Christianity and the policy of the Roman Government towards it The flavour of these chapters is due to the irony which Gibbon has employed with consummate art and felicity There was a practical motive for using this weapon An attack on Christianity laid a writer open to prosecution and penalties under the statutes of the realm (9 and 10 William III c 22, still unrepealed) Gibbon's stylistic artifice both averted the peril of prosecution and rendered the attack

more telling In his *Autobiography* he alleges that he learned from the *Provincial Letters* of Pascal "to manage the weapon of grave and temperate irony, even on subjects of ecclesiastical solemnity" It is not easy, however, to perceive much resemblance between the method of Pascal and that of Gibbon, though in particular passages we may discover the influence which Gibbon acknowledges For instance, the well-known description (in chap xlvii) of the preposition "in" occurring in a theological dogma as a "momentous particle which the memory rather than the understanding must retain" is taken directly from the first Provincial Letter The main points in the general conclusions of these chapters have been borne out by subsequent research. The account of the causes of the expansion of Christianity is chiefly to be criticized for its omissions There were a number of important contributory conditions (enumerated in Harnack's *Mission und Ausbreitung des Christentums*) which Gibbon did not take into account He rightly insisted on the facilities of communication created by the Roman empire, but did not emphasize the diffusion of Judaism. And he did not realize the importance of the kinship between Christian doctrine and Hellenistic syncretism, which helped to promote the reception of Christianity He was ignorant of another fact of great importance (which has only in recent years been fully appreciated through the researches of F. Cumont), the wide diffusion of the Mithraic religion and the close analogies between its doctrines and those of Christianity In regard to the attitude of the Roman Government towards the Christian religion, there are questions still *sub judice;* but Gibbon had the merit of reducing the number of martyrs within probable limits

Gibbon's verdict on the history of the middle ages is contained in the famous sentence, "I have described the triumph of barbarism and religion" It is important to understand clearly the criterion which he applied, it is frequently misapprehended He was a son of the 18th century; he had studied with sympathy Locke and Montesquieu; no one appreciated more keenly than he did political liberty and the freedom of an Englishman This is illustrated by his love of Switzerland, his intense interest in the fortunes of that country, his design of writing "The History of the Liberty of the Swiss"—a theme, he says "from which the dullest stranger would catch fire" Such views and sentiments are incompatible with the idealization of a benevolent despotism Yet in this matter Gibbon has been grossly misapprehended and misrepresented For instance, Mirabeau wrote thus to Sir Samuel Romilly "I have never been able to read the work of Mr Gibbon without being astounded that it should ever have been written in English, or without being tempted to turn to the author and say, 'You an Englishman? No, indeed' That admiration for an empire of more than two hundred millions of men, where not one had the right to call himself free, that effeminate philosophy which has more praise for luxury and pleasures than for all the virtues, that style always elegant and never energetic, reveal at the most the elector of Hanover's slave" This criticism is based on a perverse misreading of the historian's observations on the age of Trajan, Hadrian and the Antonines He enlarges, as it was his business to do, on the tranquillity and prosperity of the empire in that period, but he does not fail to place his finger on the want of political liberty as a fatal defect He points out that under this benevolent despotism, though men might be happy, their happiness was unstable, because it depended on the character of a single man, and the highest praise he can give to those virtuous princes is that they "deserved the honour of restoring the republic, had the Romans of their days been capable of a rational freedom" The criterion by which Gibbon judged civilization and progress was the measure in which the happiness of men is secured, and of that happiness he considered political freedom an essential condition He was essentially humane; and it is worthy of notice that he was in favour of the abolition of slavery, while humane men like his friend Lord Sheffield, Dr Johnson and Boswell were opposed to the anti-slavery movement.

BIBLIOGRAPHY —Of the original quarto edition of *The Decline and Fall,* vol i. appeared, as has already been stated, in 1776, vols ii and iii. in 1781 and vols iv–vi (inscribed to Lord North) in 1788 In later editions vol i. was considerably altered by the author; the others hardly at all The number of modern reprints has been very considerable For many years the most important and valuable English edition was that of Milman (1839 and 1845), which was reissued with many critical additions by Dr W Smith (8 vols 8vo, 1854 and 1872). This has now been superseded by the edition, with copious notes, by J. B. Bury (7 vols 8vo, 1896–1900, new ed 1909–13). The edition in Bohn's British Classics (7 vols, 1853) deserves mention *See* also the essay on Gibbon in Sir Spencer Walpole's *Essays and Biographies* (1907) There are in addition, translations in nearly every European language Gibbon's *Miscellaneous Works, with Memoirs of his Life and Writings, composed by himself; illustrated from his Letters, with occasional Notes and Narrative,* published by Lord Sheffield in two vols in 1796, has been often reprinted The new edition in five vols (1814) contained some previously unpublished matter, and in particular the fragment on the revolutions of Switzerland A French translation of the *Miscellaneous Works* by Marigné appeared at Paris in 1798 There is also a German translation (Leipzig, 1801).

(J. B. B)

GIBBON, the collective title of the smaller man-like apes of the Indo-Malay countries, all belonging to the genus *Hylobates* (*see* PRIMATES), which constitutes the family *Hylobatidae.* One of the distinctive features of this family is the presence of small naked callosities on the buttocks The extreme length of the limbs and the absence of a tail are other features of these small apes, which are arboreal in their habits, and make the woods resound with their unearthly cries at night, in agility they are unsurpassed When they descend to the ground—which they do to obtain water—they walk in the upright posture, either with the hands crossed behind the neck, or with the knuckles resting on the ground Their food consists of leaves and fruits Gibbons may be divided into two groups, the one represented by the siamang, *Hylobates (Symphalangus) syndactylus,* of Sumatra and the Malay Peninsula, and the other by a number of closely allied species The union of the index and middle fingers by means of a web extending as far as the terminal joints is the distinctive feature of the siamang, which is the largest of the group and black in colour with a white frontal band Black or puce-grey is the prevailing colour in the second group, of which the hulock (*H hulock*) of Assam, *H lar* of Arakan and Pegu, *H entelloides* of Tenasserim, and *H agilis* of Sumatra are representatives. The range of the genus extends from the southern bank of the Bramaputra in Assam to southern China, the Malay Peninsula, Java, Sumatra and Borneo.



SILVERY GIBBON (HYLOBATES LEUCISCUS), THE MAN-LIKE SMALL APE OF INDO-MALAY COUNTRIES

GIBBONS, GRINLING (1648–1721), English wood-carver, was born in 1648, according to some authorities of Dutch parents at Rotterdam, and according to others of English parents at London By the former he is said to have come to London after the great fire in 1666 He died in London on Aug 3, 1721. Gibbons early displayed great talent in his art, and was recommended by Evelyn to Charles II, who employed him in the execution of statuary and of ornamental carving in wood He also worked for Sir Christopher Wren. One of his principal works is a life-size bronze statue representing James II in the dress of a Roman emperor, and he also designed the base of the statue of Charles I. at Charing Cross He is, however, chiefly famous as a sculptor in wood He executed the ornamental carving for the chapel at Windsor, the foliage and festoons in the choir of St Paul's, the baptismal fonts in St James's, and an immense quantity of ornamental work at Burleigh, Chatsworth and other great houses The finest of all his productions is a ceiling at Petworth His subjects are chiefly birds, flowers, foliage, fruit and lace, characterized by delicacy and elaboration of details, and truthfulness of imitation In 1714 Gibbons was appointed master carver in wood to George I Sometimes, he would waste his time on trifling subjects Many flowers he carved shook when shaken by a breeze

See A E Bullock, *Grinling Gibbons & his Compeers,* H A. Tipping, *Grinling Gibbons & the Woodwork of his Age* (1914).

GIBBONS, JAMES (1834–1921), American Roman Catholic Cardinal and Archbishop, was born in Baltimore, Md, July 23, 1834. He was educated at St Charles college, Ellicott City, Md, and St Mary's Seminary, Baltimore, where he studied theology and was ordained priest on June 30, 1861. After four years as curate in parishes and as volunteer chaplain to Northern troops he became secretary to Archbishop Martin J. Spalding. In 1868 he was consecrated bishop and appointed to organize the new Vicariate Apostolic of North Carolina. At the Vatican Council, 1870, he was the youngest bishop in the Catholic Church The four years as missionary bishop in North Carolina, a great deal of which time was spent travelling about and meeting all classes of people, were the formative years of his career During this time he wrote *The Faith of Our Fathers,* a presentation of the doctrines of the Roman Catholic Church, intended for orthodox Protestants; it passed through more than 40 editions in America and about 70 in England Gibbons was transferred to the See of Richmond, Va, in 1872 and in 1877 was made coadjutor with the right of succession to Archbishop James R Bayley of Baltimore In October of the same year he succeeded to the archbishopric Pope Leo XIII in 1883 selected him to preside over the Third Plenary Council of Baltimore (1884) and on June 30, 1886, created him a cardinal priest with the title of Santa Maria in Trastevere His address on taking over his titular church was in praise of the practical workings of the American system of separation of Church and State This admiration of things American characterized his whole career. The Knights of Labor were condemned by a Canadian cardinal and their cause was taken up successfully by Cardinal Gibbons Various efforts made to maintain control of immigrant groups under European leadership were opposed and defeated by him His foresight and prudence in the conduct of church affairs and of the relations of the Church with the American people marked him as a great leader. He contributed frequently to periodicals, but as an author is known principally by his works on religious subjects, including *Our Christian Heritage* (1889), *The Ambassador of Christ* (1896) and *A Retrospect of Fifty Years* (1916) For many years an ardent advocate of the establishment of a Catholic university, at the Third Plenary Council of Baltimore, 1884, he saw the realization of his desires in the foundation of the Catholic University of America at Washington, of which he became first chancellor and president of the board of trustees. In 1911, on the occasion of his Silver Jubilee as cardinal and his Golden Jubilee as priest, the most distinguished men in the country, without regard to religious belief, gathered in Washington to voice his praises Similar testimony was rendered at his death on March 24, 1921

(F P D)

GIBBONS, ORLANDO (1583–1625), English composer, was the most illustrious of a family of musicians all more or less able. His father, William Gibbons (d. 1595) was one of the "waits" of Cambridge, and his three sons, and, at least, one of his grandsons, were all good musicians The eldest son, Edward (*c* 1570–*c.* 1650), was priest-vicar and succentor at Exeter cathedral, and some of his music is extant in various libraries Ellis (1573–1603) contributed two madrigals to Morley's *Triumphs of Oriana* Orlando, the youngest and most famous of the brothers, was born at Cambridge, Dec 25, 1583 At 12 years of age he became a chorister of King's college, Cambridge, and in due course a sizar of the college, taking his degree of Mus D. in 1606. At the age of 21, he became organist of the Chapel Royal Gibbons received many marks of royal favour, and in 1619 was appointed one of the king's musicians for the virginals In 1622 he received the honorary degree of Mus Doc at Oxford, for which occasion he composed the anthem "O, clap your hands." Next year he was appointed organist of Westminster Abbey, but only lived to hold the post for two years In 1625 he went to Canterbury to produce a composition written in honour of the marriage of Charles to Henrietta Maria, and there died of apoplexy on June 5, 1625. He was buried in Canterbury cathedral

The works published by Gibbons during his lifetime were *Fantasies in Three Parts, composed for viols* (*c.* 1610), said to have been the first piece of music in England printed from engraved copper plates; six pieces for the virginals printed in the collection called *Parthenia* (1611); *Madrigals and Motets of 5 parts, Apt for Viols and Voices* (1612), which rank among the most exquisite of his works; and two anthems printed in Leighton's *Teares or Lamentaciones* (1614). His fame was kept alive as a composer of church music by the selections from his services and anthems printed by Barnard in his First Book of Selected Church Music (1641), and by Boyce in his Cathedral Music (1760–78) Some 40 anthems by Gibbons are in existence Some of these are in the polyphonic style of which he was a consummate master; others show him as a pioneer in the new form developed by Blow, Purcell and others of a later generation, for they have solos, often with instrumental accompaniment, and chorus. He wrote church services in both the old and the new style, and left 17 hymn tunes marked with his own peculiar dignity of expression

A collection of Gibbons's church music was edited by Sir F Ouseley, in 1873, a complete edition is in the Carnegie edition of Tudor Church Music (vol IV, 1925) His pieces for keyboard instruments were edited by Margaret Glyn (5 vols, 1925), and some of his music for strings by Fellowes (1924) *See* Margaret H. Glyn, *About Elizabeth and Virginal Music and its Composers* (1924), and E. H. Fellowes, *Orlando Gibbons* (Oxford, 1925)

GIBBS, JOSIAH WILLARD (1839–1903), American mathematical physicist, was born at New Haven, Conn, on Feb 11, 1839 Entering Yale in 1854 he graduated 1858, and in 1863 went to Europe, studying in Paris in 1866–67, in Berlin in 1867 and in Heidelberg in 1868 Returning to New Haven in 1869, he was appointed professor of mathematical physics at Yale in 1871 and held that position till his death on April 28, 1903 His first contributions to mathematical physics were two papers published in 1873 on "Graphical Methods in the Thermodynamics of Fluids," and "Method of Geometrical Representation of the Thermodynamic Properties of Substances by means of Surfaces" His next and most important publication was his famous paper "On the Equilibrium of Heterogeneous Substances" (1876–78), which, it has been said, founded a new department of chemical science. This was translated into German by W Ostwald (who styled its author the "founder of chemical energetics") in 1891 and into French by H le Chatelier in 1899 In 1881 and 1884 he printed some notes on the elements of vector analysis for the use of his students, these were never formally published, but they formed the basis of a text-book on *Vector Analysis* which was published by his pupil, E B. Wilson, in 1901 Between 1882 and 1889 a series of papers on certain points in the electromagnetic theory of light and its relation to the various elastic solid theories appeared in the *American Journal of Science,* and his last work, *Elementary Principles in Statistical Mechanics,* was issued in 1902 The name of Willard Gibbs, who was the most distinguished American mathematical physicist of his day, is especially associated with the "Phase Rule" In 1901 the Copley medal of the Royal Society of London was awarded him as being "the first to apply the second law of thermodynamics to the exhaustive discussion of the relation between chemical, electrical and thermal energy and capacity for external work"

For biographical sketch *see* his *Scientific Papers* (1906).

See W L Miller, *The Method of Willard Gibbs in Thermodynamics* (1925); E Cohen, "Semi-Century of Willard Gibbs's Phase Law, 1876–1926," in *Science,* n s vol lxiv, p 621 (1926); and John Johnson "Josiah Gibbs An Appreciation," in *Scientific Monthly,* Feb., 1928, pp 129–139

GIBBS, OLIVER WOLCOTT (1822–1908), American chemist, was born in New York city on Feb 21, 1822 He graduated at Columbia college in 1841, and at the College of Physicians and Surgeons in 1845 Leaving America he studied in Germany with von Liebig and others, and in Paris with A Laurent, J B Dumas and H V Regnault, returning in 1848 In that year he became professor of chemistry at the Free Academy, now the College of the City of New York, and in 1863 he obtained the Rumford professorship in Harvard university, a post retained until his retirement in 1887 He died on Dec 9, 1908 Gibbs' researches were mainly in analytical and inorganic chemistry, the cobaltammines, platinum metals and complex acids being especially investigated He was an excellent teacher, and contributed many articles to scientific journals.

GIBEON, an ancient city of Palestine, whose inhabitants successfully tricked Joshua into a truce (Josh ix.). David's select warriors fought with the chosen of Ishbosheth at the "Pool of Gibeon" (2 Sam ii), and here Joab treacherously slew Amara (2 Sam xx) But Gibeon was more renowned for its "high place" which the youthful King Solomon made it one of his first cares to visit, and where for a time the tabernacle was deposited Gibeon is most probably represented to-day by El-Jîb, where we seem to have an echo, if faint and uncertain, of the ancient name El-Jîb is a small village on an isolated hill, 5m N W of Jerusalem, and is surrounded by olive groves Here are to be found springs and the remains of a reservoir

Alt would identify Gibeon with Tell en-Nasbeh

See P Lohmann, Archaologisches von en-nebi Sâmwîl *Zeitschr Deutsch Pal Vereins,* 41 (1918) 117 *seq*, H L Vincent, Néby Samouil *Revue Biblique,* 31 (1922) 360 *seq*, G Dalman, Nochmals Gibeon *Palastina Jahrbuch,* 22 (1926) 140 *seq*, A Alt, Gibeon und Beeroth *Palastina Jahrbuch,* 22 (1926) 11 *seq* (E Ro)

GIBEONITES, the inhabitants of Gibeon (*q v*)

GIBRALTAR. A British fortress and Crown colony at the western entrance to the Mediterranean The best description is by Ramsay and Geikie (*Quart Journ Geol Soc*, London, 1878, p 505) —"The Rock forms a well marked promontory that trends in a direction south by west into the Mediterranean The extreme length of the Rock from the base of the cliff at the north front to Europa Point is only a little over 2½ m, and the promontory tapers somewhat gradually away from a breadth of 1,550 yds, between Gibraltar and Catalan Bay to a width of 550 yds. at Europa. The Rock shoots abruptly upwards from the low flat ground at the north front in a fine mural precipice, the basal portion of which is partly concealed by a sloping curtain of débris and breccia This precipitous wall culminates . at the Rock Gun (1,349 ft) from which point the dividing ridge or backbone of the promontory extends southward in a sharp jagged arch, the dominant points of which are Middle hill (1,195 ft), Signal station (1,294 ft), heights above Monkey's Alameda (1,396 ft) and O'Hara's tower (1,370 ft) At the latter the ridge is sharply truncated, and succeeded to the south by the well-marked plateau of Windmill hill and Europa From the Rock Gun to O'Hara's tower the dividing ridge presents to the east a bold escarpment, which is for the most part inaccessible, and in places almost vertical, the cliffs where they are lowest having a drop of not less than 300 or 400 ft, and of more than 1,000 ft where they approach the sea on the north From their base the ground falls rapidly away to the coastline at angles that vary from 30° to 40° The opposite slopes of the dividing ridge are not so abrupt, the only really precipitous portion that faces the west being the line of cliff that overlooks Gardiner's road and Engineer's road between the Moorish wall and the Mount A low sandy plain, that does not average more than 10 ft in height above the sea, connects the Rock with the mainland"

The top of Windmill hill slopes from 400 to 300 ft above sea, and so is separated by a great cliff from O'Hara's tower on the north, it ends southward in a 200 ft cliff, below which are Europa flats that themselves end in a 50 ft cliff plunging steeply into fairly deep water Europa Point is 11½ nautical miles from the African coast, and its lighthouse is in 5° 21′ W and 36° 6′ 30″ N The rock is built of limestone, covered on the west by shales, both of Lower Jurassic age The limestone has many caves with accumulations of bone-breccia and there are several apparently Pleistocene or still more recent deposits

According to M Déperet (*Comptes Rendus Acad Sci*, Paris, T 166, 1918), "it was formerly supposed that Gibraltar was connected with the African shore during or after the Pleistocene Ice age but the trend of opinion is now towards the view that the connection must be Pliocene at the latest Reference used to be made to the occurrence of Barbary apes on the Rock, but it is now thought that these were introduced by Romans or Moors; no fossil remains of them have been found in any caves or breccias Neither the surviving nor the fossil-Pleistocene fauna suggests an African connection The presence of the great auk in Pleistocene times at the Rock is not held to imply any great difference of climate, as its remains have been found in south Italy, Brittany, etc, though it became restricted in course of time to the far north Several caves have been examined towards the south end, but special attention has been given to one at the north end overlooking the isthmus near the Devil's tower (see *Journ Roy Anthr Inst, op cit*), which has yielded evidence of the former presence of 25 species of mammals, including the elephant and rhinoceros; for the rest the mammalian remains are essentially European"

The flora of the Rock is not over rich, because of the isolation and of the character of much of its surface The stone pine and the wild olive appear to be old established The fauna, apart from the barbary apes, is not of great interest A Mousterian flint industry has been described for Gibraltar (especially the Devil's tower site) by Miss Garrod, who has also found two skulls of Mousterian type (H J F)

Climate.—June, July and August are practically rainless and May and September nearly so The rest of the year is delightful, with occasional storms The thermometer in summer does not often reach 90° F in the shade, from 83° to 85° may be taken to be the average maximum for July and August, and these are the hottest months of the year The average yearly rainfall is 34 4 in, and in 50 years from 1857 to 1906 the greatest recorded rainfall was 59 35 in, and the smallest 16 75 inches The water-supply for drinking and cooking purposes is almost wholly derived from rain-water, stored chiefly in underground tanks, there are very few good wells Large storage tanks have been constructed by the sanitary commissioners with specially prepared collecting areas high up the Rock The collecting areas cover 16 ac, and the storage tanks have a capacity of over six million gallons

The Town.—The modern town of Gibraltar is of comparatively recent date, nearly all the older buildings having been destroyed during the great siege (1779–1783) The town lies, with most of its buildings crowded together, at the north-western corner of the Rock, and covers only about one-ninth part of the whole area; only a small part of it is on level ground, and those of its narrow streets and lanes which are at right angles to the line wall, or sea front, are for the most part, except at their western ends, little more than ramps or rough stairs formed of rubble stones, contracting in places into stone steps

In a small disused graveyard, near Southport gate, lie buried a number of those who fell at Trafalgar To the south of the



FROM THE "EUROPEAN MAGAZINE," OCT 1, 1792

THE SIEGE OF GIBRALTAR, 1779–1783, SHOWING ARRIVAL OF BRITISH RELIEVING SQUADRON UNDER ADMIRAL DARBY, APRIL 12, 1781

town are the Alameda parade and gardens, a lunatic asylum, the dockyard, graving docks and the naval and military hospitals

Population.—After the capture of the town by the British the former Spanish population emigrated and founded, 6 m. away, the little town of San Roque Most of the native inhabitants are of Italian or Genoese descent; there are also a number of Maltese, and between two and three thousand Jews The Jews form a distinct society of their own The language of the people is Spanish, not very correctly spoken English is learnt as a foreign language and is rarely, if ever, spoken by the people in their own homes Gibraltar being primarily a fortress and naval base, every effort, in view of war contingencies, is made by the authorities

to prevent natural increase of population. Sanitary and building regulations, modelled upon English statutes designed with quite different objects, are administered with some ingenuity and not a little severity. The poor are pushed across the frontier into the neighbouring Spanish town of La Linea de la Concepcion, itself a mere suburb of Gibraltar, whose population (63,236 in 1920), however, is three times that of the parent city A large army of workers comes daily from "the Lines" into Gibraltar, returning at "first evening gunfire" shortly after sunset, at which time the gates are locked for the night Aliens are not allowed to reside in Gibraltar without a special permit, which must be renewed at short intervals By an Order in Council, taking effect from Nov 1900, the like disabilities were extended to British subjects not previously resident

In 1924 the population was 20,638; 17,160 civilians, 2,932 military and 546 naval

Constitution.—Gibraltar is a Crown colony In 1922 an executive council was established, but all legislative power remains with the governor There is a city council, which is vested with large powers of spending and with the control of buildings and streets and other matters managed by local authorities in England An appeal from its decisions, so far as they affect individuals, lies to the supreme court Apart from the garrison and civil officials there are comparatively few members of the Anglican Church The great majority of the people belong to the Church of Rome, and since 1910 Gibraltar has been a Roman Catholic bishopric, independent of the Spanish hierarchy and subject directly to the Vatican The Jews have four synagogues. There are Presbyterian and Wesleyan churches Education is not compulsory for the civil population, but most of the children, if not all, receive a fair education in private or private aided schools The number of children on the rolls of the Government aided elementary schools (14 in number) was (1925–26) 2,610

Commerce.—Except in respect of alcoholic liquors and tobacco, Gibraltar has been a free port since the year 1705—a distinction due, it is said, to the refusal of a sultan of Morocco to allow of much-needed exports from Morocco to Gibraltar if full liberty of trade were not granted to his subjects During the great wars of the beginning of the 19th century trade was most active in Gibraltar, and some large fortunes were made, but trade on a large scale has almost disappeared Before the year 1898 wine, beer and spirits were the only goods which paid duty In that year a duty of 1d per lb was for the first time put upon tobacco and in 1899 produced £7,703 In 1902 the duty on tobacco was raised to 2d per lb and produced £29,311 In 1905 this duty produced £24,575 The chief business of Gibraltar is the coaling of passing steamers, this gives work to several thousand men Goods are also landed for re-export to Morocco, but the bulk of the Morocco trade, much of which formerly came to Gibraltar, is now done by lines of steamers trading to and from Morocco direct to British, German or French ports Nearly all the fresh meat consumed in Gibraltar comes from Morocco, also large quantities of poultry and eggs A fair amount of retail business is done with the passengers of ocean steamers, which call on their way from the East and from North and South America The main sources of revenue are (i) duties upon wine, spirits, malt liquors and tobacco; (ii) port and harbour dues, (iii) tavern and other licences, (iv) post and telegraph; (v) ground and other rents, (vi) stamps and miscellaneous

The money, weights and measures in legal use are British Before 1898 Spanish money only was in use The great depreciation of the Spanish currency during the war with the United States led in 1898 to the reintroduction of British currency as the legal tender money of Gibraltar Notwithstanding this change the Spanish dollar still remains in current use, much of the retail business of the town being done with persons resident in Spain, the dollar fully holds its own

Harbour and Fortifications.—Great changes were made in the defences of Gibraltar early in the 20th century Guns of the newest types replaced those of older patterns The heavier pieces instead of being at or near the sea-level, were placed high up, many of them on the crest line of the Rock.

With the completion of the new dockyard works the value of Gibraltar as a naval base has greatly increased It can now undertake all the ordinary repairs and coaling of a large fleet There is an enclosed harbour in which a fleet can safely anchor secure from the attacks of torpedo boats A mole, at first intended for commercial purposes, closes the north end of the new harbour The Admiralty, however, soon found that their needs had outgrown the first design and the Commercial Mole was taken over for naval purposes, plans for a new commercial mole being prepared

The land space available for the purposes of dockyard extension being very limited, a space of about 64 ac was reclaimed from the sea in front of the Alameda and the road to Rosia; some of the land reclaimed was as much as 40 ft under water. The large quantity of material required for this purpose was obtained by tunnelling the Rock from west to east and from quarries above Catalan Bay village, to which access was gained through the tunnel The graving docks occupy the dug-out site of the former New Mole Parade. There are three of these docks, 850, 550 and 450 ft in length respectively The largest dock is divisible by a central caisson so that four ships can be docked at one time The docks are all 95 ft. wide at the entrance, with 35½ ft of water over the sills at low-water spring tides

The enclosed harbour covers 440 ac, 250 of which have a minimum depth of 30 ft at low water It is closed on the south and south-west by the New Mole (1,400 ft) and the New Mole extension (2,700 ft), together 4,100 ft, on the west by the Detached Mole (2,720 ft) and on the north by the Commercial Mole

The New Mole, so called to distinguish it from the Old Mole and its later extension the Devil's Tongue at the north end of the town, is said to have been begun by the Spaniards in 1620 It was successfully assaulted by landing parties from the British fleet under Sir George Rooke at the capture of Gibraltar by the British in 1704 It was extended at different times, and before the beginning of the new works was 1,400 ft in length The New Mole, with its latest extension, has a width at top of 102 feet It is formed of rubble stone floated into position in barges It has a continuous wharf wall on the harbour side 3,500 ft long, with water alongside 30 to 35 ft deep On the outer side coal is usually stacked in sheds extending nearly the whole length of the mole

The Detached Mole is a vertical wall formed of concrete blocks, each block weighing 28 tons These blocks were built together on the sloping block system upon a rubble foundation of stone deposited by barges and levelled by divers for the reception of the concrete blocks

The Commercial Mole is now chiefly used by the navy as a convenient wharf for destroyers It encloses the harbour to the north and extends westward from the end of the Devil's Tongue At the end nearest the town are large stores, there is also a small wharf on its outer side which is used by the tenders of ocean steamers and by the small boats which ply to Algeciras

This mole is built of rubble, and at its western end it has an arm about 1,600 ft long running south in the direction of the Detached Mole Parallel with and inside the western arm are five jetties The jetties and western arm have extensive coal sheds and are faced with a concrete wharf wall of a total length of 7,000 ft with 20 to 30 ft of water alongside The Devil's Tongue was an extension of the Old Mole, constructed during the great siege 1779–83 in order to bring a flanking fire to bear upon part of the Spanish lines Vessels of any size can anchor in the bay in 3½–25 fathoms of water

The signal station on the top receives and distributes the names and messages of passing ships

History.—Gibraltar was known to the Greek and Roman geographers as Calpe or Alybe, the two names being probably corruptions of the same local (perhaps Phoenician) word The eminence on the African coast near Ceuta which bears the modern English name of Apes' hill was then designated Abyla; and Calpe and Abyla, at least according to an ancient and widely current interpretation, formed the renowned Pillars of Hercules

(*Herculis columnae*, Ἡρακλέους στῆλαι), which for centuries were the limits of enterprise to the seafaring peoples of the Mediterranean world. Gibraltar is called after Tariq (or Tarik) ben Zaid, its name being a corruption of Jebel Tariq (Mount Tariq). Tariq invaded Andalusia in AD 711 with an army of 12,000 Arabs and Berbers, and in the last days of July of that year destroyed the Gothic power in a three days' fight on the banks of the river Guadalete near where Jerez de la Frontera now stands. In order to secure his communications with Africa he ordered the building of a strong castle upon the Rock, known to the Romans as Mons Calpe. This work, begun in the year of the great battle, was completed in 742 It covered a wide area, reaching from the shores of the bay to a point half-way up the north-western slope of the Rock; here the keep, a massive square tower, still stands and is known as the Moorish castle In 1309 it was taken by Spain, and in 1333 retaken by the Moors, from whom it passed in 1411 to the Moorish ruler of Granada. In 1462 it became Spanish once more, passing in 1469 into the family of the duke of Medina Sidonia. In 1502 Gibraltar was formally incorporated with the domains of the Spanish crown The Spanish made great efforts to strengthen the place, and they succeeded so well that throughout Europe Gibraltar was regarded as impregnable, the engineer, Daniel Speckle (1536–1589), being chiefly responsible for the design of the fortifications

Gibraltar was taken by the allied British and Dutch forces, after a three days' siege, on July 24, 1704 (*See* SPANISH SUCCESSION, WAR OF THE) The capture was made, as the war was being fought, in the interests of Charles, archduke of Austria, but Sir George Rooke, the British admiral, on his own responsibility caused the British flag to be hoisted, and took possession in the name of Queen Anne, whose government ratified the occupation. The Spaniards quickly assembled an army to recapture the place, and a new siege opened in Oct 1704 by troops of France and Spain under the marquess of Villadarias. The activity of the British admiral, Sir John Leake, and of the military governor, Prince George of Hesse-Darmstadt (who had commanded the land forces in July), rendered the efforts of the besiegers useless During the next 20 years there were endless negotiations for the peaceful surrender of the fortress, varied in 1720 by an abortive attempt at a *coup de main*, which was thwarted by the resourcefulness of the governor of Minorca (Col. Kane), who threw reinforcements and supplies into Gibraltar at the critical moment. Gibraltar was unsuccessfully besieged by the Spaniards in 1726

The Great Siege of 1779–1783—Neither in the War of the Austrian Succession nor in that of 1762 did Spain endeavour to besiege the Rock, but during the War of American Independence the siege of 1779–83 is justly regarded as one of the most memorable sieges of history The governor, Gen Sir George Augustus Elliot (afterwards Lord Heathfield), was informed from England on July 6, 1779, that hostilities had begun A short naval engagement in the straits took place on the 11th, and Gen Elliot made every preparation for resistance It was not, however, until the month of August that the Spaniards became threatening. The method of the besiegers appeared to be starvation, but the interval between strained relations and war had been well employed by the ships, and supplies were, for the time at any rate, sufficient. While the Spanish siege batteries were being constructed the fortress fired, and many useful artillery experiments were carried out by the garrison at this time and subsequently throughout the siege. On Nov 14, there took place a spirited naval action in which the privateer "Buck," Captain Fagg, forced her way into harbour This was one of many such incidents, which usually arose from the attempts made from time to time by vessels to introduce supplies from Tangier and elsewhere. Dec 1779, indeed, was a month of privation for the garrison, though of little actual fighting In Jan 1780, on the rumour of an approaching convoy, the price of foods "fell more than two-thirds," and Admiral Sir George Rodney won a great victory over De Langara and entered the harbour Prince William Henry (afterwards King William IV) served on board the British fleet as a midshipman during this expedition Supplies and reinforcements were thrown into the fortress by Rodney, and the whole affair was managed with the greatest address both by the Home Government and the royal navy. "The garrison," in spite of the scurvy, "might now be considered in a perfect state of defence," says Drinkwater.

On June 7 took place an attack by Spanish fireships, which were successfully dealt with by the naval force in the bay under Captain Lesley of H M. frigate "Enterprise." Up to October the state of things within the fortress was much what it had been after Rodney's success "The enemy's operations on the land side had been for many months so unimportant as scarcely to merit our attention" (Drinkwater). Scurvy was, however, prevalent (*see* Drinkwater, p 121), and the supply question had again become acute. Though the enemy's batteries did not open fire, the siege works steadily progressed, in spite of the fire from the fortress, and there were frequent small engagements at sea in which the English were not always successful Further, the expulsion, with great harshness, of the English residents of Barbary territory put an end to a service of supply and information which had been of the greatest value to Elliot (Jan. 1781). Three more months passed in forced inaction Then, on April 12, 1781, on the arrival of a British relieving squadron under Admiral Darby, the whole of the Spanish batteries opened fire Stores were landed in the midst of a heavy bombardment, and much damage was done both to the fortifications and military buildings and to the town At this time there was a good deal of indiscipline in the garrison, with which Gen Elliot dealt severely. This was in the last degree necessary, for the bombardment continued up to June 1, after which the rate of the enemy's fire decreased to 500 rounds per day. By July 12 it had almost ceased. In September the firing again became intense and the casualties increased, the working parties suffering somewhat heavily In October there was less expenditure of ammunition, as both sides were now well covered, and in November the governor secretly prepared a great counterstroke. The sortie made on the night of Nov 26–27 was brilliantly successful, and the Spanish siege works were mostly destroyed At the close of the year the garrison was thus again in an excellent position

Hot-Shot Experiment.—Early in 1782 a gun-carriage wheel, allowing of a large angle of depression, was invented by an officer of the Royal Artillery, and indeed throughout the siege many experiments (such as would nowadays be carried out at a school of gunnery) were made with guns, mountings, ammunition, methods of fire, etc , both in Gibraltar and in the Spanish camp The gun-carriage referred to enabled 93% of hits to be obtained at 1,400 yds range In April grates for heating shot were constructed by order of the governor, these were destined to be famous. At the same time it was reported that the duc de Crillon was now to command the besiegers (French and Spaniards) with D'Arçon as his chief engineer The grand attack was now imminent, and preparations were made to repel it (July 1782) The chief feature of the attack was to be, as reported on July 26, ten ships "fortified 6 or 7 ft. thick . . . with green timber bolted with iron, cork and raw hides, which were to carry guns of heavy metal and be bombproof on the top with a descent for the shells to slide off; that these vessels . . were to be moored within half gunshot of the walls," etc On the other side many of the now existing rock galleries were made about this time The count of Artois and another French prince arrived in the French lines in August to witness the culminating effort of the besiegers, and some polite correspondence passed between Crillon and the governor (reprinted in Drinkwater, p. 267) The garrison made a preliminary trial of the red-hot shot on Sept. 8, and the success of the experiment not only elated the garrison but was partly instrumental in causing Crillon to hasten the main attack.

After a preliminary bombardment the famous battering ships took up their positions in broad daylight on the 13th and opened fire. The British solid shot seem to have failed absolutely to penetrate the massive wooden armour on the sides and the roofs of the battering ships, and about noon the ships had settled down to their work and were shooting coolly and accurately But between 1 and 2 P M the British artillerymen began to use red-hot shot freely. All day the artillery duel went on, the shore guns,

though inferior in number, steadily gaining the upper hand, and the battering ships were in great distress by nightfall. The struggle continued in the dark, the garrison now shooting rapidly and well, and one by one the ten ships were set on fire. Before noon on the 14th the attack had come to an end by the annihilation of the battering fleet, every ship having been blown up or burnt to the water's edge. Upwards of 8,300 rounds were expended by the garrison, though less than a hundred pieces were in action. The enemy's bombardment was, however, resumed and partial engagements continued up to the third naval relief of the fortress by Lord Howe, who won a great victory at sea over the Spaniards. The long siege came to an end on Feb. 6, 1783, when the duc de Crillon informed Elliot that the preliminaries of peace had been signed On March 31 the duke visited the fortress, and many courtesies passed between the late enemies Captain (afterwards Colonel) John Drinkwater (1762–1844), the historian of the siege, first published his work in 1785 A new edition of *A History of the Siege of Gibraltar* was published in 1905 The history of the four eventful years' siege is fully detailed also in the Memoir, attached to Green's *Siege of Gibraltar* (1784), of its gallant defender Sir George Augustus Elliot, afterwards Lord Heathfield, whose military skill and moral courage place him among the best soldiers and noblest men of his time.

Since 1783 the history of Gibraltar has been comparatively uneventful. In the beginning of 1801 there were rumours of a Spanish and French attack, but the Spanish ships were defeated off Algeciras in June by Admiral Saumarez During the World War Gibraltar was of great importance as a coaling station. A war memorial was unveiled there in 1923

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GIBSON, CHARLES DANA (1867–), American artist and illustrator, was born at Roxbury (Mass), on Sept 14, 1867. After a year's study at the schools of the Art Students' League, he began with some modest little drawings for the humorous weekly *Life* These he followed up with more serious work, and soon made a place for himself as the delineator of the American girl, at various occupations, particularly those out of doors These obtained an enormous vogue, being afterwards published in book form, running through many editions. Some book illustrations followed, notably for *The Prisoner of Zenda*

He was imitated by many of the younger draughtsmen, copied by amateurs, and his popularity was shown in his engagement by *Collier's Weekly* to furnish weekly for a year a double page, receiving for the 52 drawings the sum of $50,000, said to have been the largest amount ever paid to an illustrator for such a commission These drawings covered various local themes and were highly successful, being drawn with pen and ink with masterly facility and great directness and economy of line So popular was one series, "The Adventures of Mr. Pipp," that a successful play was modelled on it In 1905, although besieged with commissions, Gibson withdrew from illustrative work, determining to devote himself to portraiture in oil, in which direction he had already made some successful experiments; but in a few years he again returned to illustration He has published a number of books of sketches In 1920 he purchased for himself a controlling interest in *Life*

GIBSON, EDMUND (1669–1748), English divine and jurist, was born at Bampton in Westmorland In 1686 he entered Queen's College, Oxford, where in 1692 he published a valuable edition of the *Saxon Chronicle* with a Latin translation, indices and notes This was followed in 1693 by an annotated edition of the *De institutione oratoria* of Quintilian, and in 1695 by a translation (2 vols , fol) of Camden's *Britannia*, "with additions and improvements," with the assistance of William Lloyd, John Smith and other English antiquaries Gibson was appointed chaplain and librarian to the archbishop of Canterbury, when he began to catalogue the library, and in 1703 and 1710 respectively he became rector of Lambeth and archdeacon of Surrey During the reigns of William and Anne the controversy over the rights and privileges of Convocation suggested to him the researches which resulted in the famous *Codex iuris ecclesiastici Anglicani* (2 vols , 1713, 2nd enl ed 1761) This work is a learned and comprehensive discussion of the legal rights and duties of the English clergy, and the constitution, canons and articles of the English Church In 1716 Gibson was presented to the see of Lincoln, whence he was in 1720 translated to that of London, where for twenty-five years he exercised great influence, being regularly consulted by Sir Robert Walpole on ecclesiastical affairs. He broke with Walpole on the Quakers' Relief Bill of 1736 He died on Sept 6, 1748

Gibson's other works include *Vita Thomae Bodlei* with the *Historia Bibliothecae Bodleianae* in the *Catalogi librorum manuscriptorum* (Oxford, 1697), and the *Reliquiae Spelmannianae* (Oxford, 1698)

GIBSON, JOHN (1790–1866), English sculptor, was born near Conway in 1790, his father being a market gardener He went to Rome in Oct 1817, where Canova introduced him into the Academy supported by Austria Gibson, who had had no technical training, was at first depressed by the sense of his deficiencies in common matters of practice. But his first work in marble—a "Sleeping Shepherd" modelled from a beautiful Italian boy—has qualities of the highest order. Gibson was soon launched, and distinguished patrons, first sent by Canova, made their way to his studio in the Via Fontanella He very seldom declined into the prettiness of Canova, and if he did not usually approach the masculine strength which redeems the faults of Thorwaldsen, he more than once surpassed him even in that quality We allude specially to his "Hunter and Dog," and to the promise of his "Theseus and Robber," which take rank as the highest productions of the sculpture of his time

The group of Queen Victoria supported by Justice and Clemency, in the Houses of Parliament—was his finest work in the round Another famous work by Gibson is the statue of Huskisson (Royal Exchange, London) But great as he was in the round, Gibson's chief excellence lay in basso rilievo, and in this less-disputed sphere he obtained his greatest triumphs His thorough knowledge of the horse, and his constant study of the Elgin marbles resulted in the two matchless bassi rilievi, the size of life, which belong to Lord Fitzwilliam—the "Hours leading the Horses of the Sun," and "Phaëthon driving the Chariot of the Sun " Gibson was the first Englishman to introduce colour on his statues—first, as a mere border to the drapery of a portrait statue of the queen, and by degrees extended to the entire flesh, as in his so-called "tinted" Venus, and in the "Cupid tormenting the Soul," once in the Holford collection, now dispersed. He justified his use of colours by reference to Greek practice Gibson was elected R A in 1836, and bequeathed all his property and the contents of his studio to the Royal Academy, where his marbles and casts are open to the public An important collection of his works made by Mrs Sandbach, the granddaughter of W Roscoe, is at Hafod in Denbighshire. He died at Rome on Jan 27, 1866.

See Lady Eastlake, *Life of John Gibson, R A* (1870) which contains his autobiography, also T Matthews, *The Biography of John Gibson* (1911), T. M Rees, *Welsh painters, engravers and sculptors* (1912).

GIBSON, THOMAS MILNER (1806–84), English politician, was born in Trinidad, where his father, an officer in the army, was serving As one of Cobden's chief allies, he was

elected for Manchester in 1841, and from 1846 to 1848 he was vice-president of the board of trade in Lord John Russell's ministry, he sat in the cabinets from 1859 to 1866 as president of the board of trade He was the leading spirit in the movement for the repeal of "taxes on knowledge," and his successful efforts on behalf of journalism and advertising were recognized by a public testimonial in 1862 He retired from political life in 1868, but he and his wife, whose salon was a great Liberal centre, were for many years very influential in society

GIBSON, WILLIAM HAMILTON (1850–1896), American illustrator, author and naturalist, was born in Sandy Hook (Conn), on Oct 5, 1850 The failure and (in 1868) death of his father, a New York broker, put an end to his studies in the Brooklyn Polytechnic institute and made it necessary for him to earn his own living. From the life insurance business, in Brooklyn, he soon turned to the study of natural history and illustration He had sketched flowers and insects when he was only eight years old, had long been interested in botany and entomology, and had acquired great skill in making wax flowers His first drawings, of a technical character, were published in 1870 He rapidly became an expert illustrator and a remarkably able wood-engraver, while he also drew on stone with great success He drew for many periodicals. He died of apoplexy brought on by overwork, on July 16, 1896, at Washington (Conn) He was an expert photographer, and his drawings had a nearly photographic and almost microscopic accuracy of detail which slightly lessened their artistic value, as a poetic and sometimes humorous quality somewhat detracted from their scientific worth Gibson was perfectly at home in black-and-white, but rarely (and feebly) used colours He was a popular writer and lecturer on natural history, in his lecture on "Cross-Fertilization," he used ingenious charts and models

GICHTEL, JOHANN GEORG (1638–1710), German mystic, was born at Ratisbon on March 14, 1638 He was admitted an advocate, first at Spires, and then at Ratisbon, but a meeting with the baron Justinianus von Weltz (1621–1668), a Hungarian nobleman who cherished schemes for the reunion of Christendom and the conversion of the world, and a natural leaning towards mysticism changed his career. He promoted a society known as the *"Christerbauliche Jesusgesellschaft."* The movement in its beginning provoked no active hostility, but when Gichtel began to attack the teaching of the Lutheran clergy and church, especially upon the fundamental doctrine of justification by faith, he was prosecuted and banished (1665) He settled at Zwolle, Holland, where he co-operated with Friedrich Breckling (1629–1711), who shared his views and aspirations In 1668 he removed to Amsterdam, where he made the acquaintance of Antoinette Bourignon (1616–1680), and became an ardent disciple of Jakob Boehme, whose works he published in 1682 (Amsterdam, 2 vols). He had attracted to himself a small band of followers known as Gichtelians or Brethren of the Angels, who held views at which he had arrived independently of Boehme But, unlike Boehme, who "desired to remain a faithful son of the Church," the Gichtelians became Separatists (*cf* J. A Dorner, *History of Protestant Theology*, ii p 185).

Gichtel's correspondence was published without his knowledge by Gottfried Arnold, a disciple, in 1701 (2 vols), and again in 1708 (3 vols). It has been frequently reprinted under the title *Theosophia practica* The seventh volume of the Berlin edition (1768) contains a notice of Gichtel's life See also G C A von Harless, *Jakob Bohme und die Alchimisten* (1870, 2nd ed , 1882).

GIDDINGS, JOSHUA REED (1795–1864), American statesman, prominent in the anti-slavery conflict, was born at Tioga Point, now Athens, Pa , on Oct 6, 1795. In 1806 his parents removed to Ashtabula county, Ohio For several years after 1814 he was a school teacher, but in Feb 1821 he was admitted to the Ohio bar and soon obtained a large practice He served in the lower house of the state legislature in 1826–28, and from 1838 until 1859 was a member of the national house of representatives, first as a whig, then as a free-soiler, and finally as a republican Recognizing that slavery was a state institution, with which the Federal government had no authority to interfere, he contended that slavery could only exist by a specific state enactment, that therefore slavery in the District of Columbia and in the territories was unlawful and should be abolished, that the coastwise slave-trade in vessels flying the national flag, like the international slave-trade, should be rigidly suppressed, and that Congress had no power to pass any act which in any way could be construed as a recognition of slavery as a national institution His attitude in the so-called "Creole case" attracted particular attention In 1841 some slaves who were being carried in the brig "Creole" from Hampton Roads, Va , to New Orleans, revolted, killed the captain, gained possession of the vessel, and soon afterwards entered the British port of Nassau Thereupon, according to British law, they became free The minority who had taken an active part in the revolt were arrested on a charge of murder, and the others were liberated Efforts were made by the U S government to recover the slaves, Daniel Webster, then secretary of State, asserting that on an American ship they were under the jurisdiction of the United States and that they were legally property On March 21, 1842, before the case was settled, Giddings introduced in the house of representatives a series of resolutions, in which he asserted that "in resuming their natural rights of personal liberty" the slaves "violated no law of the United States " For offering these resolutions Giddings was formally censured by the house Thereupon he resigned, appealed to his constituents, and was immediately re-elected by a large majority From 1861 until his death, at Montreal, on May 27, 1864, he was U S consul-general in Canada

Giddings published a series of political essays signed "Pacificus" (1843), *Speeches in Congress* (1853), *The Exiles of Florida* (1858), and *a History of the Rebellion Its Authors and Causes* (1864)

See *The Life of Joshua R Giddings* (Chicago, 1892), by his son-in-law, George Washington Julian (1817–1899), a Free-soil leader and a representative in Congress in 1849–1851, a Republican representative in Congress in 1861–1871, a Liberal Republican in the campaign of 1872, and afterwards a Democrat.

GIDE, ANDRÉ (1869–), French novelist and essayist, was born in Paris on Nov 21, 1869, and educated at the *Ecole Alsacienne* and the *Lycée Henri IV* He made his début in literature with a half-psychological, half-lyrical confession, *les Cahiers d' André Walter* (1891) This was followed by the ironical *Le Voyage d'Urien* (1893), *Paludes* (1895) depicting the mediocrity of man's life, and by *Les Nourritures Terrestres* (1897) a work in which his anti-intellectualism is carried to the extreme of advocating a pure voluptuousness for the enrichment of life In 1902 Gide published his first novel, *l'Immoraliste*, a masterpiece, following the purest classical tradition with clear-cut psychological design and sureness of touch *La Porte étroite* (1909, Eng trs 1924), *Isabella* (1911), *La Symphonie Pastorale* (1919), are comparatively short analytical novels, distinguished by the same merits In the *Caves du Vatican* (1914) he attempts less successfully the fantastic and humorous novel This "sotie" is interesting as illustrating the idea of the *acte gratuit*, that is, void of all ethical or social finality Among Gide's more recent works are *Les Faux Monnayeurs* (1925), an unequal work, encumbered with detail, but of acute analysis, and *Si le Grain ne Meurt* (1924), an autobiographical account in which sincerity sometimes gives way to cynicism. Gide is also the author of several critical essays and translations

See the bibliography of his works compiled by R. Simonson (Paris 1924), and S Braak *A Gide et l'Ame moderne* (1923)

GIDE, CHARLES (1847–), French economist, was born on June 29, 1847, at Uzès (Gard) Educated at the Collège d'Uzès, he entered the faculty of law of the University of Paris He early became professor of political economy, first at Bordeaux, then at Montpellier, and from 1898 to 1920 at the University of Paris He is the author of one of the best introductory treatises on political economy, *Principes d'Economie Politique*, first published in 1884 and since translated into English and other languages, and is joint author with Prof Rist of an excellent work on the history of economic theory, *Histoire des Doctrines Economiques* (3rd ed 1920) Gide devoted a great deal of time and energy to the encouragement and furtherance of the co-operative movement in France, and wrote largely on this question. He made unremitting endeavours to maintain and promote har-

monious international relations and especially to preserve co-operation amongst intellectual workers in different countries. (*See* FRANCE.)

GIDEON, a liberator, reformer and "judge" of Israel who delivered Israel from hordes of desert raiders—Midianites and others (Jud vi–viii.) He is called Jerubbaal also in the narrative, and it is possible that the exploits of two heroes have been combined in the passage. There are, as a matter of fact, at least two narratives combined in the relevant chapters of Judges. According to one account Gideon is visited by the Angel of Yahweh as he is threshing corn in a wine-press, to hide it from the Midianites, and is greeted as the future saviour of Israel. A portion of this narrative has been lost, but it must have told of a raid on Tabor by the Midianites, in the course of which Gideon's brothers were killed. Gathering 300 of his clansmen, Gideon first attacked the raiders by night and drove them away in flight, and then, pursuing them beyond Jordan, captured and slew their two chiefs, Zebah and Zalmunnah. He was then offered the throne, but refused it, and made an image from the Midianite spoil, thus leading Israel into idolatry. In the other narrative Gideon is summoned at night by Yahweh to overthrow the altar of Baal and to establish an altar to Yahweh in its place. This is discovered in the morning, and Gideon is only saved from the anger of his fellows by the pleading of his father, who argues that since Baal has been insulted, Baal must take vengeance—if he can. Gideon then gathers all Israel, his force is reduced to 300 in number, and with these, encouraged by a dream which he hears told in the camp of Midian, he assaults the enemy by night. They flee in panic, but find that the fords of Jordan are held against them by Ephraimites, who capture and kill the two chiefs Oreb and Zeeb. The Ephraimites then complain that Gideon, a Manassite, had not summoned them to follow him, and he appeases their anger by pointing to the honour they have won in killing Oreb and Zeeb.

The story is important as illustrating the danger of raids from the desert to which Palestine was subject, and it prepared the way for Abimelech, Gideon's son, who made the first tentative effort to establish an Israelite monarchy. (S. A. C.; T. H. R.)

GIEBEL, CHRISTOPH GOTTFRIED ANDREAS (1820–1881), German zoologist and palaeontologist, was born on Sept. 13, 1820 at Quedlinburg in Saxony, and educated at the University of Halle, where he became professor of zoology and director of the museum in 1858. He died at Halle on Nov. 14, 1881.

His chief publications were *Palaozoologie* (1846), *Fauna der Vorwelt* (1847–56), *Deutschlands Petrefacten* (1852), *Odontographie* (1855), *Lehrbuch der Zoologie* (1857), *Thesaurus ornithologiae* (1872–77).

GIEN, a town of central France, capital of the arrondissement of Gien in the department of Loiret, on the Loire, 39 m. E.S.E. of Orleans by rail. Pop. (1926) 6,825. Gien has many old houses and a stone bridge built by Anne de Beaujeu, daughter of Louis XI., about the end of the 15th century. It is the seat of a sub-prefect. The old castle, used as a law court, was built in 1494 by Anne de Beaujeu, of brick and stone arranged in geometrical patterns. The church of St. Pierre possesses a late 15th century square tower. It is important for opaque porcelain, and viticulture has increased considerably.

GIERS, NICHOLAS KARLOVICH DE (1820–1895), Russian statesman of Swedish extraction, was born on May 21, 1820. He was educated at the lyceum of Tsarskoye Selo, near St. Petersburg (Leningrad). At 18 he entered the service of the Eastern department of the Ministry of Foreign Affairs, and spent more than 20 years in subordinate posts, chiefly in south-eastern Europe, until he became minister plenipotentiary in Persia in 1863. Here he remained for six years, and, after serving as a minister in Switzerland and Sweden, he was appointed in 1875 director of the Eastern department and assistant minister for foreign affairs under Prince Gorchakov, whose niece he had married. The Herzegovinian insurrection had broken out, and he could perceive from secret official papers that the incident had far-reaching ramifications. While the Austrian officials in Dalmatia were almost openly assisting the insurgents, Russian volunteers were flocking to Serbia with the connivance of the Russian and Austrian Governments, and General Ignatiev, as ambassador in Constantinople, was urging his Government to take advantage of Turkey's weakness and bring about a radical solution of the Eastern question. Gorchakov did not want a radical solution involving a great European war, but he did nothing to stem the current of popular excitement. Alexander II., personally averse from war, was not insensible to the patriotic enthusiasm, and remained undecided. Giers gauged the situation accurately. As an official and a man of non-Russian extraction he had to be reticent, but in private he condemned severely the ignorance and recklessness of those around him. The event justified his sombre previsions. The so-called patriots wished to defy Europe in order to maintain intact the Treaty of San Stefano, and again Giers found himself in an unpopular minority. His influence was thrown into the scale of peace. His views, supported by Count Shuvalov, finally prevailed, and the European congress assembled at Berlin. He was not present at the congress, and escaped the blame for the concessions which Russia made to Great Britain and Austria. From that time he was practically minister of foreign affairs, for Prince Gorchakov was in weak health, and lived mostly abroad.

On the death of Alexander II. in 1881 it was generally expected that Giers would be dismissed, as deficient in Russian nationalist feeling, for Alexander III. had strong anti-German Slavophil tendencies. In reality the young tsar was fully determined not to let his hand be forced by men less cautious than himself. He wanted a minister of foreign affairs who would allow him to control the main lines, and occasionally the details, of the national policy. Giers was, therefore, appointed minister of foreign affairs on the retirement of Prince Gorchakov in 1882, he held office until 1894. In accordance with Alexander III.'s wish, M. de Giers followed systematically a pacific policy. Accepting the Triple Alliance as a *fait accompli,* he sought to establish more friendly relations with the cabinets of Berlin, Vienna and Rome. To the advances of the French Government he at first turned a deaf ear, but when the *rapprochement* between the two countries was effected with little or no co-operation on his part, he utilized it for restraining France and promoting Russian interests. He died on Jan. 26, 1895, soon after the accession of Nicholas II.

GIESEBRECHT, WILHELM VON (1814–1889), German historian, born in Berlin on March 5, 1814, studied under Leopold von Ranke, and his first important work, *Geschichte Ottos II.*, was contributed to Ranke's *Jahrbucher des deutschen Reichs unter dem sachsischen Hause* (1837–40). His *Geschichte der deutschen Kaiserzeit* (6 vols. 1855–95), the work of a lifetime, was the first general history of the period (up to 1190) based on modern scientific methods. The last volume is by B. von Simson. Later German historians have severely criticized Giesebrecht's glorification of the imperial era with its Italian entanglements, but his contemporaries, who saw the new German empire in the making, admired the book as much for its glorification of the German idea as for its intrinsic merits. In 1857 he went to Konigsberg as professor ordinarius, and in 1862 succeeded H. von Sybel as professor of history at Munich. He died at Munich on Dec. 17, 1889. Giesebrecht was an active member of the group of scholars who took over the direction of the *Monumenta Germaniae historica* in 1875.

His other works include *Jahrbucher des Klosters Altaich* (1841); a translation of Gregory of Tours's *Historia Francorum* (1851), *Deutsche Reden* (Munich 1871), and *Arnold von Brescia* (1873). *See* also Lord Acton in the *English Historical Review* vol. v. (1890).

GIESELER, JOHANN KARL LUDWIG (1792–1854), German writer on church history, was born on the 3rd of March 1792 at Petershagen, near Minden. He was professor at Bonn (1819), and Gottingen (1831). He died on the 8th of July 1854. His *Lehrbuch der Kirchengeschichte* (6 vols., 1824–57) with its copious references to original authorities, is of great value to the student, there are two partial English translations *Text Book of Ecclesiastical History,* New York, 5 vols. and *Compendium of Ecclesiastical History,* Edinburgh, 5 vols., in "Clark's Theological Library."

GIESSEN, a town of Germany, capital of the province of Upper Hesse in the republic of Hesse. It is situated at the conflu-

ence of the Wieseck with the Lahn, 41 m. N.N.W. of Frankfort-on-Main on the railway to Cassel. Pop. (1925) 33,600. Giessen was formed in the 12th century out of the villages Selters, Aster and Kroppach, for whose protection Count William of Gleiberg built the castle of Giessen. The town came, in 1203, into the possession of the count palatine, who sold it in 1265 to the landgrave Henry of Hesse. It was fortified in 1530 but in 1805 the walls were demolished. In the old part of the town the streets are narrow and irregular. The principal buildings are the Stadtkirche, the provincial government offices, comprising a portion of the old castle dating from the 12th century, and the town-hall (containing an historical collection). The university, founded in 1607 by the landgrave of Hesse, has a library, a botanic garden, an observatory, medical schools, a museum of natural history, a chemical laboratory and an agricultural college. The industries include metal founding and the manufacture of rubber articles, machines, leather, tobacco and beer.

GIFFARD, GODFREY (*c.* 1235–1302), chancellor of England and bishop of Worcester, brother of Walter Giffard (*q.v.*), succeeded his brother as chancellor in 1266, and held that office until 1270. He was bishop of Worcester from 1268 until his death on Jan. 26, 1302. He was a benefactor of his cathedral.

See W. Thomas, *Survey of Worcester Cathedral; Episcopal Registers, Register of Bishop Godfrey Giffard*, edited by J. W. Willis-Bund (Oxford, 1898–1899), and the Annals of Worcester in the *Annales monastici*, vol. iv., edited by H. R. Luard (London, 1869).

GIFFARD, WALTER (d. 1279), chancellor of England and archbishop of York, was a son of Hugh Giffard of Boyton, Wiltshire, and after serving as canon and archdeacon of Wells, was chosen bishop of Bath and Wells in May 1264. In August 1265 Henry III. appointed him chancellor of England, and he was one of the arbitrators who drew up the *dictum de Kenilworth* in 1266. Later in this year Pope Clement IV. named him archbishop of York. He was the chief of the three regents of the kingdom from the death of Henry III. in 1272 until the return of Edward I. in August 1274, and again in 1275. Giffard died in April 1279.

See *Fasti Eboracenses*, edited by J. Raine (London, 1863). Giffard's *Register* from 1266 to 1279 has been edited for the Surtees Society by W. Brown.

GIFFARD, WILLIAM (d. 1129), bishop of Winchester, was chancellor of William II. and received his see, in succession to Bishop Walkelin, from Henry I. (1100). He was one of the bishops elect whom Anselm refused to consecrate (1101) as having been nominated and invested by the lay power. During the investitures dispute Giffard was on friendly terms with Anselm, and drew upon himself a sentence of banishment through declining to accept consecration from the archbishop of York (1103). He was, however, one of the bishops who pressed Anselm, in 1106, to give way to the king. He was consecrated after the settlement of 1107. He became a close friend of Anselm, founded at Waverley, Surrey, the first English Cistercian house (1128) and restored Winchester cathedral with great magnificence.

See Eadmer, *Historia novorum*, ed. M. Rule (1884), S. H. Cass, *Bishops of Winchester* (1827).

GIFFEN, SIR ROBERT (1837–1910), K.C.B., 1895, British statistician and economist, was born at Strathaven, Lanarkshire. He entered a solicitor's office in Glasgow, attending courses at the university. He drifted into journalism, and after working for the *Stirling Journal*, he joined the staff of the *Globe* in 1862. He assisted John Morley on the *Fortnightly Review*. In 1868 he became Walter Bagehot's assistant-editor on the *Economist;* and in 1873 city-editor of the *Daily News*, and later of *The Times*. In 1876 he was appointed head of the statistical department in the Board of Trade, and subsequently he became assistant secretary (1882) and finally controller-general (1892), retiring in 1897. As chief statistical adviser to the Government, he was constantly employed in drawing up reports, giving evidence before commissions of inquiry, and acting as a government auditor. In 1892 he was elected F.R.S. He died in Scotland on April 12, 1910.

His principal publications were *Essays on Finance* (1879 and 1884), *The Progress of the Working Classes* (1884), *The Growth of Capital* (1890), *The Case against Bimetallism* (1892), and *Economic Inquiries and Studies* (1904).

GIFFORD, ROBERT SWAIN (1840–1905), American marine and landscape painter, was born on Naushon island (Mass.), on Dec. 23, 1840. He studied art with the Dutch marine painter Albert van Beest, who had a studio in New Bedford, and in 1864 he opened a studio for himself in Boston, subsequently settling in New York. He was a charter member of the American Water Color Society and the Society of American Artists. From 1878 until 1896 he was teacher of painting and chief master of the Woman's Art School of Cooper Union, New York, and from 1896 until his death he was director. Gifford painted longshore views, sand dunes, and landscapes generally, with charm and poetry. He was an etcher of considerable reputation. He died in New York on Jan. 13, 1905.

GIFFORD, WILLIAM (1756–1826), English publicist and man of letters, was born at Ashburton, Devon, in April 1756, the son of a glazier. Before he was 13 William had lost both parents, and after being sent to sea and then apprenticed to a shoemaker, he was able to return to school through the kindness of an Ashburton surgeon, William Cooksley. In 1779 he proceeded to Oxford, where he was appointed a Bible clerk in Exeter college. On graduating, he found a patron in the first Earl Grosvenor, who sent him on two prolonged Continental tours in the capacity of tutor to his son, Lord Belgrave. Settling in London, Gifford published in 1794 his clever satirical piece, after Persius, entitled the *Baviad*, aimed at a coterie of writers at Florence, then popularly known as the Della Cruscans, of which Mrs. Piozzi was the leader. A second satire of a similar description, the *Maeviad*, directed against the corruptions of the drama, appeared in 1795. About this time Gifford became acquainted with Canning, with whose help he originated the weekly newspaper of Conservative politics entitled the *Anti-Jacobin*, which began to appear in 1799. In 1809, when the *Quarterly Review* was projected, he was made editor. The success which attended the *Quarterly* from the outset was due in no small degree to Gifford, but Southey, one of his regular contributors, said that Gifford looked on authors as Izaak Walton did on worms. His bitter opposition to Radicals and his onslaughts on new writers, conspicuous among which was the article on Keats's *Endymion*, called forth Hazlitt's *Letter to W. Gifford* in 1819. His connection with the *Review* continued until within about two years of his death in London on Dec. 31, 1826. Gifford also published an English version of Juvenal (1802), an annotated edition of Massinger's *Plays* (1804), a metrical translation of Persius (1821) and an edition of the dramas of Ben Jonson (1816). His edition of Ford and a short autobiography appeared posthumously in 1827.

GIFT, a general English term for a present or thing bestowed, *i.e.*, an alienation of property otherwise than for a legal consideration. Formerly in English law property in land could be conveyed by one person to another by a verbal gift of the estate accompanied by delivery of possession. The Statute of Frauds required all such conveyances to be in writing, and a later statute (8 & 9 Vict. *c.* 106) requires them to be by deed (*q.v.*).

Chattels may be effectually transferred from one person to another by a simple verbal gift accompanied by delivery. But unless the actual thing is bodily handed over to the donee, the mere verbal expression of the donor's desire or intention has no legal effect whatever. The persons are in the position of parties to an agreement which is void as being without consideration. But a declaration of trust, while retaining possession, is good (*see* Williams, *Personal Property*). When the nature of the thing is such that it cannot be bodily handed over, it will be sufficient to put the donee in such a position as to enable him to deal with it as the owner. For example, when goods are in a warehouse, the delivery of the key will make a verbal gift of them effectual; but it seems that part delivery of goods which are capable of actual delivery will not validate a verbal gift of the part undelivered. The gift of such personal property as is not chattels or transferable to bearer requires a written transfer in proper form. But *see* CONVEYANCE.

GIFT EXCHANGE: *see* TRADE, PRIMITIVE.

GIFU, a city of Japan, capital of the *ken* (government) of Central Japan, which comprises the two provinces of Mino and

Hida. Pop. *c.* 45,000 It lies E. by N. of Lake Biwa, on the Central railway, on a tributary of the river Kiso, which flows to the Bay of Miya Uro. The *ken* has an area of about 4,000 sq m, and is thickly peopled, the population exceeding 1,000,000. The chief industries are silk and paper goods

GIG, an onomatopoeic word for any light whirling object; *e g*, a top, or a revolving lure made of feathers for snaring birds; but now chiefly used of a light two-wheeled cart or carriage for one horse; of a narrow, light, ship's boat for oars or sails; and of a clinker-built rowing-boat used on the Thames A "gig" in mining, is a wooden chamber or box divided in the centre and used to draw up and lower down miners in a pit or shaft, and the "gig-mill" or "gigging machine," is a textile machine which raises the nap on cloth by means of teazels. A "gig" or "fish-gig" (properly "fiz-gig," possibly an adaptation of Span. *fisga,* harpoon) is an instrument for spearing fish

GIGANTISM, a condition in which the stature is unusually great (*see* MONSTER).

GIGLIO, an island of Italy (anc. *Igilium*), off the southwest coast of Italy, in the province of Grosseto, 11 m to the west of Monte Argentario It measures about 5 m by 3 and its highest point is 1,634 ft above sea-level Pop (1921) of Giglio Castello, the village at the highest point, 1,938, of Giglio Porto (at the harbour), 782 Granite was quarried here by the Romans and is still used, the island is fertile, and produces wine and fruit, the cultivation of which has taken the place of the forests of which Rutilius spoke when it served as a place of refuge from the barbarian invaders. Charlemagne gave it to the abbey of Tre Fontane at Rome, with a considerable part of the Maremma From 1264 to 1406 it belonged to Pisa, then to Florence, then, after being seized by the Spanish fleet, it was ceded to Antonio Piccolomini, nephew of Pius II In 1558 it was sold to Eleonora, wife of Cosimo I of Florence

See Archduke Ludwig Salvator, *Die Insel Giglio* (Prague, 1900)

GIGTHI, a Roman city of north Africa, near the west coast of the Little Syrtis (Gulf of Gabès). It lies about 20 m N E of the modern Medenine The ruins are considerable, especially those of the forum, surrounded on three sides by Corinthian porticos, here were the Capitolium, Curia and basilica, and various temples. The thermae and a market have also been cleared To the north-west is the island of Djerba, identified with the land of the lotus eaters In Roman times it was joined to the mainland by a causeway, the remains of which are still visible Mount Souk, the chief village, on the north coast of the island (pop 7,500) is a centre of the sponge fishery The Spaniards intervened in Djerba in 1510 and after 1535, and made it their base of operations against Tripoli in 1560 They were defeated and the Spanish garrison on the island was exterminated

See Mondricourt, *L'expédition espagnole de 1560 contre l'île de Djerba* (Paris, 1914)

GIGUE: *see* JIG

GIJÓN, a seaport of northern Spain, province of Oviedo, on the Bay of Biscay, and the terminus of railways from Avilés, Oviedo and Langreo Pop (1920), 57,573 The older parts of Gijón occupy the slopes of a rocky peninsula, Santa Catalina point, while its more modern suburbs extend east and west along the shore The town contains few buildings of architectural interest beyond the 15th century parish church of San Pedro, with its triple rows of aisles and the Jovellanos Nautical and Technical institute, which contains a fine collection of drawings This institute was founded in 1797 by Gaspar Melchor de Jovellanos (1744–1811), the poet and statesman, a native of Gijón, who is buried in San Pedro church

A stretch of sandy beach east of the peninsula has made this the bathing quarter of the town Westward, to Cape Torres extends the Bay of Gijón, the most important roadstead on the Spanish coast between Ferrol and Santander. The construction of a commercial port at Gijón was begun with a royal grant in 1480. An arsenal was added in the reign of Philip II (1556–98), and to this the remnant of the Invincible Armada returned for repairs in 1588 In 1778 the port was equipped for trade with the West Indies Its modern prosperity, however, dates from 1884, when railway communication was established with Langreo and other Asturian mining districts. In 1892 the harbour of Musel, at the western end of the bay, was constructed At the eastern end, protected by Santa Catalina and two moles, lie the outer and two inner harbours of Gijón proper.

Gijón is usually identified with the Roman *Gigia,* captured by the Moors early in the 8th century; it was one of the first cities to be retaken by King Petayo (720–737) In 844 Gijón successfully resisted a Norman raid, in 1395 it was burned down, and in the 16th and 17th centuries it suffered many attacks by corsairs From the middle of the 17th century, however, it gradually rose to commercial importance.

Coasting, as well as foreign trade, is considerable Gijón is also an important industrial centre, with iron, copper and bronze foundries, petroleum refineries, large tobacco, glass, sugar and porcelain factories, and chemical, preserved food, paper, candle and cloth-making works Coal is the main export, others being iron, zinc and copper ores, apples, nuts, butter, cider and fish The chief imports are timber, machinery, petroleum, superphosphate and foodstuffs.

GILA CLIFF DWELLINGS, a national monument (reservation) situated about 35 m north of Silver City in the south-eastern part of Catron county, New Mexico, U S A The reservation (160 ac in area) was established on Nov 16, 1907 to protect a group of four cliff dwellings still in good preservation in the canyon of the West fork of the Gila river

GILA MONSTER (*Heloderma suspectum*), the only lizard known to be poisonous It inhabits deserts in the south-western United States, chiefly in the valley of the Gila river in Arizona and New Mexico The Gila monster is usually about 2 ft in length and has a thick body covered with small bead-like tubercles In colour it is blackish or purplish, with large, somewhat transverse, pinkish or yellowish blotches The poison fangs are in the lower jaw, and its bite has been known to cause death in man This lizard is usually sluggish but, especially in the wild state, is vicious when aroused, snapping its powerful jaws from side to side with an unexpected agility, all the while emitting sharp hisses Its grip is very tenacious and cannot be broken by man without some prying instrument In movement the Gila Monster is slow and methodical, but not clumsy, dragging rather than lifting its body over the ground It is oviparous, depositing its soft-shelled eggs in the sand (*See* LIZARD, REPTILES)

GILAN, the westernmost of the three Caspian provinces of Persia, lying between 37° and 38° N with a breadth varying from 15 to 60 m Separated on the north from Russia by the little river of Astara, it is bounded on the west by the province of Azerbaijan, on the south by Kazvin and on the east by Mazandaran Like all the Caspian provinces of Persia, Gilan consists geographically of two zones; the coastal plain, backed by a well nigh impenetrable jungle, and the forest-clad spurs running out northward from the *massif* of the Elburz range These zones present an astonishing contrast in climate, landscape and race Though the Safid Rud (called Kizil Uzun in its upper reaches) is the only river of any volume, the province is abundantly watered by a great number of smaller streams

The climate of the plains in the neighbourhood of Resht, the capital, is exceedingly damp and relaxing, with a very high rainfall—56 inches having been recorded, yet, over a great part of the area the fall is not sufficiently sure and regular in summer to provide for cultivation without resort to irrigation The mild and wet winter is broken by the *bad-i-garm,* or warm wind The soil is very fertile, consisting mainly of a rich loam lying over sandstone and shingle The vegetation resembles that of southern Europe, but owing to the warm humidity which prevails, it is more tropically luxuriant, and in the lower valleys of the Elburz, up to 5,000 ft, there are forest tracts as dense as any Indian jungle

The prevailing forest trees are box, oak, ash, beech, elm and hornbeam, the first named comes to rare perfection but unfortunately indiscriminate cutting for export has tended to make it scarce. Many kinds of fruit-bearing trees are to be met with but the quality of the fruit they yield is on the whole disappoint-

ing. Two varieties of wild grape occur but the cultivated vine does not thrive; the medlar and the fig flourish, as do the wild pomegranate and the water-melon, the latter attaining huge proportions. Oranges and lemons thrive in the gardens, and in the hilly district of Rudbar there is considerable cultivation of olives, but the process of oil extraction in vogue is crude and wasteful The specialities of Gilan in the direction of fruit are a peculiar variety of pear, in great demand for grafting, and the "Gilan plum" which is well known all over northern Persia

The fauna is well represented, but tigers, once not uncommon, are now very scarce; panther, hyaena, jackal, wild boar, are to be found, and two species of deer, the fine Maral stag (*Cervus elephus maral*) and the Ahu or roedeer (*Capreolus pyargus*). Among the birds, pheasant, woodcock, duck, teal, geese and various other waterfowl abound

The fishing industry on the Caspian from this province is very important, but during the World War and onwards the business was practically at a standstill owing to the unacceptable claims advanced by the Soviet Government in regard thereto Early in 1928, however, the parties came to terms, since when the fisheries have been working satisfactorily

Of crops, rice, the cultivation of which only became general in comparatively recent years, when it gradually replaced a then moribund silk industry, holds its own as the fundamental produce of Gilan, and about 1911 reached an average yield of 180,000 tons, or five-sixths of the total exported from the country

Sericulture which was formerly a very important and practically the sole industry of Gilan was almost reduced to nothing about 1865 by a mysterious epidemic disease which broke out among silkworms alike in Persia and in France; but thanks to the researches of the famous bacteriologist, Pasteur, who was deputed by Napoleon III to study the disease, it was gradually got under control and from 1890 onwards the trade regained some of its former prosperity, so that just before the World War the output of raw silk had risen to 1,200,000 lb, 88% of which was produced in Gilan Another notable product of the Caspian provinces, though not specially of Gilan, is sugar-cane, for the growth of which the climate seems eminently suited Tea-planting was introduced into the Lahijan district in 1901 and production has considerably increased in the last few years, so that Lahijan tea is now procurable in most Persian towns, but more capital is needed to put the industry on a prosperous and progressive footing The other crop of importance produced in the province is tobacco, to the cultivation of which considerable impetus has been given by the increase in cigarette smoking throughout Persia Gilan is said to supply the wants of all northern Persia in this direction Various indications of the existence of petroleum have been found in the provinces but no action has yet been taken in the direction of its exploitation

Estimates of the population of Gilan differ enormously Lorini, in 1911, put the figure at 340,000, which was considered high at the time, but a later rough census made for official purposes in 1915, suggested that from 5 to 6 million would be nearer the mark

The capital of the province, and the most active commercial centre is Resht (*q v*), through which the Tehran-Kazvin-Pahlavi motor road runs, one of the best in the country The latter place (formerly known as Enzeli) enjoys by far the most lively trade of all the Caspian ports of Persia The revenue of the province in 1926–27 amounted to nearly 24½ million krans

After remaining long independent, Gilan was conquered by Hulagu Khan, who razed the fortifications of Shamiran to the ground in 1227 and formed it into two small principalities, separated by the river Safid Rud and with their capitals at Lahijan and Resht respectively This remained the position until 1567 when the province was finally incorporated in Persia by the Safavid monarch It was however occupied by a Russian force in the early part of 1723 and Tahmasp III, the tenth Safavid Shah, being then without a throne, and his country occupied by the Afghans, ceded it, together with Mazandaran and Astarabad, to Peter the Great by treaty Russian troops remained in occupation until 1734 when they were obliged to evacuate it

The derivation of the name Gilan from the modern Persian word *gil* meaning mud (hence "land of mud") is incorrect. It probably means "land of the Gil," an ancient tribe which classical writers mention as the Gelae.

See H. L Rabino, *Les provinces caspiennes de la Perse. Le Guilan* (1917), J. B L Noel, "A reconnaissance in the Caspian provinces of Persia," *Geogr J*, 1921, lvii, L. S Fortescue, "The Western Elburz and Persian Azerbaijan," *Geogr J*, 1924, lxiii, and "Les provinces caspiennes de la Perse," *La Geographie*, 1925, xliii.

GILBART, JAMES WILLIAM (1794–1863), English writer on banking, was born in London on March 21, 1794 He worked first as a bank clerk in London, and then became a branch manager of the Provincial Bank of Ireland In 1834 he became manager of the London and Westminster Bank, and did much to develop the system of joint-stock banking On the renewal of the bank charter in 1844, he procured the insertion of a clause granting to joint-stock banks the power of suing by their public officer, and also the right of accepting bills at less than six months' date In 1846 he was elected F R S He died in London on Aug 8, 1863 The Gilbart lectures on banking at King's college are called after him The following are his principal works on banking, most of which have passed through more than one edition *Practical Treatise on Banking* (1827), *The History and Principles of Banking* (1834), *The History of Banking in America* (1837), *Lectures on the History and Principles of Ancient Commerce* (1847), *Logic for the Million* (1851); and *Logic of Banking* (1857)

GILBERT, ALFRED (1854–), British sculptor and goldsmith, born in London, was the son of Alfred Gilbert, musician He received his education mainly in Paris (École des Beaux-Arts, under Cavelier), and studied in Rome and Florence where the significance of the Renaissance made a lasting impression upon him and his art He also worked in the studio of Sir J Edgar Boehm, R A His first work of importance was the charming group of the "Mother and Child," then "The Kiss of Victory," followed by "Perseus Arming" (1883), produced directly under the influence of the Florentine masterpieces he had studied Its success was great, and Lord Leighton forthwith commissioned "Icarus," which was exhibited at the Royal Academy in 1884, along with a remarkable "Study of a Head," and was received with general applause Then followed "The Enchanted Chair," which along with many other works, deemed by the artist incomplete or unworthy of his powers, was ultimately broken by the sculptor's own hand The next year Gilbert was occupied with the Shaftesbury Memorial Fountain, in Piccadilly, London, a work of great originality and beauty, yet shorn of some of the intended effect through restrictions put upon the artist In 1888 was produced the statue of H M Queen Victoria, set up at Winchester, in its main design and in the details of its ornamentation the most remarkable work of its kind produced in Great Britain, and perhaps, it may be added, in any other country in modern times Other statues of great beauty, at once novel in treatment and fine in design, are those set up to Lord Reay in Bombay, and John Howard at Bedford (1898), the highly original pedestal of which did much to direct into a better channel what are apt to be the eccentricities of what is called the "New Art" school The sculptor rose to the full height of his powers in his "Memorial to the Duke of Clarence," at Windsor, and his fast developing fancy and imagination, which are the main characteristics of all his work, are seen in his "Memorial Candelabrum to Lord Arthur Russell" and "Memorial Font to the son of the 4th Marquess of Bath" Gilbert's sense of decoration is paramount in all he does, and although in addition to the work already cited he produced busts of extraordinary excellence of Cyril Flower, John R Clayton (since broken up by the artist—the fate of much of his admirable work), G F Watts, Sir Henry Tate, Sir George Birdwood, Sir Richard Owen, Sir George Grove and various others, it is on his goldsmithery that the artist would rest his reputation; on his mayoral chain for Preston, the epergne for Queen Victoria, the figurines of "Victory" (a statuette designed for the orb in the hand of the Winchester Statue), "St Michael" and "St George," as well as smaller objects such as seals, keys and the like Gilbert was chosen associate of the Royal Academy in 1887, full

member in 1892 (resigned 1909), and professor of sculpture (afterwards resigned) in 1900 In 1889 he won the *Grand Prix* at the Paris International Exhibition. He was created a member of the Victorian Order in 1897. (*See* SCULPTURE.)

See Joseph Hatton, *The Life and Work of Alfred Gilbert R A, M V O, D C L.* (*Art Journal* Office, 1903). (M. H. S.)

GILBERT, CASS (1859–), American architect, was born at Zanesville (O), on Nov 24, 1859 He studied at the Massachusetts institute of technology and in 1883 began his career as an architect in St Paul, but later moved to New York He became perhaps most widely known as the architect of the Woolworth building in New York, which has 57 storeys and is 760ft in height, and, with the exception of the Eiffel Tower in Paris, is the tallest structure in the world Among other buildings he designed the Minnesota State Capitol, St Paul; the Endicott building, the Dayton avenue church and St Clement's Episcopal church in St Paul, the U S. custom house and the Union club, New York; the Brazer building and the Suffolk Savings Bank, Boston; Art building and Festival Hall (for the Louisiana Purchase Exposition), and the Central Public Library, St Louis; Ives Memorial Library, New Haven (Conn), Public Library, Detroit He drew the plans for the University of Minnesota and for the University of Texas He was appointed by President Roosevelt a member of the Council of the Fine Arts; and by President Taft a member of the National Commission of Fine Arts; being reappointed by President Wilson In 1926 he was appointed design architect for the proposed bridge over the Hudson river at New York city, and in the same year was elected president of the National Academy of Design

GILBERT, GROVE KARL (1843–1918), American geologist, was born at Rochester, N Y, on May 6, 1843, and graduated at the University of Rochester in 1862 He began the study of geology and in 1869 went as a volunteer assistant on the second Ohio State survey In 1871 he was assigned to the Wheeler survey and during his three years service took a remarkable trip by boat up the lower canyons of the Colorado river, by pack train through central Arizona and down the valley of the Gila, and again by boat down the Colorado to the Gulf of California As a result of this trip he published two papers characterizing the basin range and plateau provinces and naming and describing ancient Lake Bonneville He was transferred to the Powell survey in 1875 which took him to Utah, and with the formation of the U S geological survey in 1879, he was made one of the six senior geologists In 1884 he was placed in charge of the Appalachian division of geology, and in 1889, upon the creation of the division of geologic correlation, he was placed at its head After 1892 he relinquished most of his administrative duties and his position as chief geologist in order to return to the fuller study of some of his earlier problems During this period his studies included the geology of Colorado, Mexico and Alaska, and he visited the latter with the Harriman expedition The *Bonneville Monograph*, which he himself regarded as his *magnum opus*, was published in 1890 His report on the *Geology of the Henry Mountains*, in which the volcanic structure known as laccolite was first described, and his *History of the Niagara River* (1890) were of particular importance He had much to do with planning the Federal Survey's bibliographic work and the adoption of principles of nomenclature and cartography, which form the basis of the survey's geologic map work He died at Jackson, Mich on May 1, 1918

See *Bulletin* of the Geological Society of America, vol xxxi, pp 26–64, which includes a complete bibliography of his publications, and N M Davis, *American Journal of Science*, 4th ser, vol xlvi, pp. 669–681.

GILBERT, SIR HUMPHREY (*c.* 1539–1583), English soldier, navigator and pioneer colonist in America, was the second son of Otho Gilbert, of Compton, near Dartmouth, Devon, and stepbrother of Sir Walter Raleigh He was educated at Eton and Oxford; intended for the law; introduced at court by Raleigh's aunt, Catherine Ashley, and appointed (July 1566) captain in the army of Ireland under Sir Henry Sidney In April 1566 he had already joined with Antony Jenkinson in a petition to Elizabeth for the discovery of the North-east Passage; in November following he presented an independent petition for the "discovering of a passage by the north to go to Cataia" In Oct 1569 he became governor of Munster; on Jan 1, 1570 he was knighted; in 1571 he was returned M P for Plymouth; in 1572 he campaigned in the Netherlands against Spain without much success, from 1573 to 1578 he lived in retirement at Limehouse, devoting himself especially to the advocacy of a North-west Passage (his famous *Discourse* on this subject was published in 1576) Gilbert's arguments, widely circulated even before 1575, were apparently of weight in promoting the Frobisher enterprises of 1576–78 On June 11, 1578, Sir Humphrey obtained his long-coveted charter for North-western discovery and colonization, authorizing him, his heirs and assigns, to discover, occupy and possess such remote "heathen lands not actually possessed of any Christian prince or people, as should seem good to him or them" Disposing not only of his patrimony but also of the estates in Kent which he had through his wife, daughter of John Aucher of Ollerden, he fitted out an expedition which left Dartmouth on Sept 23, 1578, and returned in May 1579, unsuccessful

In 1579 Gilbert aided the Government in Ireland, and in 1583, after many struggles—illustrated by his appeal to Washington on July 11, 1582, for the payment of an amount due to him from government, and by his agreement with the Southampton venturers—he succeeded in equipping another fleet for "Western Planting" On June 11, 1583, he sailed from Plymouth with five ships and the queen's blessing, on July 30 he was off the north coast of Newfoundland, on Aug 3 he arrived off the present St John's, and selected this site as the centre of his operations, on Aug 5 he began the plantation of the first English colony in North America Proceeding southwards with three vessels, exploring and prospecting, he lost the largest near Cape Breton (Aug 29); immediately after (Aug 31) he started to return to England with the "Golden Hind" and the "Squirrel," of forty and ten tons respectively Obstinately refusing to leave the "frigate" and sail in his "great ship," he shared the former's fate in a tempest off the Azores "Monday, Sept 9," reports Hayes, the captain of the "Hind," "the frigate was near cast away yet at that time recovered, and, giving forth signs of joy, the general, sitting abaft with a book in his hand, cried out unto us in the 'Hind,' 'We are as near to heaven by sea as by land' The same Monday night, about twelve, the frigate being ahead of us in the 'Golden Hind,' suddenly her lights were out, in that moment the frigate was devoured and swallowed up of the sea"

See Hakluyt, *Principal Navigations* (1599), vol iii pp 135–181; Gilbert's *Discourse of a Discovery for a New Passage to Cataia*, published by George Gascoigne in 1576, with additions, probably without Gilbert's authority, Hooker's *Supplement* to Holinshed's *Irish Chronicle*, Roger Williams, *The Actions of the Low Countries* (1618), *State Papers, Domestic* (1577–83), Wood's *Athenae Oxonienses*, *North British Review*, No 45, Fox Bourne's *English Seamen under the Tudors*, Carlos Slafter, *Sir H Gylberte and his Enterprise* (Boston, 1903), with all important documents Gilbert's interesting writings on the need of a university for London, anticipating in many ways not only the modern London University but also the British Museum library and its compulsory sustenance through the provisions of the Copyright Act, have been printed by Furnivall (*Queen Elizabeth's Achademy*) in the Early English Text Society Publications, extra series, No viii *See* also W G Gosling, *The Life of Humphrey Gilbert* (1911)

GILBERT, SIR JOHN (1817–1897), English painter and illustrator, was born at Blackheath, London, on July 21, 1817 He had had little formal instruction when he began to exhibit at the Gallery of British Art watercolours on historical and romantic subjects Gilbert began to exhibit at the Royal Academy in 1838, was elected A R A in 1872 and R A on June 29, 1876 Many of his most ambitious works are at the Academy But it is not in these large works in oils that Gilbert was seen at his best At the gallery of the Old Water Colour society, to which from 1852, when he was elected an associate exhibitor, till he died (Oct 5, 1897), he contributed 270 drawings, most of them admirable because of the largeness of their style, massive colouration, broad chiaroscuro and vigorous design "The Trumpeter," "The Standard-Bearer," "Richard II resigning his Crown" (now at Liverpool), "The Drug Bazaar at Constantinople," "The Mer-

chant of Venice" and "The Turkish Water-Carrier" are examples. Gilbert was elected a full member in 1855, and president of the society in 1871, shortly after which he was knighted.

GILBERT, SIR JOHN THOMAS (1829–1898), Irish Celtic scholar and historian, was born in Dublin on Jan 23, 1829 As a young man he studied the records of his native city, and his first important work was a *History of the City of Dublin* (3 vols, 1854–59) He was secretary of the Public Record office (1867–75) Gilbert was, from 1855 onwards, secretary of the Irish Celtic and Archaeological society, and published many original documents relative to Irish history, notably those of the convents of St. Mary and St Thomas in Dublin He died in Dublin on May 23, 1898

See *Life of Sir John T. Gilbert* (2 vols., 1905) by his wife, Lady Gilbert.

GILBERT, SIR JOSEPH HENRY (1817–1901), English chemist, was born at Hull on Aug. 1, 1817 He studied chemistry first at Glasgow; then at University College, London, and finally at Giessen under Liebig He was for 58 years director of the chemical laboratory at the experimental station established by Sir J. B. Lawes at Rothamsted, near St. Albans, for the systematic study of agriculture He died on Dec 23, 1901 The work which he carried out in collaboration with Lawes involved the application of many branches of science, such as chemistry, meteorology, botany, animal and vegetable physiology and geology, its influence in improving the methods of practical agriculture extended all over the civilized world. His name is perhaps best associated with the development of the "nitrogen" theory of fertilizers as opposed to the "mineral" theory of Liebig (*q.v*). Gilbert was elected a fellow of the Royal Society in 1860, and in 1867 was awarded a Royal medal jointly with Lawes. In 1882 he was president of the London Chemical Society, and for six years from 1884 he filled the Sibthorpian chair of rural economy at Oxford He was knighted in 1893.

GILBERT, MARIE DOLORES ELIZA ROSANNA ["LOLA MONTEZ"] (1818–1861), dancer and adventuress, the daughter of a British army officer, was born at Limerick, Ireland, in 1818 Her father dying in India when she was seven years old, and her mother marrying again, the child was sent to Europe to be educated, subsequently joining her mother at Bath In 1837 she made a runaway match with a Captain James of the Indian army, and accompanied him to India In 1842 she returned to England, and shortly afterwards her husband obtained a decree *nisi* for divorce She studied dancing, making an unsuccessful first appearance at Her Majesty's theatre, London, in 1843, billed as "Lola Montez, Spanish dancer" Subsequently she appeared with considerable success in Germany, Poland and Russia Thence she went to Paris, and in 1847 appeared at Munich, where she became the mistress of the old king of Bavaria, Ludwig I She was naturalized, created comtesse de Landsfeld, and given an income of £2,000 a year She soon proved herself the real ruler of Bavaria, adopting a liberal and anti-Jesuit policy Her political opponents proved, however, too strong for her, and in 1848 she was banished In 1849 she came to England, and in the same year was married to George Heald, a young officer in the Guards In 1851 she appeared in America, and in 1853 Heald was drowned at Lisbon Subsequently she appeared in Australia, but returned in 1857 to America, where she died on Jan 17, 1861

See E. B D'Auvergne, *Lola Montez* (New York, 1909).

GILBERT, NICOLAS JOSEPH LAURENT (1751–1780), French poet, was born at Fontenay-le-Château in Lorraine In 1774 he came to Paris, where he became known as an opponent of the Encyclopaedists and a panegyrist of Louis XV The satiric force of one or two of his pieces, as *Mon Apologie* (1778) and *Le Dix-huitième Siècle* (1775), justify his reputation, which has been further increased by writers, who, like Alfred de Vigny in his *Stello* (chaps 7–13), considered him a victim to the spite of his philosophic opponents. His best-known verses are the *Ode imitée de plusieurs psaumes*, usually entitled *Adieux à la vie*

Gilbert's *Oeuvres complètes* were first published in 1788, and they have since been edited by Mastrella (1823), by Charles Nodier (1817 or 1825) and by M de Lescure (1882).

GILBERT, SEYMOUR PARKER (1892–), American lawyer and financial expert, was born in Bloomfield, N.J., on Oct. 13, 1892. He graduated from Rutgers college in 1912, and from Harvard law school in 1915 After admission to the New York bar, he practised with the firm of Cravath and Henderson in New York city from 1915 to 1918 In the latter year, on the initiative of R C Leffingwood, a former associate secretary of the Treasury, he joined the War Loan staff as counsel In June 1920 he became assistant secretary (later under-secretary) of the Treasury in charge of fiscal affairs. He resigned on Nov. 17, 1923, and was appointed permanent agent general for reparation payments from Germany under the Dawes Plan on Oct 31, 1924, succeeding Owen D Young. At the end of his first year, Nov. 30, 1925, Gilbert reported that the initial annuity of a billion gold marks due on reparation payments had been received in full On Sept. 2, 1926, he turned over to the U S Treasury the first cash payment, $5.900,000, received by the United States from Germany under the operation of the Dawes Plan. At this time, by agreement with the German finance minister, Gilbert modified the amount of immediate cash payments and fixed the total annuities to be paid during the ensuing three years His analysis of the second year payments showed that 54% of the total was met by payments in kind. In Aug. 1927 he announced the receipt of the third annuity payment of German reparations In Sept 1928 he made a like announcement for the fourth annuity payment.

GILBERT (or GYLBERDE), **WILLIAM** (1544–1603), the most distinguished man of science in England during the reign of Queen Elizabeth, was a member of an ancient Suffolk family, long resident in Clare, and was born on May 24, 1544, at Colchester, where his father, Hierome Gilbert, became recorder. Educated at Colchester school, he entered St John's college, Cambridge, in 1558, and after taking the degrees of B.A and M A in due course, graduated M D in 1569, in which year he was elected a senior fellow of his college He travelled in Europe, and in 1573 settled in London, where he practised as a physician He was admitted to the College of Physicians probably about 1576, and he held several important offices In 1589 he was one of the committee appointed to superintend the preparation of the *Pharmacopoeia Londinensis* which the college in that year decided to issue, but which did not actually appear till 1618. In 1601 Gilbert was appointed physician to Queen Elizabeth, with the usual emolument of £100 a year On the death of the queen in 1603 he was reappointed by her successor, but he did not long enjoy the honour, for he died on Nov. 30 (Dec 10, N S), 1603, either in London or in Colchester He was buried in the latter town, in the chancel of Holy Trinity church, where a monument was erected to his memory To the College of Physicians he left his books, globes, instruments and minerals, but they were destroyed in the great fire of London

Gilbert's principal work is his treatise on magnetism (*q v ; see* also ELECTRICITY), entitled *De magnete, magneticisque corporibus, et de magno magnete tellure* (London, 1600, later editions—Stettin, 1628, 1633, Frankfort, 1629, 1638) This work, which embodied the results of many years' research, was distinguished by its strict adherence to the scientific method of investigation by experiment, and by the originality of its matter It contains an account of the author's experiments on magnets and magnetic bodies and on electrical attractions, and also his great conception that the earth is nothing but a large magnet, and that it is this which explains, not only the direction of the magnetic needle north and south, but also the dipping or inclination of the needle A posthumous work of Gilbert's was edited by his brother from two mss , its title is *De mundo nostro sublunari philosophia nova* (Amsterdam, 1651) He was also the first advocate of Copernican views in England, and he concluded that the fixed stars are not all at the same distance from the earth

An English translation of the *De magnete* was published by P. F. Mottelay in 1893, and another, with notes by S. P Thompson, was issued by the Gilbert club of London in 1900.

GILBERT, SIR WILLIAM SCHWENK (1836–1911), English playwright and humorist, son of William Gilbert (a descendant of Sir Humphrey Gilbert), was born in London on Nov.

18, 1836 His father wrote novels, the best-known of which were *Shirley Hall Asylum* (1863) and *Dr Austin's Guests* (1866). Several of these novels were illustrated by his son, who developed a talent for whimsical draughtsmanship. W. S Gilbert was educated at Boulogne, at Ealing and at King's college, London He became a clerk in the education department of the privy council office in 1857 Disliking the routine work, he left the Civil Service in 1861, entered the Inner Temple, was called to the bar in Nov. 1864, and joined the northern circuit His practice was inconsiderable, and his military and legal ambitions were eventually satisfied by a captaincy in the volunteers and appointment as a magistrate for Middlesex (June 1891) In 1861 he began to contribute excellent comic verse to *Fun*, with humorous illustrations, the work of his own pen, over the signature of "Bab." These were collected in 1869 under the title of *Bab Ballads*, followed by *More Bab Ballads*. The two collections and *Songs of a Savoyard* were united in a volume issued in 1898, with many new illustrations The best of the old cuts, such as those depicting the "Bishop of Rum-ti-Foo" and the "Discontented Sugar Broker," were preserved intact

While remaining a staunch supporter of *Fun*, Gilbert became dramatic critic to the *Illustrated Times*. Early in Dec 1866 T W Robertson was asked by Miss Herbert, lessee of the St James's theatre, to find some one who could turn out a bright Christmas piece in a fortnight, and suggested Gilbert, the latter promptly produced *Dulcamara*, a burlesque of *L'Elisire d'amore*, written in ten days, rehearsed in a week, and duly performed at Christmas He sold the piece outright for £30, a piece of rashness which he had cause to regret, for it turned out a commercial success In 1870 he was commissioned by Buckstone to write a blank verse fairy comedy, based upon *Le Palais de la vérité*, the novel by Madame de Genlis The result was *The Palace of Truth*, a fairy drama, poor in structure but clever in workmanship, produced by Mr. and Mrs Kendal in 1870 at the Haymarket. This was followed in 1871 by *Pygmalion and Galatea*, another three-act "mythological comedy", *The Wicked World*, written for Buckstone and the Kendals, and in collaboration with Gilbert à Beckett, *The Happy Land* (1873) Gilbert's next dramatic ventures inclined more to the conventional pattern, combining sentiment and a cynical humour in a manner strongly reminiscent of his father's style These were: *Sweethearts* (Prince of Wales's theatre, Nov 7, 1874), *Tom Cobb* (St. James's, April 24, 1875), *Broken Hearts* (Court, Dec 9, 1875); *Dan'l Druce* (Haymarket, Sept 11, 1876), and *Engaged* (Haymarket, Oct 3, 1877) The first and last of these proved decidedly popular. *Gretchen*, a verse drama in four acts, appeared in 1879 A one-act piece, called *Comedy and Tragedy*, was produced at the Lyceum on Jan 26, 1884 Two dramatic trifles of later date were *Foggerty's Fairy* and *Rozenkrantz and Guildenstern*, a travesty of *Hamlet*, performed at the Vaudeville in June 1891. Several of these dramas were based upon short stories by Gilbert, a number of which had appeared from time to time in the Christmas numbers of various periodicals. The best of them have been collected in the volume entitled *Foggerty's Fairy, and other Stories*

In the autumn of 1871 Gilbert commenced his memorable collaboration (which lasted over 20 years) with Sir Arthur Sullivan The first two comic operas, *Thespis, or The Gods grown Old* (Sept 26, 1871) and *Trial by Jury* (Royalty, March 25, 1875), were merely essays. Like one or two of their successors, they were, as regards plot, little more than extended "Bab Ballads" Later (especially in the *Yeomen of the Guard*), much more elaboration was attempted The next piece was produced at the Opera Comique (Nov 17, 1877) as *The Sorcerer* At the same theatre were successfully given *H M S Pinafore* (May 25, 1878), *The Pirates of Penzance; or The Slave of Duty* (April 3, 1880), and *Patience; or Bunthorne's Bride* (April 23, 1881) In Oct 1881 *Patience* was removed to a new theatre, the Savoy, specially built for the Gilbert and Sullivan operas by Richard D'Oyly Carte (*q v*) *Patience* was followed on Nov 25, 1882, by *Iolanthe; or The Peer and the Peri;* and then came, on Jan 5, 1884, *Princess Ida, or Castle Adamant*, a re-cast of a charming and witty fantasia which Gilbert had written some years previously, and had then described as a "respectful perversion of Mr. Tennyson's exquisite poem." The impulse reached its fullest development in the operas that followed next in order—*The Mikado; or The Town of Titipu* (March 14, 1885); *Ruddigore* (Jan. 22, 1887); *The Yeomen of the Guard* (Oct 3, 1888); and *The Gondoliers* (Dec 7, 1889) After the appearance of *The Gondoliers* a coolness occurred between the composer and librettist, Gilbert thought that Sullivan had not supported him in a business disagreement with D'Oyly Carte But the estrangement was only temporary Gilbert wrote several more librettos, and of these *Utopia Limited* (1893) and the exceptionally witty *Grand Duke* (1896) were written in conjunction with Sullivan

As a master of metre Gilbert had shown himself consummate, as a dealer in quips and paradoxes and ludicrous dilemmas, unrivalled Even for the music of the operas he deserves some credit, for the rhythms were frequently his own (as in "I have a Song to Sing, O"), and the metres were in many cases invented by himself One or two of his librettos, such as that of *Patience*, are virtually flawless Enthusiasts are divided only as to the comparative merit of the operas *Princess Ida* and *Patience* are in some respects the daintiest. There is a genuine vein of poetry in *The Yeoman of the Guard*. Some of the drollest songs are in *Pinafore* and *Ruddigore*. *The Gondoliers* shows the most charming lightness of touch, while with the general public *The Mikado* proved the favourite. The enduring popularity of the Gilbert and Sullivan operas was abundantly proved by later revivals. Among the birthday honours in June 1907 Gilbert was given a knighthood In 1909 his *Fallen Fairies* (music by Edward German) was produced at the Savoy Gilbert was drowned at Harrow Weald, Middlesex, on May 29, 1911 (T S)

See "W. S. Gilbert, An Autobiography" in *The Theatre* (April 2, 1883, pp. 217 *seq*), Edith A Browne, *W. S Gilbert* (1907), A Lawrence, *Life of Sir Arthur Sullivan* (1899), Cellier and Bridgeman, *Gilbert and Sullivan and their Operas* (Boston, 1914)

GILBERT DE LA PORREE (*c* 1075–1154), scholastic logician and theologian, was born at Poitiers, and educated under Bernard of Chartres and Anselm of Laon After teaching for some 12 years in Chartres, he lectured in Paris (from 1137), and in 1142 became bishop of Poitiers Gilbert's association with Abelard, and his heterodox opinions regarding the Trinity, led to his being attacked by Bernard of Clairvaux at the Synod of Reims in 1148, but he escaped formal condemnation He returned to his diocese where he died on Sept 4, 1154 His celebrated *De sex principiis*, often quoted by his successors, seeks to complete Aristotle's study of the categories, *substance, quantity, quality* and *relation* by an account of the remaining six, *when, where, action, passion, position* and *habit*, called *formas assistentes* His tendency towards extreme realism led him in his commentary on the *De Trinitate* of Boethius to come near to the theological heresy of tritheism For him, the pure form of existence, that by which God is God, must be distinguished from the three persons who are God by participation in this form, which is to say, *Deitas* or *Divinitas* must be distinguished from *Deus* In the same commentary he proclaims a negative theology, the simplicity of God making it impossible for Him to possess two factors one of which could be predicated of the other

BIBLIOGRAPHY—*De sex principiis* and commentary on the *De Trinitate* in Migne, *Patrol Lat* lxiv, 1255, and clxxxviii, 1257; *see* also Abbé Berthaud, *Gilbert de la Porrée* (Poitiers, 1892), B Hauréau, *Hist de la phil. scolastique*, H Usener, "G de la Porree" in *Jahrb. f prot Theol* (1879), Prantl, *Geschichte d Logik*, ii, Poole, *Illustrations of the Hist. of Mediaeval Thought* (2nd ed, 1920), Grabmann, *Gesch der schol Method*, vol ii (Freiburg i/B, 1911), and Duhem, *Le Système du Monde*, t. iii. (1915)

GILBERT OF SEMPRINGHAM, ST., founder of the Gilbertines, the only religious order of English origin, was born at Sempringham in Lincolnshire, *c* 1083–89 He was educated in France, and ordained in 1123, being presented by his father to the living of Sempringham About 1135 he established there a convent for nuns, and to perform the heavy work and cultivate the fields he formed a number of labourers into a society of lay brothers attached to the convent Similar establishments were founded elsewhere, and in 1147 Gilbert tried to get them incorporated in the Cistercian order Failing in this, he formed com-

munities of priests and clerics to perform the spiritual ministrations needed by the nuns The women lived according to the Benedictine rule as interpreted by the Cistercians; the men according to the rule of St Augustine, and were canons regular The special constitutions of the order were largely taken from those of the Premonstratensian canons and of the Cistercians Like Fontevrault (*q v*) it was a double order, both communities living side by side, but, though the property belonged to the nuns, the superior of the canons was the head of the whole establishment, and the general superior was a canon, called "Master of Sempringham" The general chapter was a mixed assembly composed of two canons and two nuns from each house The order received papal approbation in 1148. By Gilbert's death (1189) there were nine double monasteries and four of canons only, containing about 700 canons and 1,000 nuns in all At the dissolution there were some 25 monasteries The order never spread beyond England

See Bollandists' *Acta Sanctorum* (Feb 4); Dugdale, *Monasticon* (1846), Helyot, *Hist des ordres religieux* (1714), II c 29, R Graham, *St. Gilbert of Sempringham, and the Gilbertines* (1901), and F A Gasquet, *English Monastic Life* (1904)

GILBERT FOLIOT (d 1187), bishop of Hereford, and of London, is first mentioned as a monk of Cluny, whence he was called in 1136 to plead the cause of the empress Matilda against Stephen at the Roman court Shortly afterwards he became prior of Cluny, then prior of Abbéville, a house dependent upon Cluny In 1139 he was elected abbot of Gloucester The appointment was confirmed by Stephen, and from the ecclesiastical point of view was unexceptionable But the new abbot proved himself a valuable ally of the empress, and her ablest controversialist Gilbert's reputation grew rapidly He was respected at Rome, and he acted as the representative of the primate, Theobald, in the supervision of the Welsh church In 1148, on being nominated by the pope to the see of Hereford, Gilbert with characteristic wariness sought confirmation both from Henry of Anjou and from Stephen But he was an Angevin at heart, and after 1154 was treated by Henry II with every mark of consideration He was Becket's rival for the primacy, and the only bishop who protested against the king's choice Becket, with rare forbearance, endeavoured to win his friendship by procuring for him the see of London (1163) But Gilbert evaded the customary profession of obedience to the primate, and apparently aspired to make his see independent of Canterbury On the questions raised by the Constitutions of Clarendon he sided with the king, whose confessor he had now become He urged Becket to yield, and, when this advice was rejected, encouraged his fellow-bishops to repudiate the authority of the archbishop In the years of controversy which followed Becket's flight the king depended much upon the bishop's skill as a disputant and diplomatist Gilbert was twice excommunicated by Becket, but both on these and on other occasions he showed great dexterity in detaching the pope from the cause of the exile To him it was chiefly due that Henry avoided an open conflict with Rome of the kind which John afterwards provoked Gilbert was one of the bishops whose excommunication in 1170 provoked the king's knights to murder Becket; but he cannot be reproached with any share in the crime His later years were uneventful, though he enjoyed great influence with the king and among his fellow-bishops Scholarly, dignified, ascetic in his private life, devoted to the service of the Church, he was nevertheless more respected than loved His nature was cold, he made few friends, and the taint of a calculating ambition runs through his whole career He died in the spring of 1187

See Gilbert's *Letters*, ed J A Giles (1845), *Materials for the History of Thomas Becket*, ed J C Robertson (Rolls series, 1875–1885); and Miss K Norgate's *England under the Angevin Kings* (1887)

(H W C. D)

GILBERT ISLANDS, an extensive archipelago belonging to Great Britain in the mid-western Pacific ocean, lying north and south of the Equator The principal islands are Butaritary, Makin, Tarawa, Abaiang, Marakei, Maiana, Abemama, Kuria, Aranuka, Nonouti, Tabitever, Beru, Nukunau, Onotoa, Tamana and Arorae Area, 166 sq miles Pop (1926), 23,250 The principal crops are pandanus fruit and coconuts Phosphate, copra and shark fins are exported. The islands were proclaimed as protectorates in 1892 The Gilber group, together with the Ellice islands, Fanning island, Washington island, Ocean, Christmas and other islands were annexed as the Gilbert and Ellice Islands colony in 1915. (*See* PACIFIC ISLANDS)

GILBEY, SIR WALTER, 1ST BART (1831–1914), English wine merchant, was born at Bishop Stortford After the Crimean War Walter Gilbey, and his brother Alfred, on the advice of their eldest brother Henry, a wholesale wine-merchant, started in the retail wine and spirit trade On account of the heavy duty on French, Portuguese and Spanish wines, the Gilbeys pushed the sales of colonial and particularly of South African wines The creation of the off-licence system by Gladstone in 1860, and the reductions in the duty on French wines effected by the commercial treaty of 1861, laid the foundation of their fortunes. Before long a leading local grocer was acting as the firm's agent in every district in England In 1864 Henry Gilbey joined his brothers Walter Gilbey was chairman of the private limited liability company into which the business was converted in 1893, and in the same year was created a baronet He died at Elsenham Hall, Essex, on Nov 12, 1914

GILDAS or **GILDUS** (516?–570), the earliest of British historians (*see* CELTIC LITERATURE, "Welsh"), surnamed by some Sapiens, and by others Badonicus Two short treatises exist, purporting to be lives of Gildas, and ascribed respectively to the 11th and 12th centuries, but they seem to confuse two, if not more, persons who had borne the name Gildas was almost certainly an ecclesiastic He went abroad, probably to France, in his 34th year, where after 10 years of hesitation and preparation, he composed the work bearing his name His materials, he tells us, were collected from foreign rather than native sources The *Cambrian Annals* give 570 as the year of his death

The writings of Gildas have come down to us under the title of *Gildae Sapientis de excidio et conquestu Britanniae* The work is now usually divided into three portions,—a preface, the history proper, and an epistle,—the last, largely made up of Scriptural passages brought together for the purpose of condemning the vices of his countrymen and their rulers, being the longest but least important In the second he passes in brief review the history of Britain from its invasion by the Romans till his own times Among other matters he refers to the persecution under Diocletian, the election of Maximus as emperor by the legions in Britain, the final abandonment of the island by the Romans and the coming of the Saxons under Vortigern Unfortunately his statements are vague and obscure With one exception (the date of the battle of Mount Badon referred to in connection with the date of his own birth, *see* ARTHUR) no dates are given, and events are not always taken up in the order of their occurrence These faults become serious when, as is the case from nearly the beginning of the 5th century to the date of his death, Gildas's brief narrative is our only authority for most of what passes current as the history of England Thus it is on his sole, though in this instance perhaps trustworthy, testimony that the famous letter rests, said to have been sent to Rome in 446 by the despairing Britons, commencing —"To Agitius (Aetius), consul for the third time, the groans of the Britons"

Gildas's treatise was first published in 1525 by Polydore Vergil, but with many avowed alterations and omissions In 1568 John Josseline, secretary to Archbishop Parker, issued a more accurate edition, and in 1691 a still better edition appeared at Oxford by Thomas Gale The next English edition described by Potthast as *editio pessima* was published by the English Historical Society in 1838, and edited by the Rev J Stevenson The text of Gildas founded on Gale's edition collated with two other mss, with elaborate introductions, is included in the *Monumenta Historica Britannica*, edited by Petrie and Sharpe (1848) Another edition is in A W Haddan and W Stubbs, *Councils and Eccles. Documents* relating to Great Britain (Oxford, 1869); *see* also Theodor Mommsen's edition in *Monum Germ hist auct antiq* xiii, *Chronica minora saeculorum iv–vii.* vol iii (1898). For useful bibliographical notes *see* C Gross, *Sources of English History* (1915), and E K Chambers, *Arthur of Britain* (1927).

GILDER, RICHARD WATSON (1844–1909), American editor and poet, was born in Bordentown, New Jersey, Feb 8, 1844 Although in later life apropos of his honorary doctor's degrees from several institutions, he spoke of his "total freedom from collegiate training" and "general ignorance," Gilder early manifested a taste for letters, which his father, a minister and teacher, encouraged As a boy he edited a paper of his own and had some poetry and even a youthful formless novel published in the newspapers, and although his father's death and brother's absence in the Civil War, in which he himself had a brief experience as a soldier, threw a heavy domestic burden on his youthful shoulders, forcing him to take the most lucrative position obtainable, he soon drifted into newspaper work After several years with the Newark (New Jersey) *Daily Advertiser,* he founded, with R Newton Crane, the *Newark Morning Register.* Because of the paper's financial weakness and final failure, Gilder for a year (1869–70) held a second editorial position on *Hours at Home,* and in 1870 accepted the assistant editorship of *Scribner's Monthly* (later the *Century Magazine*), of which he became editor in 1881. Throughout this time he was contributing verse to the magazines and reviews, and descriptive pieces to the newspapers, but the great development of his lyric impulse came after his introduction by Helen Hunt, later Mrs Jackson, to his future wife, Helena de Kay Miss de Kay, a granddaughter of Joseph Rodman Drake, was at that time a student of art at Cooper Union Her knowledge of art and music widened Gilder's appreciation, and after their marriage June 3, 1874, their studio home became a social centre for some of the most distinguished men and women of the day The immediate fruit of this new relationship was *The New Day* (1875), tender and beautiful love sonnets, which were followed by *The Celestial Passion* (1878), a sequel and companion volume Gilder's later verse, although dominantly lyric, shows to some extent the factors so prominent in his life—patriotism, enthusiastic participation in the best artistic movements of the day and burning indignation at abuses Not only is he credited with a revolution in magazine management, but his days were filled with public addresses, committee meetings, and disinterested labours of all sorts Perhaps most memorable were his efforts on behalf of international copyright and as chairman of the New York Tenement House Commission in 1894 Mrs Gilder not only continued her painting but translated Sensier's biography of Millet, assisted in founding the Society of American Artists, and throughout 35 years of companionship proved an ideal wife and mother Gilder, who had several breakdowns because of overwork, died on Nov 18, 1909.

Gilder published ten books of verse, *Lyrics and Other Poems* (1885) and *Five Books of Song* (1894), being collective editions of his work until those years His complete poems appeared in 1908 His full and upright life is best brought out in his *Letters,* edited by his daughter Rosamond Gilder (1916) Brander Matthews gives an admirable estimate, "Richard Watson Gilder," in the *North American Review* (Jan 1910)

GILDERSLEEVE, BASIL LANNEAU (1831–1924), American classical scholar, born in Charleston (S C) on Oct 23, 1831, graduated at Princeton in 1849, and studied at Berlin, Bonn and Gottingen From 1856 to 1876 he was professor of Greek in the University of Virginia, holding the chair of Latin also in 1861–66, and in 1876 he became professor of Greek in the newly-founded Johns Hopkins university, a position from which he retired in 1915 In 1880 *The American Journal of Philology* was established under his editorial charge

He published a *Latin Grammar* (1867; revised, with the co-operation of Gonzalez B Lodge, 1894 and 1899) and a Latin series for use in secondary schools (1875), both marked by lucidity of order and mastery of grammatical theory and methods His edition of *Persius* (1875) is of great value. But his bent was rather toward Greek than Latin His special interest in Christian Greek was partly the cause of his editing in 1877 *The Apologies of Justin Martyr,* "which"—to use his own words—"I used unblushingly as a repository for my syntactical formulae " His *Syntax of Classical Greek* from Homer to Demosthenes with C W. E Miller (Part I., 1900; Part II , 1911) collects these formulae Gildersleeve edited in 1885 *The Olympian and Pythian Odes of Pindar,* with a brilliant and valuable introduction His views on the function of grammar were summarized in a paper on *The Spiritual Rights of Minute Research* delivered at Bryn Mawr in 1895, and his collected contributions to literary periodicals appeared in 1890 under the title *Essays and Studies Educational and Literary* He was also the author of *Hellas and Hesperia* (1909) and of *Creed of the Old South* (1915) He died in Baltimore on Jan 9, 1924

GILDING, the art of spreading gold, either by mechanical or chemical means, over the surface of a body for the purposes of protection or ornament The art of gilding was known to the ancients According to Herodotus, the Egyptians were accustomed to gild wood and metals, and gilding by means of gold plates is frequently mentioned in the Old Testament Pliny informs us that the first gilding seen at Rome was after the destruction of Carthage, under the censorship of Lucius Mummius, when the Romans began to gild the ceilings of their temples and palaces, the capitol being the first place on which this enrichment was bestowed Owing to the comparative thickness of the gold-leaf used in ancient gilding, the traces of it which yet remain are remarkably brilliant and solid Gilding has in all times occupied an important place in the ornamental arts of Oriental countries, and the native processes pursued in India at the present day may be taken as typical of the arts as practised from the earliest periods

Modern gilding is applied to numerous surfaces and by various processes, making the art an important part of widely different ornamental and useful arts It forms an important and essential part of picture framemaking (*see* FRAME), is largely employed in connection with cabinet-work, decorative painting and house ornamentation, and is of great importance in bookbinding and ornamental leather work Further, gilding is much employed in electro-gilt reproductions and in electro-plating, and is also a characteristic feature in the decoration of pottery, porcelain and glass Any of these various processes may, however, fall under one of two heads—mechanical gilding and chemical gilding

MECHANICAL GILDING

This embraces all the operations by which gold-leaf is prepared (*see* GOLDBEATING), and the several processes by which it is mechanically attached to the surfaces it is intended to cover It thus embraces the burnish or water-gilding and the oil-gilding of the carver and gilder, and the gilding operations of the house decorator, the sign-painter, the bookbinder, the paper-stainer and several others Polished iron, steel and other metals are gilded mechanically by applying gold-leaf to the metallic surface at a temperature just under red-heat, pressing the leaf on with a burnisher and reheating, when additional leaf may be laid on The process is completed by cold burnishing Copper and wood are perhaps the most widely used bodies for the application of gilding

Copper Gilding.—For the gilding of copper, employed in the decoration of temple domes and other large works, the following is an outline of the process employed The metal surface is thoroughly scraped, cleaned and polished, and then sufficiently heated in a fire to remove any traces of grease or other impurity which may remain from the operation of polishing It is then dipped in an acid solution prepared from dried unripe apricots, and rubbed with pumice or brick powder Next, the surface is rubbed over with mercury, which forms a superficial amalgam with the copper, after which it is left some hours in clean water, again washed with the acid solution and dried It is now ready for receiving the gold, which is laid on in leaf, and, on adhering, assumes a grey appearance from combining with the mercury, but on the application of heat, the latter metal volatilizes, leaving the gold a dull, greyish hue The colour is brought up by means of rubbing with agate burnishers The weight of mercury used in this process is double that of the gold laid on, and the thickness of the gilding is regulated by the circumstances or necessities of the case For the gilding of iron or steel, the surface is first scratched over with chequered lines, then washed in a hot solution of green apricots, dried and heated just short of red-heat The gold-leaf is then laid on, and rubbed in with agate burnishers, when it adheres by catching into the prepared scratched

surface.

Wood Gilding.—In applying gilding to wood, after the surface has been sand-papered in order to remove all sharp edges, followed by a very careful dusting, the glue priming size stage is of first importance

Priming—Glue size is made by mixing an ounce of glue to a gill and one-half of water, and allowing it to soak at least two hours, after which the mixture is placed in a double boiler and heated until it has become all liquid, then it is removed to set. The combination, which is of jelly-like appearance, can then be cut into blocks or squares, and is generally known as the stock glue size It is the supply base for all following sizes where glue is used as an ingredient

Sizing, a term used mostly by painters, is primarily applied to the act of glazing the surface of the material to be gilded For this preparation, the stock glue size is thinned by mixing a two-thirds proportion of water and dissolving the combination by heat in a double boiler, being careful not to place the vessel near an open fire

It is necessary for this size to be painted on the raw wood when the combination is still warm It is well also to have the surface moderately warm so that the size will not form a film on the surface of the wood, but will soak into the grain and act as a filler It is also necessary to remove any superfluous liquid and blank spaces that may appear just after the glue size is applied. From two to five hours are required for the wood to dry. The glue priming size is followed by the whiting size This size is made by adding another one-third portion of water to the stock glue size and then heating

The First Coat of Whiting—After this mixture has reached the proper temperature, which is somewhat under boiling, sprinkle in the best quality of bolted whiting until the mixture becomes a thick cream

The first coat of whiting should be applied in a stipple-like fashion, which enables the second coat to have a gripping surface on which to take a better hold. This stippling should be given at least two hours to dry After the first coat has been applied and allowed sufficient time to dry, the surface should be carefully examined for imperfections such as miscuts, openings at joints, or nail holes These imperfections require considerable care in filling with putty, made in the following manner —

Putty Filler—Make a depression in the stock dry whiting, and pour in a small amount of stock size glue, which should be heated Take a putty stick and work it around until it becomes a doughy mass of whiting and glue When it has finally been kneaded sufficiently to allow handling, work it in the palm of the hand until it becomes as pliable as common painter's putty In placing this prepared putty into the blemishes on the wood, moisten each particle immediately before putting it into place It is also advisable to use a little moisture in smoothing over the surface and removing any superfluous putty

The second coat of whiting or filling coat is also called the smooth coat It is applied as evenly and smoothly as possible, with the exception of the parts that are desired to retain a stippled effect, in which case, the stipple is repeated and applied on the parts as in the previous coat Do the stippling before finally smoothing the other surfaces with a brush

The third coat, if necessary, is next applied This all depends on the surface to be gilded and the amount of ornamentation, and is mainly intended to produce a pleasing effect When the desired body of whiting has been applied and has dried for at least two hours, the parts which are to remain smooth are rubbed down with a damp cloth If necessary, especially in deep ornamentation, a brush will answer this purpose better After the moist smoothing of the surface has been accomplished, it is gone over with a fine piece of sandpaper (0 or 00) in order to remove the burr which is caused by the damp smoothing After removing all dust after sand-papering, it is ready for its first coat of gold size

Gold Size is applied in much the same manner as paint would be applied, which means working it out smoothly so as to prevent any surplus remaining in corners or causing puddles Where ornamentation is deep, puddles or floods in hollows are causes of crackling and endless trouble, and one of the most common warnings to an apprentice is, "Don't let the depths fill up"

A Second Coat, and sometimes a third, is applied in like manner, being careful again to allow the surface to dry well after each application and sandpaper to remove any surface burrs. After this, the wood is again dusted off carefully and a coat of very weak size is applied, by heating a piece of stock glue until it is completely dissolved This weak size must not be applied in a hot state and must be of an even, cool temperature before applying; in fact, less warm than luke-warm. The weak size must be applied by a long soft-haired brush, avoiding puddles in the depths and with such a gentle touch that you do not disturb the gold size A weak size solution is made as follows A piece of stock size glue the size of a lima bean dissolved in one gill of hot water, allowed to cool, add a few drops of denatured alcohol.

Burnished gold size is made as follows. Take a desired amount of the basic (red clay, blue clay or any one of many more colours as it comes in the jar) place it in the vessel and add cold water Stir until it has reached such a consistency that the brush will stand upright in it, then place it in the heater to remain only long enough to take off the chill The stock glue, having previously been placed in a heater to bring to a very high temperature, is poured, a little at a time, into the clay, stirring the mixture in a rapid, agitative manner, adding glue until it reaches the consistency of just wanting to drip from the brush in a heavy, creamy form, the jar containing the burnished gold size is covered and allowed to set over night to ascertain its strength, which should be of a jelly consistency

A test of gold size for immediate use is made as follows Apply very thinly, a coat of the size on the thumb nail or two other finger nails, so that it may dry through the heat of the finger and fanning in the air When this has dried, take the opposite thumb nail and begin to burnish the nail that holds the gold size If it comes off, it lacks glue, if it is dull and slaty looking, it lacks body clay, but if it burnishes by the finger nail action and has a mellow lustre, the test is successful and the size is ready for use.

Hints on Application—Gold size must never be cold, nor can it be warm when it is applied In laying gold-leaf with the hair tip, a solution of a few drops of alcohol in water should be added to the gold sizing before the leaf is flipped on Also, if possible, keep the wood tilted so that the liquid will run down and not remain in puddles in any one spot Burnishing must be done within 48 hours, the sooner the better, after the liquid and gold size have dried, but the minimum should be four hours for drying After burnishing the surface, it may be necessary to apply small patches of gold in spots where it did not adhere in the first laying

Faulting, or patching, is done in the same manner as gilding with the exception that the solution in this case should contain a greater percentage of alcohol, which quickens the drying Small patches dry in about 30 minutes After the patching has been completed, then, with a soft brush, preferably goat hair or badger, dust off all surplus particles of gold, so that they will not mix with the lacquer which follows When the burnishing has been done, take some weak size and with a camel's hair brush, apply very lightly a coat all over, not with a heavy brush motion, but just laying it on When dry, which takes about one hour, the wood is ready for lacquering

Lacquering is the process in which pure white shellac, diluted with denatured alcohol until it flows in a watery state, is applied with a camel's hair brush in a light manner The lacquer must dry for about ten hours, after which the wood is ready for toning

Any desired effect may be obtained by dissolving a pigment with turpentine and adding a few drops of painters' dryer, which acts as a binder It should have the consistency of thin, transparent white raw umber or zinc white This medium is freely applied, allowing it to settle into the depths, removing the surplus from all high light with cheese cloth or soft, absorbent cloth After a few moments, the final effect can be obtained by

an additional light wiping with the cloth, although the best results are often obtained by using the fingers instead of a rag. It is advisable not to tone, at any one time, a greater surface than can be kept under control, because within ten minutes, this tone so strongly adheres to the lacquer that erasure is difficult

(A E)

CHEMICAL GILDING

This embraces those processes in which the gold used is at some stage in a state of chemical combination Of these the following are the principal —

Cold Gilding.—In this process the gold is obtained in a state of extremely fine division, and applied by mechanical means. Cold gilding on silver is performed by a solution of gold in aqua-regia applied by dipping a linen rag into the solution, burning it, and rubbing the black and heavy ashes on the silver with the finger or a piece of leather or cork

Wet Gilding is effected by means of a dilute solution of chloride of gold with twice its quantity of ether The liquids are agitated and allowed to rest, when the ether separates and floats on the surface of the acid. The whole mixture is then poured into a funnel with a small aperture, and allowed to rest for some time, when the acid is run off and the ether separated. The ether will be found to have taken up all the gold from the acid, and may be used for gilding iron or steel, for which purpose the metal is polished with the finest emery and spirits of wine. The ether is then applied with a small brush, and as it evaporates it deposits the gold, which can now be heated and polished. For small delicate figures a pen or a fine brush may be used for laying on the ether solution.

Fire-gilding or Wash-gilding is a process by which an amalgam of gold is applied to metallic surfaces, the mercury being subsequently volatilized, leaving a film of gold or an amalgam containing from 13 to 16% of mercury. In the preparation of the amalgam the gold must first be reduced to thin plates or grains, which are heated red hot, and thrown into mercury, previously heated, till it begins to smoke Upon stirring the mercury with an iron rod, the gold totally disappears The proportion of mercury to gold is generally six or eight to one When the amalgam is cold it is squeezed through chamois leather for the purpose of separating the superfluous mercury, the gold, with about twice its weight of mercury, remains behind, forming a yellowish, silvery mass of the consistency of butter When the metal to be gilded is wrought or chased, it ought to be covered with mercury before the amalgam is applied, that this may be more easily spread, but when the surface of the metal is plain, the amalgam may be directly applied to it When no such preparation is applied, the surface to be gilded is simply bitten and cleaned with nitric acid A deposit of mercury is obtained on a metallic surface by means of "quick-silver water," a solution of nitrate of mercury, the nitric acid attacking the metal to which it is applied, and thus leaving a film of free metallic mercury The amalgam being evenly spread over the prepared surface of the metal, the mercury is then sublimed by a heat just sufficient for that purpose, for, if it is too great, part of the gold may be driven off, or it may run together and leave some of the surface of the metal bare When the mercury has evaporated, which is known by the surface having entirely become of a dull, yellow colour, the metal must undergo other operations, by which the fine gold colour is given to it.

First, the gilded surface is rubbed with a scratch brush of brass wire, until its surface is smooth; then it is covered with a preparation called "gilding wax" and again exposed to the fire until the wax is burnt off This wax is composed of bees-wax mixed with some of the following substances. viz., red ochre, verdigris, copper scales, alum, vitriol, borax. By this operation the colour of the gilding is heightened, and the effect seems to be produced by a perfect dissipation of some mercury remaining after the former operation. The dissipation is well effected by this equable application of heat. The gilt surface is then covered over with nitre, alum or other salts ground together, and mixed up into a paste with water or weak ammonia The piece of metal thus covered is exposed to a certain degree of heat, and then quenched in water. By this method its colour is further improved and brought nearer to that of gold, probably by removing any particles of copper that may have been on the gilt surface. This process, when skilfully carried out, produces gilding of great solidity and beauty; but owing to the exposure of the workmen to mercurial fumes, it is very dangerous, and besides there is much loss of mercury.

Gilding of Pottery and Porcelain.—The quality of gold consumed for these purposes is very large The gold used is dissolved in aqua-regia, and the acid is driven off by heat, or the gold may be precipitated by means of sulphate of iron In this pulverulent state the gold is mixed with one-twelfth of its weight of oxide of bismuth, together with a small quantity of borax and gum water The mixture is applied to the article with a camel's-hair pencil, and after passing through the fire is of a dingy colour, but the lustre is brought out by burnishing with agate and bloodstone, and afterwards cleaning with vinegar or white lead (*see* POTTERY)

GILDS: *see* GUILDS

GILEAD, a name used to denote the whole of the territory occupied by the Israelites between the plateaus of Moab and the Hauran, and sometimes in a wider and more general sense to denote the region extending from the river Arnon, to the base of Hermon. It is a country of high forest ridges (average height, 2,500 ft) lying between the Jordan and the desert plateau The base slopes are of sandstone partly covered by white marls and the upper of limestone scored and riven by numerous *wadis* Whilst the gentle declivities towards the eastern plateau have tended to be bare of trees, the western slopes, prior to the World War, were well clothed with oak, terebinth and pine Gilead is in the main a fertile and beautiful land. "The pastures are everywhere luxuriant, and the wooded heights and winding glens, in which the tangled shrubbery is here and there broken up by open glades and flat meadows of green turf, exhibit a beauty of vegetation such as is hardly to be seen in any other district of Palestine"

History.—The name Gilead first appears in the narrative of the reconciliation of Jacob and Laban (Gen xxxi), where the composite nature of the narrative renders identification of locality difficult, and was in use in the time of Josephus, and even later, but with no precise geographical definition In the Israelitic conquest of the territory east of the Jordan Sihon was crushed at Jahaz, south of Heshbon (Num xxi, 23) and Og, king of Bashan, smitten at Edrei (Deut i, 5) In the division of the land the southern half of Gilead fell to Reuben and Gad (according to one account) and the northern half to Manasseh Gideon on the soil of Gilead swept back the routed hosts of Midian (Judges viii), Jephthah the Gileadite smote the Ammonites from Aroer to Minnith (Judges xi) and dealt faithfully with the treacherous men of Ephraim when their tongues betrayed them at the fords of Jordan (Judges xii) Gilead was the scene of the fierce battle between David and Absalom Round Ramoth-Gilead many bitter struggles were waged and Ahab perished before its walls. The land, too, played a prominent part in the Maccabean revolt

It was the fate of the Gileadites to meet the first shock of the Syrian onslaughts and the rolling tide of Assyrian invasion The Gilead hill country appears to have bred a bold, independent people, but kindly and hospitable Its intricate country formed a refuge for royalty expectant or in eclipse. Saul's son, Ishbosheth, was here made king by Abner To its friendly shelter Absalom fled before the anger of his father and abode three years, and David, too, when Absalom's rebellion was at its height, found harbourage and a kindly welcome It was men of Jabesh-Gilead who risked their lives to recover the bodies of Saul and his sons from the walls, or market-place of Beth-Shan (Beisān). From his home amongst the Gilead hills Elijah emerged to become one of the world's great spiritual leaders, and twice at least did Jesus visit the region—the land beyond Jordan To Josephus it was Peraea, a land of small provinces whose names re-echoed the centres in which Greek colonists had established themselves during the reign of the Seleucidae Gilead had as chief cities in Old Testament times, Mahanaim, Succoth, Penuel, Mizpeh, Jazer, Ramoth-Gilead, Jabesh-Gilead, and in later times Pella (Fihl), Gerasa (Jerāsh) and others. Ramoth and Mahanaim were stations

of two out of three of Solomon's commissariat officers. The country was later extensively and intensively Romanized, as architectural monuments witness, and it is difficult, apart from excavations still to be undertaken, to determine where the Old Testament cities of Gilead lie under their Roman covering Ramoth-Gilead especially has been sought in a variety of places

The balm associated with Gilead is probably to be identified with mastic, the resin furnished by the *Pistachia Lentiscus* Gilead is now part of the new territory of Trans-Jordan under British mandate.

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GILES, ST., who flourished in the 6th or 7th century, is said to have been an Athenian of royal descent After the death of his parents he distributed his possessions among the poor, and went to Arles. Two years later, he retired to a neighbouring desert, where he was discovered by Flavius, the king of the Goths, who built a monastery and made Giles the first abbot St Giles was buried probably in the hermitage which he had founded in a spot which was afterwards the town of St -Gilles (diocese of Nîmes, department of Gard) In 808 Charlemagne took the abbey of St -Gilles under his protection, and it is mentioned among the monasteries from which only prayers for the prince and the State were due St Giles is the special patron of lepers, beggars and cripples, and his feast is celebrated on Sept 1

See *Acta Sanctorum*, E Rembry, *Saint Gilles* (Bruges, 1881); and Butler, *Lives of the Saints*

GILGAL (*ie*, "circle" of sacred stones), the name of several places in western Palestine mentioned in the Old Testament The most important is that situated near Jericho (*Josh* iv 19 xv. 7). Josephus has recorded that it was 10 stadia, and Jerome that it was 2 Roman miles, from Jericho, but neither was explicit in its location The latter speaks of it as a deserted place held in deep veneration by the natives The sacredness of the spot may have been due to the erection there of the 12 memorial stones (Josh iv 20) Zschokke (1865), Conder (1874) and Dalman (1911), identify it with sites at or near Khirbet el-Ethilek between Jericho and Jordan, and about 1½ m from Jericho Another Gilgal, mentioned in Josh xii 23, appears to have been situated in the maritime plain This has been identified with Jiljuliyeh, 4 m N of Antipatris A third Gilgal (2 Ki iv 38) was in the mountains near Bethel, evidently the modern Jiljuliyeh, about 7 m N of Bethel (Beitîn) A fourth Gilgal (Deut xi 30) would seem to be suggested in the neighbourhood of Mt Gerizim A place called Juleijil 1 m E of the foot of Mt Gerizim is a likely identification

See articles in *Encyclop Biblica* and Hastings' *Dict. of the Bible;* G. Dalman, "Gilgal bei Jericho," *Palastina-Jahrbuch*, 7 (1911) 303 *seq*, C Niebuhr, "Gilgal als entwicklungsgeschichtliches Problem," *Orient Litt. Zeitung*, 23 (1920) 105 *seq*; G Dalman, "der Gilgal d Bibel und die Steinkreise Palastinas," *Palastina-Jahrbuch*, 15 (1920), 5 *seq* (E Ro)

GILGAMESH, EPIC OF, the title given to one of the most important literary products of Babylonia, from the name of the chief personage in the series of tales of which it is composed.

Though the Gilgamesh Epic is known to us chiefly from the fragments found in the royal collection of tablets made by Assur-bani-pal, the king of Assyria (668–626 B C) for his palace at Nineveh, internal evidence points to the high antiquity of at least some portions of it, and the discovery of tablets two and three and of a fragment of the epic in the older form of the Babylonian script, which can be dated *c* 2000 B C, confirms this view. Equally certain is a second observation of a general character that the epic originating, as the greater portion of the literature in Assur-bani-pal's collection, in Babylonia is a composite product, that is to say, it consists of a number of independent stories or myths originating at different times and united to form a continuous narrative with Gilgamesh as the central figure This view naturally raises the question whether the independent stories were all told of Gilgamesh or, as almost always happens in the case of ancient tales, were transferred to Gilgamesh as a favourite popular hero Internal evidence again comes to our aid to lend its weight to the latter theory.

Gilgamesh is said to have been a king in the first dynasty of Erech, and to have reigned 126 years, but he belongs to an age that could only have preserved a dim recollection of his achievements and adventures through oral traditions The name[1] is Sumerian and fragments of an early Sumerian poem concerning him have been found at Nippur Why and how he came to be a popular hero in Babylonia cannot with our present material be determined, but the epic indicates that he came as a conqueror and established himself at Erech In so far we have embodied in the first part of the epic dim recollections of actual events, but we soon leave the solid ground of fact and find ourselves soaring to the heights of genuine myth Gilgamesh becomes a god, and in certain portions of the epic clearly plays the part of the sun-god of the spring-time, taking the place apparently of Tammuz or Adonis, the youthful sun-god, though the story shows traits that differentiate it from the ordinary Tammuz myths A separate stratum in the Gilgamesh epic is formed by the story of Enkidu—introduced as the friend of Gilgamesh, who joins him in his adventures There can be no doubt that Enkidu, who symbolizes primeval man, was a figure originally entirely independent of Gilgamesh, but his story was incorporated into the epic by that natural process to be observed in the national epics of other peoples, which tends to connect the favourite hero with all kinds of tales that for one reason or the other become embedded in the popular mind Another stratum is represented by the story of a favourite of the gods known as Ut-Napishtim, or in Sumerian Zi-û-sud-ra, the Xisuthros of Berossos, who is saved from a destructive storm and flood that destroys his fellow-citizens of Shuruppak Gilgamesh is artificially brought into contact with Ut-Napishtim, to whom he pays a visit for the purpose of learning the secret of immortal life and perpetual youth which he enjoys During the visit Ut-Napishtim tells Gilgamesh the story of the flood and of his miraculous escape Nature myths have been entwined with other episodes in the epic and finally the theologians took up the combined stories and made them the medium for illustrating the truth and force of certain doctrines of the Babylonian religion In its final form, the outcome of an extended and complicated literary process, the Gilgamesh Epic covered 12 tablets, each tablet devoted to one adventure in which the hero plays a direct or indirect part, and the whole covering according to the most plausible estimate about 3,000 lines Of all 12 tablets portions have been found among the remains of Assur-bani-pal's library, but some of the tablets are so incomplete as to leave even their general contents in some doubt The fragments do not all belong to one copy Of some tablets portions of two, and of some tablets portions of as many as four, copies have turned up, pointing, therefore, to the great popularity of the production The best preserved are tablets VI and XI, and of the total about 1,500 lines are now known, wholly or in part, while of those partially preserved quite a number can be restored A brief summary of the contents of the 12 may be indicated as follows

In the 1st tablet, after a general survey of the adventures of Gilgamesh, his rule at Erech is described, where he enlists the services of all the young able-bodied men in the building of the great wall of the city The people sigh under the burden imposed, and call upon the goddess Aruru to create a being who might act as rival to Gilgamesh, curb his strength, and dispute his tyrannous control The goddess consents, and creates Enkidu, who is described as a wild man, living with the gazelles and the beasts of the field Enkidu, whose name points to the tradition which made Ea (*q v*) the creator of humanity, symbolizes primeval man Through a hunter, Enkidu and Gilgamesh are brought together, but instead of becoming rivals, they are joined in friendship Enkidu is induced by the snares of a maiden to abandon his life with the animals and to proceed to Erech, where Gilgamesh,

[1]The name of the hero, written always ideographically, was for a long time provisionally read *Izdubar*, but a tablet discovered by T G Pinches gave the equivalent *Gilgamesh* (*see* Jastrow, *Religion of Babylonia and Assyria*, p 468).

who has been told in several dreams of the coming of Enkidu, awaits him Together they proceed upon several adventures, which are related in the following four tablets At first, indeed, Enkidu curses the fate which led him away from his former life, and Gilgamesh is represented as bewailing Enkidu's dissatisfaction. The sun-god Shamash calls upon Enkidu to remain with Gilgamesh, who pays him all honours in his palace at Erech With the decision of the two friends to proceed to the forest of cedars in which the goddess Irnina—a form of Ishtar—dwells, and which is guarded by Khumbaba, the 2nd tablet ends In the 3rd tablet, very imperfectly preserved, Gilgamesh appeals through the goddess Ninsun, mother of Gilgamesh, to the sun-god Shamash for his aid in the proposed undertaking The 4th tablet contains a description of the formidable Khumbaba, the guardian of the cedar forest. In the 5th tablet Gilgamesh and Enkidu reach the forest Encouraged by dreams, they proceed against Khumbaba, and despatch him near a specially high cedar over which he held guard In the 6th tablet Gilgamesh is wooed by the goddess of love, Ishtar Gilgamesh, recalling to the goddess the sad fate of those who fall victims to her charms, rejects the offer In the course of his recital snatches of other myths are referred to, including the famous Tammuz-Adonis tale, in which Tammuz, the youthful bridegroom, is slain by his consort Ishtar The goddess, enraged at the insult, asks her father Anu to avenge her A divine bull is sent to wage a contest against Gilgamesh, who is assisted by his friend Enkidu. This scene of the fight with the bull is often depicted on seal cylinders The two friends by their united force succeed in killing the bull, and then after performing certain votive and purification rites return to Erech, where they are hailed with joy In the 7th tablet Enkidu is smitten with sore disease, but the fragmentary condition of this and the succeeding tablet is such as to envelop in doubt the accompanying circumstances, including the cause and nature of his disease The 8th tablet records the death of Enkidu The 9th and 10th tablets, exclusively devoted to Gilgamesh, describe his wanderings in quest of Ut-Napishtim, from whom he hopes to learn how he may escape the fate that has overtaken his friend He goes through mountain passes and encounters lions At the entrance to the mountain Mashu, scorpionmen stand guard, from one of whom he receives advice as to how to pass through the Mashu district He succeeds in doing so, and finds himself in a wonderful park, which lies along the sea coast In the 10th tablet the goddess Sabitu, who, as guardian of the sea, first bolts her gate against Gilgamesh, after learning of his quest, helps him to pass in a ship across the sea to the "waters of death" The ferryman of Ut-Napishtim brings him safely through these waters, despite the difficulties and dangers of the voyage, and at last the hero finds himself face to face with Ut-Napishtim In the 11th tablet, Ut-Napishtim tells the famous story of the Babylonian flood Ut-Napishtim and his wife are anxious to help Gilgamesh to new life He is sent to a place where he washes himself clean from impurity He is told of a weed which restores youth to the one grown old Scarcely has he obtained the weed when it is snatched away from him by a serpent, and the tablet closes somewhat obscurely with the prediction of the destruction of Erech In the 12th tablet Gilgamesh succeeds in obtaining a view of Enkidu's shade, and learns through him of the sad fate endured by the dead With this description, in which care of the dead is inculcated as the only means of making their existence in Aralu, where the dead are gathered, bearable, the epic, so far as we have it, closes

The reason why the flood episode and the interview with the dead Enkidu are introduced is quite clear Both are intended as illustrations of doctrines taught in the schools of Babylonia, the former to explain that only the favourites of the gods can hope under exceptional circumstances to enjoy life everlasting, the latter to emphasize the impossibility for ordinary mortals to escape from the inactive shadowy existence led by the dead, and to inculcate the duty of proper care for the dead That the astro-theological system is also introduced into the epic is clear from the division into 12 tablets, which correspond to the yearly course of the sun, while throughout there are indications that all the adventures of Gilgamesh and Enkidu, including those which have an historical background, have been submitted to the influence of this system and projected on to the heavens. This interpretation of the popular tales, according to which the career of the hero can be followed in its entirety and in detail in the movements in the heavens, in time, with the growing predominance of the astral-mythological system, overshadowed the other factors involved, and it is in this form, as an astral myth, that it passes through the ancient world and leaves its traces in the folk-tales and myths of Hebrews, Phoenicians, Syrians, Greeks and Romans throughout Asia Minor and even in India

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GILGIT, an outlying province in the extreme north-west of India, over which Kashmir has reasserted her sovereignty Only a part of the basin of the river Gilgit is included within its political boundaries There is an intervening width of mountainous country, represented chiefly by glaciers and ice-fields, and intersected by narrow sterile valleys, measuring some 100 to 150 m in width, to the north and north-east, which separates the province of Gilgit from the Chinese frontier beyond the Muztagh and Karakoram This part of the Kashmir borderland includes Kanjut (or Hunza) and Ladakh To the north-west, beyond the sources of the Yasin and Ghazar in the Shandur range (the two most westerly tributaries of the Gilgit river) is the deep valley of the Yarkhun or Chitral Gilgit proper now forms a *wazarat* of the Kashmir states administered by a *wazir* Gilgit is the headquarters of a British political agent, directly responsible to the government of India for the administration of the outlying districts or petty states of Hunza, Nagar, Ashkuman, Yasin and Ghizar, the little republic of Chilas, etc These states acknowledge the suzerainty of Kashmir, paying an annual tribute in gold or grain, but they form no part of its territory

Within the wider limits of the former Gilgit agency are many mixed races, speaking different languages, which have all been usually classed together under the name Dard The Dard, however, is unknown beyond the limits of the Kohistan district of the Indus valley to the south of the Hindu Koh, the rest of the inhabitants of the Indus valley belonging to Shin republics, or Chilas The great mass of the Chitral population are Kho (speaking Khowar), and they may be accepted as representing the aboriginal population of the Chitral valley (*See* HINDU KUSH) Between Chitral and the Indus the "Dards" of Dardistan are chiefly Yeshkuns and Shins, and it would appear from the proportions in which these people occupy the country that they must have primarily moved up from the valley of the Indus in successive waves of conquest, first the Yeshkuns, and then the Shins The Shins are of Hindu origin and spread themselves northwards and eastwards as far as Baltistan, where they collided with the aboriginal Tatar of the Asiatic highlands The *wazarat* of Gilgit contains a population (1901) of 60,885, all Mohammedans, mostly of the Shiah sect, but not fanatical The dominant race is that of the Shins, whose language is universally spoken This is one of the so-called Pisacha languages, an archaic Aryan group intermediate between the Iranian and the Sanskritic

In general appearance and dress all the mountain-bred peoples extending through these northern districts are very similar Thick felt coats reaching below the knee, loose "pyjamas" with cloth "putties" and boots (often of English make) are almost universal, the distinguishing feature in their costume being the felt cap worn close to the head and rolled up round the edges Their temperament varies much with their habitat—those who live on the shadowed sides of mountains being distinctly more morose and more serious in disposition than the dwellers in valleys which catch the winter sunlight They are, at the same time, bloodthirsty and treacherous to a degree which would

appear incredible to a casual observer of their happy and genial manners, exhibiting a strange combination of "the monkey and the tiger" Addicted to sport of every kind, they are excellent agriculturists, and show great ingenuity in their local irrigation works.

Routes in the Gilgit Agency.—One of the oldest recorded routes through this country is that which connects Mastuj in the Chitral valley with Gilgit, passing across the Shandur range (12,250) It now forms the high-road between Gilgit and Chitral, and has been engineered into a passable route From the north three great glacier-bred affluents make their way to the river of Gilgit, joining it at almost equal intervals, and each of them affords opportunity for a rough passage northwards (1) The Yasin river, which follows a fairly straight course from north to south for about 40 m. from the foot of the Darkôt pass across the Shandur range (15,000) to its junction with the river Gilgit, close to the little fort of Gupis, on the Gilgit-Mastuj road Much of this valley is cultivated and extremely picturesque At the head of it is a grand group of glaciers, one of which leads up to the well-known pass of Darkôt. (2) 25 m (by map measurement) below Gupis the Gilgit receives the Ashkuman affluent from the north The little Lake of Karumbar is held to be its source, as it lies at the head of the river The same lake is sometimes called the source of the river Yarkhun or Chitral, and it seems possible that a part of its waters may be deflected in each direction The Karumbar, or Ashkuman, is nearly twice the length of the Yasin, and the upper half of the valley is encompassed by glaciers, rendering the route along it uncertain and difficult (3) 40 m or so below the Ashkuman junction, and nearly opposite the little station of Gilgit, the river receives certain further contributions from the north which are collected in the Hunza and Nagar basins These basins include a system of glaciers of such gigantic proportions that they are probably unrivalled in any part of the world The glacial head of the Hunza is not far from that of the Karumbar, and, like the Karumbar, the river commences with a wide sweep eastwards, following a course roughly parallel to the crest of the Hindu Kush (under whose southern slopes it lies close) for about 40 m Then striking south for another 40 m, it twists amidst the barren feet of gigantic rock-bound spurs which reach upwards to the Muztagh peaks on the east and to a mass of glaciers and snow-fields on the west, hidden amidst the upper folds of mountains towering to an average of 25,000 ft The next great bend is again to the west for 30 m, before a final change of direction to the south at the historical position of Chalt and a comparatively straight run of 25 m to a junction with the Gilgit The valley of Hunza lies some 10 m from the point of this westerly bend, and 20 (as the crow flies) from Chalt

Glaciers and Mountains.—Conway and Godwin Austen have described the glaciers of Nagar which, enclosed between the Muztagh spurs on the north-east and the frontier peaks of Kashmir (terminating with Rakapushi) on the south-west, and massing themselves in an almost uninterrupted series from the Hunza valley to the base of those gigantic peaks which stand about Mount Godwin Austen, seem to be set like an ice-sea to define the farthest bounds of the Himalaya From its uttermost head to the foot of the Hispar, overhanging the valley above Nagar, the length of the glacial ice-bed known under the name of Biafo is said to measure about 90 m Throughout the mountain region of Kanjut (or Hunza) and Nagar the valleys are deeply sunk between mountain ranges, which are nowhere less than 15,000 ft in altitude, and which must average above 20,000 ft. As a rule, these valleys are bare of vegetation Where the summits of the loftier ranges are not buried beneath snow and ice they are bare, bleak and splintered, and the nakedness of the rock scenery extends down their rugged spurs to the very base of them Sun-baked in summer and frost-riven in winter, the mountain sides are but immense ramps of loose rock débris, only awaiting the yearly melting of the upper snow-fields, or the advent of a casual rainstorm, to be swept downwards in an avalanche of mud and stones into the gorges below Here it becomes piled and massed together, till the pressure of accumulation forces it out into the main valleys, where it spreads in alluvial fans and silts up the plains This formation is especially marked throughout the high level valleys of the Gilgit basin.

Passes.—Each of these northern affluents of the main stream is headed by a pass, or a group of passes, leading either to the Pamir region direct, or into the upper Yarkhun valley from which a Pamir route diverges The Yasin valley is headed by the Darkôt pass (15,000 ft), which drops into the Yarkhun not far from the foot of the Baroghil group over the main Hindu Kush watershed The Ashkuman is headed by the Gazar and Kora Bohrt passes, leading to the valley of the Ab-i-Punja; and the Hunza by the Kilik and Mintaka, the connecting links between the Taghdumbash Pamir and the Gilgit basin They are all about the same height—15,000 ft All are passable at certain times of the year to small parties, and all are uncertain In no case do they present insuperable difficulties in themselves; but the gorges and precipices which distinguish the approaches to them from the south, the slippery sides of shelving spurs whose feet are washed by raging torrents, the perpetual weary monotony of ascent and descent over successive ridges multiplying the gradient indefinitely—these form the real obstacles blocking the way to these northern passes

Gilgit Station.—The pretty little station of Gilgit (4,890 ft above sea) spreads itself in terraces above the right bank of the river nearly opposite the opening leading to Hunza, almost nestling under the cliffs of the Hindu Koh, which separates it on the south from the savage mountain wilderness of Darel and Kohistan It includes a residency for the British political officer, with about half a dozen homes for the accommodation of officials, barracks suitable for a battalion of Kashmir troops, and a hospital Evidences of Buddhist occupation are not wanting in Gilgit, though they are few and unimportant Such as they are, they appear to prove that Gilgit was once a Buddhist centre, and that the old Buddhist route between Gilgit and the Peshawar plain passed through the gorges and clefts of the unexplored Darel valley to Thakot under the northern spurs of the Black mountain

Connection with India.—The Gilgit river joins the Indus a few miles above the little post of Bunji, where an excellent suspension bridge spans the river A little below Bunji the Astor river joins the Indus from the south-east, and this deep pine-clad valley indicates the continuation of the highroad from Gilgit to Kashmir via the Tragbal and Burzil passes Another well-known route connecting Gilgit with the Abbottabad frontier of the Punjab lies across the Babusar pass (13,000 ft), linking the lovely Hazara valley of Kaghan to Chilas, Chilas (4,150 ft) being on the Indus, some 50 m below Bunji This is a more direct connection between Gilgit and the plains of the Punjab than that afforded by the Kashmir route via Gurais and Astor, which latter route involves two considerable passes—the Tragbal (11,400) and the Burzil (13,500), but the intervening strip of absolutely independent territory (independent alike of Kashmir and the Punjab) which includes the hills bordering the road from the Babusar pass to Chilas, renders it a risky route for travellers unprotected by a military escort Like the Kashmir route, it is now defined by a good military road

History.—The Dards (*Daradae*) are located by Ptolemy with surprising accuracy on the west of the Upper Indus, beyond the head-waters of the Swat river (*Soastus*), and north of the *Gandarae, i e*, the Gandharis, who occupied Peshawar and the country north of it This region was traversed by two of the Chinese pilgrims of the early centuries of our era, who have left records of their journeys, viz, Fahien, coming from the north, *c* 400, and Hsuan Tsang, ascending from Swat, *c.* 631. The latter says: "Perilous were the roads, and dark the gorges Sometimes the pilgrim had to pass by loose cords, sometimes by light stretched iron chains Here there were ledges hanging in mid-air, there flying bridges across abysses, elsewhere paths cut with the chisel, or footings to climb by" Yet even in these inaccessible regions were found great convents and miraculous images of Buddha How old the name of *Gilgit* is we do not know, but it occurs in the writings of the great Mohammedan savant al-Biruni, in his

notices of Indian geography. Speaking of Kashmir, he says: "Leaving the ravine by which you enter Kashmir and entering the plateau, then you have for a march of two more days on your left the mountains of Bolor and Shamilan, Turkish tribes who are called *Bhattavaryan* Their king has the title Bhatta-Shah Their towns are *Gilgit*, Aswira and Shiltash, and their language is the Turkish. Kashmir suffers much from their inroads" (Trs. Sachau, i 207). It is impossible to say what ground the writer had for calling the people *Turks*. But it is curious that the *Shins* say they are all of the same race as the Moguls of India, whatever they may mean by that. Gilgit, as far back as tradition goes, was ruled by rajahs of a family called Trakane When this family became extinct the valley was desolated by successive invasions of neighbouring rajahs, and in the 20 or 30 years ending with 1842 there had been five dynastic revolutions. The most prominent character in the history was a certain Gaur Rahman or Gauhar Aman, chief of Yasin, a cruel savage and man-seller, of whom many evil deeds are told Being remonstrated with for selling a *mullah*, he said, "Why not? The Koran, the word of God, is sold; why not sell the expounder thereof?" The Sikhs entered Gilgit about 1842 and kept a garrison there. When Kashmir was made over to Maharajah Gulab Singh of Jammu, in 1846, by Lord Hardinge, the Gilgit claims were transferred with it. And when a commission was sent to lay down boundaries of the tracts made over, Mr Vans Agnew (afterwards murdered at Multan) and Lieut Ralph Young of the Engineers visited Gilgit, the first Englishmen who did so The Dogras (Gulab Singh's race) had much ado to hold their ground, and in 1852 a catastrophe occurred, parallel on a smaller scale to that of the English troops at Kabul Nearly 2,000 men of theirs were exterminated by Gaur Rahman and a combination of the Dards; only one person, a soldier's wife, escaped, and the Dogras were driven away for eight years Gulab Singh would not again cross the Indus, but after his death (in 1857) Maharajah Ranbir Singh longed to recover lost prestige. In 1860 he sent a force into Gilgit Gaur Rahman just then died, and there was little resistance The Dogras took Yasin twice, but did not hold it They also, in 1866, invaded Darel, one of the most secluded Dard states, to the south of the Gilgit basin, but withdrew again In 1889, in order to guard against the advance of Russia, the British Government, acting as the suzerain Power of Kashmir, established the Gilgit agency, in 1901, on the formation of the North-West Frontier province, the rearrangement was made as stated above

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GILKIN, IWAN (1858–1924), Belgian poet, was born at Brussels on Jan. 7, 1858 He was a member of the group of poets known as *La jeune Belgique,* and his earlier work shows strongly the influence of Baudelaire He wrote *Damnation de l'artiste* (1890), *Ténèbres* (1892), and other poems collected under the title of *La Nuit* (1897). Other volumes of verse followed His most individual work is to be found in his dramatic poem, *Prométhée* (1899), and the blank verse drama, *Le Roi Cophétua* Gilkin died at Brussels on Sept. 30, 1924.

GILL, ERIC ROWLAND (1882–), English stone carver, wood engraver and draughtsman, was born on Feb 22, 1882, at Brighton, where his father was curate of the church of "The Countess of Huntingdon's Connexion" In 1897 the family moved to Chichester and the boy was sent to the art school in that city. His father decided to make him an architect, and in 1899 he apprenticed him to a London office. Gill did not, however, adopt this profession but took his career into his own hands Becoming fascinated with the art of lettering, he began to carve letters and shields for tombstones, and for some years made a living by this work. In 1910 he produced his first sculpture, a Madonna and Child, which received much favourable criticism Through the influence of Augustus John he was enabled to give an exhibition of his work at the Chenil gallery, London, in 1911. About this time he went through a phase of profound spiritual struggle Religion and art were to him inseparable, and after vain attempts to find or create a religion consistent with his special creed of absolute values, he entered the Roman Catholic Church in 1913 In the same year he was commissioned to carve the Stations of the Cross in Westminster cathedral. These were carved in Hoptonwood stone and form flat, low reliefs on the brick pillars of the church Much discussion was aroused by them at the time, objection being raised to their so-called archaism, in fact they have the beauty of sincerity and conviction, and, although unequal, they contain examples of Gill's finest work His principal sculptures before this date included the statue "Mother and Child" (1910); a Crucifix in Hoptonwood stone (1910), now in the Tate Gallery, London, his "Cupid" (Portland stone, 1910); the "Tumbler" (1912); the "Madonna and Child" (in Portland stone, coloured and gilt, 1912), "Torso" in Bath stone (Manchester art gallery, 1912), and in 1913 "Dancer," "Mother and Child," "Boxers," and "Torso and Head" After the War he produced "St Sebastian," "Torso," "Adam and Eve," 1920 (headless—an unusual concession to the modern tendency), "Anadiómené," "Splits" (two postures) and the black marble torso "Deposition" (1924). In 1922–23 he executed the relief of "Christ driving the moneylenders out of the Temple" as war memorial for Leeds university and in 1922 the Stations of the Cross for St. Cuthbert's, Bradford He has also done a very large number of woodcuts. A very successful exhibition of his work was held at the Goupil gallery in London in 1928.

In Gill's case it is impossible to separate the man and his work. Directness and sincerity are distinguishing marks of the one as of the other. His ideals are clearly set forth in his writings *Christianity and Art* (1927), *Sculpture, an Essay on Stone Cutting—with a Preface about God* (1917), and *Id quod visum placet, A Practical Test of the Beautiful* (1926) It is his creed that craftsman and designer should be, not two persons, but one, and he fiercely denounces the practice, mainly adopted by sculptors, of modelling in clay and having the model translated into marble by other hands

See Albert Rutherston, *Eric Gill* in Contemporary British Artists Series (London, 1927), Kineton Parkes, *Sculpture of To-day* (Universal Art Series, 1921).

GILL or **BRANCHIA,** the name given to any structure specially adapted for aquatic respiration. Gills are found in some Annelida, most Mollusca, Crustacea, the aquatic Arachnida, such as the king-crab, the larvae of many aquatic insects, and in protochordates, fishes and most larval and a few adult Amphibia In the Lamellibranchia (*q v*) among the molluscs and in *Amphioxus* and the Tunicata (*qq v*), the gills are modified for feeding purposes, and in one group of lamellibranchs, the Septibranchia, they have entirely lost their respiratory function. (*See* Mollusca, Annelida, Crustacea, Arachnida, Fishes)

The word is also applied to structures resembling the branchiae of fishes, such as the wattles of a fowl or the radiating films on the under side of fungi In liquid measure a gill is one-fourth of a pint

GILLES DE ROYE or **EGIDIUS DE ROYA** (d 1478), Flemish Cistercian chronicler, was born probably at Montdidier, and became professor of theology in Paris and abbot of the monastery of Royaumont at Asnières-sur-Oise, retiring about 1458 to the convent of Notre Dame des Dunes, near Furnes Gilles wrote the *Chronicon Dunense* or *Annales Belgici,* a résumé and continuation of the work of another monk, Jean Brandon (d 1428), which deals with the history of Flanders, and also with events in Germany, Italy and England from 792 to 1478

The Chronicle was published by F R Sweert in the *Rerum Belgicarum annales* (Frankfort, 1620); and the earlier part of it by C B Kervyn de Lettenhove in the *Chroniques relatives à l'histoire de la Belgique* (1870).

GILLES LI MUISIS or **LE MUISET** (*c* 1272–1352), French chronicler, was born probably at Tournai, and in 1289 entered the Benedictine abbey of St Martin in his native city, becoming prior of this house in 1327, and abbot four years later Gilles wrote two Latin chronicles, *Chronicon majus* and *Chronicon*

minus, dealing with the history of the world from the creation until 1349. This work, ed J. J de Senet, in *Corpus chronicorum Flandriae,* tome II (Brussels, 1841), continued by another writer to 1352, is valuable for the history of northern France and Flanders during the first half of the 14th century Gilles also wrote some French poems, and these *Poesies de Gilles li Muisis* have been published by Baron Kervyn de Lettenhove (Louvain, 1882).

See A. Molinier, *Les Sources de l'histoire de France,* tome iii. (1903).

GILLESPIE, GEORGE (1613–1648), Scottish divine, was born at Kirkcaldy, where his father, John Gillespie, was parish minister, on Jan. 21, 1613, and was educated at the University of St Andrews He was acting as private chaplain to the earl of Cassillis when he wrote his first work, *A Dispute against the English Popish Ceremonies obtruded upon the Church of Scotland* (1637), which was burnt by order of the privy council In April 1638 Gillespie was ordained minister of Wemyss (Fife), and in the same year was a member of the Glasgow Assembly, before which he preached (Nov 21) a sermon against royal interference in matters ecclesiastical In 1642 Gillespie was translated to Edinburgh. In 1640 he had accompanied the commissioners of the peace to England as one of their chaplains; and in 1643 he was appointed one of the four Scottish commissioners to the Westminster Assembly, where he displayed great power as a controversialist In 1645 he returned to Scotland, and is said to have drawn the Act of Assembly sanctioning the directory of public worship On his return to London he had a hand in drafting the Westminster confession of faith, especially chap i Gillespie was elected moderator of the Assembly in 1648 The hard work entailed by this office hastened his death, which took place at Kirkcaldy on Dec 17, 1648

His principal publications were controversial and chiefly against Erastianism

See *Works,* with memoir, published by Hetherington (1843–46).

GILLESPIE, THOMAS (1708–74), Scottish divine, was born at Clearburn, Duddingston, Midlothian, in 1708 He received ordination at Northampton in January 1741 In September of the same year he was admitted minister of the parish of Carnock, Fife, the presbytery of Dunfermline admitting as valid the ordination he had received in England, and allowing a qualification of his subscription to the church's doctrinal symbol, so far as it had reference to the sphere of the civil magistrate in matters of religion Having absented himself from the meetings of presbytery held for the purpose of ordaining one Andrew Richardson, an unacceptable presentee, as minister of Inverkeithing, he was deposed by the Assembly of 1752 for maintaining that the refusal of the local presbytery to act in this case was justified. He continued, however, to preach, first at Carnock, and afterwards in Dunfermline, where a large congregation gathered round him In 1761, in conjunction with Thomas Boston of Jedburgh and Collier of Colinsburgh, he formed a distinct communion under the name of "The Presbytery of Relief,"—relief, that is to say, "from the yoke of patronage and the tyranny of the church courts" The Relief Church eventually became one of the communions combining to form the United Presbyterian Church. He died on Jan 19, 1774

See Lindsay, *Life and Times of the Rev Thomas Gillespie;* Smithers, *History of the Relief Church;* for the Relief Church *see* UNITED PRESBYTERIAN CHURCH.

GILLESPIE, a city of Macoupin county, Ill, U S A, 45m N E of Saint Louis, in a rich agricultural and coal-mining district. It is served by the Big Four and the Illinois Traction (electric) railways The population was 4,064 in 1920

GILLETTE, WILLIAM HOOKER, (1855–) American playwright and actor, was born in Hartford, Conn, on July 24, 1855, the son of former United States Senator Francis G Gillette and of Elizabeth Daggett (Hooker) Gillette, a descendant of one of the town's founders As a boy he displayed histrionic talent, planning and building scenery and miniature stages, and giving marionette shows He graduated at the Hartford high school, but soon afterwards defied parental objection to a theatrical career by becoming utility man in a stock company in New Orleans. Mark Twain (Samuel L. Clemens), a neighbour and close friend of the family, intervened for him, and he became a member of John T. Raymond's company His first appearance was on Sept. 29, 1875, in *Faint Heart Ne'er Won Fair Lady,* at the Globe theatre in Boston. While in Boston Gillette studied at the Massachusetts Institute of Technology, at Boston university, and at Harvard, and later, when working in New York, he studied at New York university After experience in stock companies in Cincinnati, O, and St Louis, Mo, he appeared in the title rôle of his own play, *The Professor,* at the Madison Square Garden theatre, on Oct 29, 1881 After that, except for his heralded appearance in *Samson, Diplomacy, The Admirable Crichton, A Successful Calamity,* and *Dear Brutus,* he has acted exclusively in plays of his own making *Held by the Enemy,* the first successful play about the Civil War, was produced in Brooklyn on Feb 22, 1886. It was followed by *A Legal Wreck,* a play of a New England coast town (Aug 14, 1888) *All the Comforts of Home* (March 3, 1890), *Mr Wilkinson's Widows* (March 3, 1891), and *Too Much Johnson* (Oct. 25, 1894), were all amusing comedies, as were *Because She Loved Him So, Clarice,* and others of less importance But Gillette's most successful character is that of a "cool resourceful man of action," and it is the plays in which this character appears portrayed by him that have been most successful, for instance, *Held by the Enemy; Sherlock Holmes,* first put on in New York on Nov 6, 1899, and in London on Sept 9, 1901; and *Secret Service,* first played in Philadelphia, May 13, 1895, staged in London and Paris in 1897, and revived in New York in 1915–16

See J B Clapp and E F Edgett, *Plays of the Present* (1902); Norman Hapgood, *The Stage in America,* chap III (1901) and A H Quinn's *Representative American Plays* (1917, 1923)

GILLIE, an attendant on a Gaelic chieftain (from Irish *gille* or *giolla,* a servant or boy) The name is now applied in the Highlands of Scotland to the man-servant who attends a sportsman in shooting or fishing A *gillie-wetfoot,* a term now obsolete, was the gillie whose duty it was to carry his master over streams

GILLIES, JOHN (1747–1836), Scottish historian and classical scholar, was born at Brechin, in Forfarshire In 1784 he completed his *History of Ancient Greece, its Colonies and Conquests* (published 1786) On the death of William Robertson (1721–93), Gillies was appointed historiographer-royal for Scotland In his old age he retired to Clapham, where he died on Feb 15, 1836

Of his other works, none of which is much read, the principal are *View of the Reign of Frederic II of Prussia, with a Parallel between that Prince and Philip II of Macedon* (1789), rather a panegyric than a critical history; translations of Aristotle's *Rhetoric* (1823) and *Ethics and Politics* (1786–97), of the *Orations* of Lysias and Isocrates (1778); and *History of the World from Alexander to Augustus* (1807), which, although deficient in style, was commended for its learning and research

GILLINGHAM, a market town of Dorsetshire, England, on the river Stour, 105 m W S W from London by the S R Pop (1921), 3,294 The church of St Mary the Virgin has a Decorated chancel The rich undulating district in which Gillingham is situated was a forest preserved by King John and his successors There is a large agricultural trade, and small manufactures of bricks, etc, are carried on

GILLINGHAM, a municipal borough of Kent, England, on the Medway Pop (1921) 34,026 Its population is largely industrial, employed in the Chatham dockyards The church of St Mary Magdalene ranges in date from Early English to Perpendicular, retaining also traces of Norman work and some early brasses A battle between Edmund Ironside and Canute, *c* 1016, is placed here; and there was formerly a palace of the archbishops of Canterbury. Gillingham was incorporated in 1903

GILLOT, CLAUDE (1673–1722), French painter and engraver, best known as the master of Watteau and Lancret, was born at Langres on April 27, 1673 His sportive mythological landscape pieces, with such titles as "Feast of Pan" and "Feast of Bacchus," opened the Academy of Painting at Paris to him in 1715, and he then adapted his art to the fashionable tastes of the day, and introduced the decorative *fêtes champêtres,* in which he was afterwards surpassed by his pupils He was also closely connected with the opera and theatre as a designer of scenery and costumes He died in Paris on May 4, 1722

GILLOTT, JOSEPH (1799–1873), English pen-maker, was born at Sheffield on Oct. 11, 1799. He set up in business in Birmingham, and about 1830 he turned his attention to the manufacture of steel pens by machinery, and in 1831 patented a process for placing elongated points on the nibs of pens Subsequently he invented other improvements, getting rid of the hardness and lack of flexibility, which had been a serious defect in nibs, by cutting, in addition to the centre slit, side slits, and cross grinding the points. Gillott was a liberal art-patron, and one of the first to recognize the merits of J. M. W. Turner. He died at Birmingham Jan. 5, 1873

GILLOW, ROBERT (d. 1773), the founder at Lancaster of a distinguished firm of English cabinet-makers and furniture designers whose books begin in 1731. He was succeeded by his eldest son Richard (1734–1811), who was taken into partnership about 1757, when the firm became Gillow and Barton, and his younger sons Robert and Thomas, and the business was continued by his grandson Richard (1778–1866) The firm were architects as well as cabinet-makers, and the first Richard Gillow designed the classical custom house at Lancaster. About 1761 premises were opened in Oxford street, London. For a long period the Gillows were the best known makers of English furniture; Sheraton, Heppelwhite and Robert Adam designed for them Between 1760 and 1770 they invented the original form of the billiard-table, they were the patentees (about 1800) of the telescopic dining-table; for a Captain Davenport they made, if they did not invent, the first writing-table of that name.

See *Gillow's, a Record of a Furnishing Firm during two Centuries* (1901).

GILLRAY, JAMES (1757–1815), English caricaturist, was born at Chelsea in 1757. Gillray commenced life by learning letter-engraving, in which he soon became an adept This employment, however, proving irksome, he wandered about for a time with a company of strolling players After a checkered experience he returned to London, and was admitted a student in the Royal Academy, supporting himself by engraving, and probably issuing a considerable number of caricatures under fictitious names. Hogarth's works were the delight and study of his early years. "Paddy on Horseback," which appeared in 1779, is the first caricature which is certainly his Two caricatures on Rodney's naval victory, issued in 1782, were among the first of the memorable series of his political sketches The name of Gillray's publisher and printseller, Miss Humphrey, is inextricably associated with that of the caricaturist Gillray lived in Miss Humphrey's house during all the period of his fame His plates were exposed in Humphrey's shop window A number of his most trenchant satires are directed against "Farmer George," and his court. George's comment on being shown a set of Gillray's sketches, was. "I don't understand these caricatures" Gillray revenged himself for this utterance by his "A Connoisseur Examining a Cooper," which he is doing by means of a candle on a "save-all", the sketch satirizes at once the king's pretensions to knowledge of art and his miserly habits

The French Revolution made Gillray conservative; and he issued caricature after caricature, ridiculing the French and Napoleon, and glorifying John Bull His last work, from a design by Bunbury, is entitled "Interior of a Barber's Shop in Assize Time," and is dated 1811. While he was engaged on it he became mad, although he had occasional intervals of sanity, which he employed on his last work The approach of madness must have been hastened by his intemperate habits Gillray died on June 1, 1815, and was buried in St. James's churchyard, Piccadilly.

Gillray's caricatures are divided into two classes, the political series and the social. The political caricatures form a historical record of the latter part of the reign of George III. They were circulated not only over Britain but throughout Europe, and exerted a powerful influence. In this series, George III, the queen, the prince of Wales, Fox, Pitt, Burke and Napoleon are the most prominent figures. In 1788 appeared two fine caricatures by Gillray. "Blood on Thunder fording the Red Sea" represents Lord Thurlow carrying Warren Hastings through a sea of gore: Hastings looks very comfortable, and is carrying two large bags of money. "Market-Day" pictures the ministerialists of the time as horned cattle for sale Among Gillray's best satires on the king are. "Farmer George and his Wife," two companion plates, in one of which the king is toasting muffins for breakfast, and in the other the queen is frying sprats; "The Anti-Saccharites," where the royal pair propose to dispense with sugar, to the great horror of the family, "A Connoisseur Examining a Cooper", "Temperance enjoying a Frugal Meal"; "Royal Affability", "A Lesson in Apple Dumplings", and "The Pigs Possessed" Among his other political caricatures may be mentioned· "Britannia between Scylla and Charybdis," a picture in which Pitt, so often Gillray's butt, figures in a favourable light; "The Bridal Night", "The Apotheosis of Hoche," which concentrates the excesses of the French Revolution in one view, "The Nursery with Britannia reposing in Peace"; and "The First Kiss these Ten Years" (1803), another satire on the peace, which is said to have greatly amused Napoleon.

Bibliography—The principal editions of Gillray's caricatures are those by Thomas M'Lean (1830); by H G Bohn (1851), with a commentary by T. Wright and R H Evans, by T Wright (1874). *See* T Wright's *Hist of Caricature and Grotesque* in Literature and Art (1865); also the article Caricature.

GILLYFLOWER, a popular name applied to various flowers, but principally to the clove, *Dianthus Caryophyllus,* of which the carnation is a cultivated variety, and to the stock, *Matthiola incana,* a well-known garden favourite The word is sometimes written gilliflower or gilloflower, and is reputedly a corruption of July-flower, "so called from the month they blow in" The name was originally given in Italy to plants of the pink tribe, especially the carnation, but has in England been transferred of late years to several cruciferous plants The gillyflower of Chaucer and Spenser and Shakespeare was, as in Italy, *Dianthus Caryophyllus;* that of later writers and of gardeners, *Matthiola* The principal other plants which bear the name are the wallflower, *Cheiranthus Cheiri,* called wall-gillyflower in old books, the dame's violet, *Hesperis matronalis,* called variously the queen's, the rogue's and the winter gillyflower, the ragged-robin, *Lychnis Flos-cuculi,* called marsh-gillyflower and cuckoo-gillyflower; the water-violet, *Hottonia palustris,* called water-gillyflower, and the thrift, *Armeria vulgaris,* called sea-gillyflower As a separate designation it is nowadays usually applied to the wallflower.

GILMAN, DANIEL COIT (1831–1908), American educator, was born in Norwich, Conn, on July 6, 1831. After his graduation at Yale in 1852 he engaged in teaching and miscellaneous literary work, went to St Petersburg with his life-long friend, Andrew D White, as attaché, and studied at Berlin (1854–55). On his return to America he was at Yale for 17 years as assistant librarian, professor of physical and political geography in the Sheffield scientific school, and as secretary of the governing board of that institution All these positions as well as his general educational activities fitted him well for his important posts as head of the University of California (1872–75) and first president of Johns Hopkins university He entered upon his duties in the latter institution in May 1875 and was formally inaugurated on Feb. 22, 1876 This post he filled until 1901 From 1901 to 1904 he was the first president of the Carnegie institution at Washington, D C. He died at Norwich, Conn, on Oct 13, 1908, the recipient of many honourary degrees and other marks of scholastic distinction. His influence upon higher education in America was great, especially at Johns Hopkins. To the organization of the Johns Hopkins hospital, of which he was made director in 1889, he contributed greatly. He was a singularly good judge of men and an able administrator, and under him Johns Hopkins had an immense influence, especially in the promotion of original and productive research. As a trustee of the John F Slater Fund, of the Peabody Educational Fund and of the Russell Sage Foundation for Social Betterment, as an original member of the General Education Board; and as successor to Carl Schurz as president of the National Civil Service Reform League, he further aided in educational and social betterment in the United States In 1896–97 he served on the Venezuela Boundary Commission appointed by President Cleveland

Some of his papers and addresses are collected in a volume entitled *University Problems in the United States* (1898). He wrote, besides,

James Monroe (1883), in the American Statesmen Series; a *Life of James D Dana*, the geologist (1899), *Science and Letters at Yale* (1901) and *The Launching of a University* (1906), an account of the early years of Johns Hopkins.

See Fabian Franklin, *Life of Daniel Coit Gilman* (1910) and John Thomas Faris, *Men Who Conquered* (Chicago, 1922).

GILMAN, LAWRENCE (1878–), music critic and author, was born at Flushing (N.Y), July 5, 1878. He was educated in the New York public schools and the Collins street classical school, Hartford (Conn), and studied painting under William M Chase In 1901 he was appointed music critic of *Harper's Weekly*, acting also as assistant editor, 1903–11, and managing editor, 1911–13 Following two years on the staff of *Harper's Magazine*, he became critic of the *North American Review* in 1915, leaving to go to the New York *Herald-Tribune* as music critic in 1923 He was programme annotator for the New York Philharmonic Society and the Philadelphia Orchestra from 1921

His works include *Phases of Modern Music, Edward MacDowell* (in the series *Living Masters of Music*, first published 1905, revised and enlarged, 1909), *The Music of Tomorrow, A Guide to Strauss' "Salomé"; Stories of Symphonic Music; Debussy's "Pelléas et Mélisande"; Aspects of Modern Opera, Nature in Music*, and *A Christmas Meditation*. He is the composer of settings for voice and piano of three poems by W. B. Yeats. *A Dream of Death, The Heart of the Woman*, and *The Curlew*.

GILMORE, PATRICK SARSFIELD (1829–1892), American bandmaster, was born in Ireland, and settled in America about 1850. He organized the best wood-wind and brass players of Europe and America, playing in the remoter areas and introducing Wagner, Liszt and other great composers where they had been unknown. He was responsible also for many great orchestras, including one at the World's Peace Jubilee, Philadelphia, 1872, when the orchestra numbered 2,000 and the chorus 20,000. He died at St Louis Sept 24, 1892

GILPIN, BERNARD (1517–1583), the "Apostle of the North," was born at Kentmere in 1517, and educated at Queen's College, Oxford, where he was elected fellow in 1542, in the same year he was ordained Gilpin was one of the first scholars elected to Wolsey's new foundation at Christ Church At Oxford he defended the doctrine of the church against Hooper, but his confidence in his own cause was somewhat shaken by a public disputation in which he supported Hooper against Peter Martyr In 1552 he preached before Edward VI. a sermon on sacrilege, in which he denounced the expropriation of church property About this time he became vicar of Norton in the Durham diocese, and obtained a licence, through William Cecil, as a general preacher throughout the kingdom during the king's lifetime On Mary's accession he went abroad to study at Louvain, Antwerp and Paris, returning to England in 1556 as rector of Easington and archdeacon of Durham His outspokenness excited hostility, and he was brought before Tunstall, bishop of Durham, on a charge of heresy Tunstall dismissed the case, and presented Gilpin with the rich living of Houghton-le-Spring, and when the accusation was renewed, he again protected him Gilpin's enemies, however, obtained a royal warrant for his apprehension from Bonner, bishop of London, but his arrival in London was fortunately delayed by an accident in which he broke his leg, and he was freed from danger by the news of Queen Mary's death He died at Houghton on May 4, 1583

Gilpin steadily refused promotion He held a great position in the North, and displayed a magnificent hospitality at Houghton to all classes of his parishioners, and treated them with great generosity in critical times He built and endowed a grammar school, maintained a large number of poor children at his own charge, and helped the more promising pupils to enter the universities

See Chr Wordsworth, *Ecclesiastical Biography* (vol. iii, 4th ed), which contains a contemporary sketch by G. Carleton, originally printed in Bates's *Vitae selectorum aliquot virorum*

GIL POLO, GASPAR (?1530–1591), Spanish novelist and poet, was born at Valencia He finds a place in the history of the novel as the author of *La Diana enamorada*, a continuation of Montemayor's *Diana*, and perhaps the most successful continuation ever written by another hand One of the most agreeable of Spanish pastorals, it was imitated by Cervantes in the *Canto de Calíope*, and was translated into English, French, German and Latin. The English version of Bartholomew Young, published in 1598 but current in manuscript 15 years earlier, is said to have suggested the Felismena episode in the *Two Gentlemen of Verona;* the Latin version of Caspar Barth, entitled *Erotodidascalus* (Hanover, 1625), is a performance of uncommon merit as well as a bibliographical curiosity.

GILSONITE, an asphaltite found in eastern Utah and western Colorado mainly in the Uinta Basin (whence its alternative names, Uintahite or Uintaite), where it occurs in vertical veins up to 18ft in thickness which can be traced for several miles It is black in colour with conchoidal fracture and lustrous surface, and was so named after S. H Gilson of Salt Lake City On heating it softens and then fuses completely, it dissolves freely in carbon disulphide, and is largely used in the manufacture of paints and varnishes. The output from the Uinta Basin region is about 20,000 tons annually

GILYAKS, a Palaeo-Asiatic people originally widespread throughout the Lower Amur and the north of Sakhalin The clan forms a society based on common rights and marital duties. The men in one class, A, had to take wives from another class, B The women in class A had to marry men—not from B but from a third class, C. Thus brother and sister mated into different clans. The classificatory system of relationship is developed on these lines. Common fire, community in the bear rites, common enemies, community in bloodmoney and common tabus bind the clans together. Shamanism and bear-worship existed Death was due to evil spirits and the corpse was cremated, except in certain special cases.

See M. Czplicka, *Aboriginal Siberia* (1914).

GIMA'A: *see* ARABS

GIMBAL, a mechanical device for hanging some object so that it should keep a horizontal and constant position, while the body from which it is suspended is in free motion, so that the motion of the supporting body is not communicated to it It is thus used particularly for the suspension of compasses or chronometers and lamps at sea, and usually consists of a ring freely moving on an axis, within which the object swings on an axis at right angles to the ring

The word is derived from the O Fr *gemel*, a term for a ring formed of two hoops linked together and capable of separation, used in the 16th and 17th centuries as betrothal and keepsake rings They sometimes were made of three or more hoops linked together

GIMLET, a tool used for boring small holes It is made of steel, with a shaft having a hollow side, and a screw at the end for boring the wood; the handle of wood is fixed transversely to the shaft A gimlet is always a small tool. A similar tool of large size is called an "auger" (*see* TOOL)

GIMLI, in Scandinavian mythology, the great hall of heaven whither the righteous will go to spend eternity

GIMP or **GYMP.** (1) Probably a nasal form of the Fr *guipure*, from *guiper*, to cover or "whip" a cord over with silk, a stiff trimming made of silk or cotton woven around a firm cord, often further ornamented by a metal cord running through it. It is also sometimes covered with bugles, beads or other glistening ornaments The trimming employed by upholsterers to edge curtains, draperies, the seats of chairs, etc , is also called gimp, and in lace work it is the firmer or coarser thread which outlines the pattern and strengthens the material. (2) A shortened form of gimple (the O E wimple), the kerchief worn by a nun around her throat, sometimes also applied to a nun's stomacher.

GIN, a two-handed card game, adapted from rum or rummy (*q v*) and Mexican conquian, by Elwood T Baker, Brooklyn, N Y , in 1909 Ten cards are dealt to each player, either being granted the opportunity of drawing the 21st card, which is exposed, the dealer having second choice. Succeeding cards are drawn singly by the players in turn, but need only be exposed as they or other cards are discarded for possible immediate use by the adversary Neither hand may contain more than ten cards. To be usable the cards drawn must fit into a combination,

or "meld," consisting of at least three of a kind (*i.e.*, three sixes) or a sequence of three or more in the same suit, the ace considered as one When the total pips of the unmelded cards (face-cards counting ten) amount to ten or less, the player may declare same before he discards, whereupon drawing ceases and both hands are spread The adversary may play any cards from his hand on melds in the declarer's The difference between the declaration and the unmelded points in the adversary's hand is scored by the declarer If the declaration is tied by the adversary, the latter scores ten plus any additional difference, and the declarer does not score If the declarer melds all ten cards, a "grand spread," he receives a bonus of ten points If a "grand spread" is tied, each scores ten The game consists of 100 points

(E T. Ba)

GIN. A potable spirituous liquor which derives its characteristic flavour principally from the juniper berry The term is an abbreviation of "geneva"—a corruption of "genièvre" or "junever," the French and Dutch equivalents respectively for juniper For many centuries juniper has been used in the preparation of alcoholic beverages and in all probability the practice at first arose from a desire to mask, by means of this or some other flavouring material, the nauseous taste of the crude spirit obtained by the earlier methods of distillation Juniper extract has long been regarded, however, as having valuable medicinal properties, particularly in affections of the urinary organs, and much of the consumption of gin may be attributed to this belief

The principal varieties are the English, to which the term "gin" is usually applied, and the Dutch, which, in addition to being known as "geneva," is sometimes referred to as "Schnapps" or "Hollands" Although the two types are somewhat similar in character the respective methods of preparation differ considerably in detail

British gin is prepared from a spirit obtained by distilling a fermented mash consisting usually of 75% of maize, 15% of malt and 10% of rye In order to deprive it of the characteristic flavour of grain, the spirit is redistilled in the presence of the flavouring matter—chiefly juniper and coriander—this process being repeated several times, thus producing the "dry gin" of commerce Sweetened gin, usually consumed as a cordial, is obtained by adding sugar syrup to the "dry" variety In the preparation of the syrup refined sugar is dissolved in its own weight of water, and the solution is added in the proportion of about 6gal of syrup to 100gal of gin Although the origin of the term "Old Tom," which is often applied to sweetened gin, is obscure, it is believed to have been derived from old Thomas Chamberlain of Hodge's distillery, and Messrs Booth's have in their possession old labels, one showing a picture of this man and another of a sailor lad on shipboard described as "Young Tom"

In preparing the Dutch product one measure of malted barley is mixed with two measures of ground rye Each hundredweight of the mixed meal is then mashed with about 24gal. of water at a moderately high temperature Cold water is then added in sufficient quantity to reduce the specific gravity of the wort to about 1 035, yeast being then added to ferment it After two or three days the fermented wort is distilled and juniper berries and other flavouring materials added to the resultant distillate—known as low wines—the mixture being again distilled To obtain a product of high quality the spirit is sometimes redistilled more than once Some manufacturers of geneva purchase pot-still spirit, specially prepared for the purpose at Schiedam and known as "moutwyn" or "maltwine" The spirit is then treated in a manner similar to that adopted in the manufacture of British gin

(F G H T)

GINDELY, ANTON (1829–1892), Austrian historian, was born at Prague on Sept. 3, 1829 He studied at Prague and at Olmutz, and became professor of history at the university of Prague and archivist for Bohemia in 1862 He died at Prague on Oct. 24, 1892 Gindely's chief work is his *Geschichte des dreissigjahrigen Krieges* (Prague, 1869–80; Eng trans New York, 1884); and his historical work is mainly concerned with the period of the Thirty Years' War Among his numerous works are: *Geschichte der böhmischen Bruder* (Prague, 1857–58); *Rudolf II und seine Zeit* (1862–68), and a criticism of Wallenstein, *Waldstein wahrend seines ersten Generalats* (2 vols 1886) He wrote a history of Bethlen Gabor in Hungarian, and edited the *Monumenta historiae Bohemica* Gindely's posthumous work, *Geschichte der Gegenreformation in Bohmen,* was edited by T Tupetz (1894)

GINER DE LOS RIOS, FRANCISCO (1840–1915), Spanish philosopher and jurist, was born in Ronda (Andalusia) on Oct. 10, 1840 He graduated in Granada, and in 1867 went to the University of Madrid as a professor of jurisprudence and there came under the influence of Professor Sanz del Rio, Krause's famous disciple In accordance with his belief that philosophy should have a concrete influence on practical life, he devoted himself to the educational question Twice Giner resigned his chair, together with several of his colleagues, in a stand for liberty of thought in the university against a reactionary Government, and was twice reinstated He helped to found the Institucion Libre de Enseñanza, an educational institution which did much to improve teaching methods in Spain, by the application of philosophical thought to the problems of education His greatest influence was personal and direct, for he was a born teacher, a man of refined sensibility, pure in his life as in his ideals

Giner published several volumes of essays—literary, educational, philosophical and religious—as well as *Lecciones Sumarias de Psicologia* (1871), *Psicologia, Idea del Derecho,* with Alfredo Calderon, trans from the German of Roder (1885), *Resumen de Filosofia del Derecho,* with Alfredo Calderon (1898), and other works A complete edition of his numerous works was undertaken a year after his death

See S de Madariaga, *The Genius of Spain* (1923)

GINGEE, a rock fortress of southern India, in the South Arcot district of Madras It consists of three hills, connected by walls enclosing an area of 7 sq m The origin of the fortress is shrouded in legend When occupied by the Mahrattas at the end of the 17th century, it withstood a siege of eight years against the armies of Aurangzeb In 1750 it was captured by the French, who held it with a strong force for eleven years It surrendered to the English in 1761

GINGER, the rhizome or underground stem of *Zingiber officinale* (family Zingiberaceae), a perennial reed-like plant growing from 3 to 4ft high The flowers and leaves are borne on separate stems, those of the former being shorter than those of the latter and averaging from 6 to 12in The flowers themselves are borne at the apex of the stems in dense ovate-oblong cone-like spikes from 2 to 3in long, composed of obtuse strongly-imbricated bracts with membranous margins, each bract enclosing a single small sessile flower The leaves are alternate and arranged in two rows, bright green, smooth, tapering at both ends, with very short stalks and long sheaths which stand away from the stem and end in two small rounded auricles The plant rarely flowers and the fruit is unknown Though not found wild, it is considered with good reason to be a native of the warmer parts of Asia, over which it has been cultivated from an early period and the rhizome imported into England From Asia the plant has spread into the West Indies, South America, western tropical Africa, and Australia



GINGER, THE UNDERGROUND STEM OF THE PLANT ZINGIBER OFFICINALE, WHICH HAS BEEN USED AS A SPICE FROM EARLY TIMES

The use of ginger as a spice has been known from very early times, it was supposed by the Greeks and Romans to be a product of southern Arabia, and was received by them by way of the Red Sea, in India it has also been known from a very remote period

Ginger is known in commerce in two distinct forms, coated and uncoated ginger, *i e.*, having or wanting the epidermis. For the first, the pieces, called "races" or "hands," from their irregular palmate form, are washed and simply dried in the sun In this form ginger presents a brown, more or less irregularly wrinkled or striated surface, and when broken shows a dark brownish fracture, hard, and sometimes horny and resinous To produce uncoated ginger the rhizomes are washed, scraped and sun-dried, and are often subjected to bleaching, either from the fumes of burning sulphur or by immersion for a short time in a solution of chlorinated lime The whitewashed appearance that much of the ginger has, as seen in the shops, is due to the fact of its being washed in whiting and water, or even coated with sulphate of lime Uncoated ginger, as seen in trade, varies from single joints an inch or less in length to flattish irregularly branched pieces of several joints, the "races" or "hands," and from 3 to 4in long, each branch has a depression at its summit showing the former attachment of a leafy stem. The colour, when not whitewashed, is a pale buff, it is somewhat rough or fibrous, breaking with a short mealy fracture, and presenting on the surfaces of the broken parts numerous short bristly fibres.

The principal constituents of ginger are starch, volatile oil (to which the characteristic odour of the spice is due) and resin (to which is attributed its pungency). Its chief use is as a condiment or spice, but as an aromatic and stomachic medicine it is also used internally The rhizomes, collected in a young green state, washed, scraped and preserved in syrup, form a delicious preserve, which is largely exported both from the West Indies and from China Cut up into pieces like lozenges and preserved in sugar, ginger also forms an agreeable sweetmeat

GINGER ALE. A sweetened, carbonated, non-excisable beverage, the predominating flavour and pleasant warmth of which are derived mainly from the rhizome *Zingiber officinale* The aeration of the beverage may be due to fermentation or to artificial saturation with carbon dioxide gas The Jamaican variety of ginger rhizome yields the finest-flavoured beverages, the flavour and pungency of the rhizome being dependent upon the essential oil and oleo-resin, which are its active principles Other flavouring materials frequently enter into the composition of ginger ale, for example cloves, cinnamon, lemon essence, malt, etc , also, additions are occasionally made of a foam-producing substance and pungent materials, such as capsicum, to increase the sharpness and pungency of the beverage In 1922 the joint committee of definitions and standards of the United States department of agriculture defined ginger ale as the carbonated beverage prepared from ginger ale flavour, sugar, syrup, harmless organic acid, potable water and caramel colour Ginger ale flavour, or ginger ale concentrate, was defined as the flavouring product in which ginger is the essential constituent, with or without the addition of other aromatic and pungent ingredients, citrus oils and fruit juices

In preparing an artificially carbonated ginger ale, a syrup is first made, this being compounded from water, sugar, ginger ale flavour or extract, citric or tartaric acid, caramel colour and foam essence Such a syrup is employed in making the carbonated beverage in the manner which is described under ALRATED WATERS

GINGER BEER. A fermented, non-excisable beverage brewed from a mixture of ginger, other spices and bitter vegetable substances Sometimes, however, the name ginger beer is applied to artificially carbonated liquor which is flavoured with compounded ginger beer flavour or extract The principal differences between ginger ale and ginger beer lie in the rather higher gravity and greater proportion of extractive matter of ginger beer and also in the fact that it is more usual to employ bitters of the nature of hops or gentian in preparing ginger beer than in ginger ale Capsicum extract, or the oleoresin capsicine, is frequently employed in the compounding of ginger beverages of this type to increase the sharpness of the beverage without greatly increasing the cloudiness of the finished product Also, a foam-producing extract is frequently added to the syrup when the liquor is prepared by artificial carbonation

The production of ginger beer by fermentation is carried out by first making an aqueous infusion of a mixture of vegetable products among which ginger predominates The following is a suitable mixture. Bruised Jamaica ginger 6 parts, liquorice extract 2 parts, hops 3 parts, cloves 3 parts, gentian ¼ part. Five parts of such a mixture are boiled in 200 parts of water for about 20 to 30 min.; the extract is strained and sweetened with 6 to 7 parts of sugar. Caramel colour is added as desired, the extract cooled to about 70° and, after adding 1 fl. oz of brewer's yeast, allowed to ferment for 24 hours. Citric acid is then added to the liquor according to the taste of the manufacturer and the beverage bottled after standing for a few days to permit the mucilaginous matter to settle out. In some instances the beverage is given a fuller tone of flavour by the addition of malt essence Ginger beverages are exceedingly popular in countries possessing temperate climates, a tremendous increase in consumption having followed the introduction of prohibition in the United States, while in Great Britain the sale of ginger drinks is one of the principal sections of the trade in non-excisable beverages (*see* AERATED WATERS)

GINGHAM, cotton or linen cloth, woven of dyed or white yarns either in a single colour or different colours, and in stripes, checks or plaids. It is made in Lancashire and in Glasgow, and also to a large extent in the United States Imitations of it are obtained by calico-printing It is used for dresses, etc

GINGUENÉ, PIERRE LOUIS (1748–1815), French author, was born at Rennes, in Brittany He was educated at a Jesuit college in his native town, and came to Paris in 1772 He wrote criticisms for the *Mercure de France,* and composed a comic opera, *Pomponin* (1777) The *Satire des satires* (1778) and the *Confession de Zulmé* (1779) followed His defence of Piccini against the partisans of Gluck made him still more widely known He welcomed the Revolution, and joined Giuseppe Cerutti, the author of the *Mémoire pour le peuple français* (1788), and others in producing the *Feuille villageoise,* a weekly paper addressed to the villages of France Imprisoned during the Terror, he escaped death by the downfall of Robespierre He assisted, as director-general of the "commission exécutive de l'instruction publique," in reorganizing the system of public instruction, and was an original member of the Institute of France In 1797 he was for a few months minister plenipotentiary to the king of Sardinia He was appointed a member of the tribunate, but Napoleon had him expelled at the first "purge," and Ginguené returned to his literary pursuits He was one of the commission charged to continue the *Histoire littéraire de la France* Ginguené's most important work is the *Histoire littéraire d'Italie* (14 vols , 1811–35), unfinished at the time of his death The last five volumes were written by Francesco Salfi and revised by Pierre Daunou

See D J. Garat, *Notice sur la vie et les ouvrages de P. L. Ginguené,* prefixed to a catalogue of his library (1817).

GINKEL, GODART VAN (1630–1703), 1st earl of Athlone, Dutch general in the service of England, was born at Utrecht in 1630, followed William, prince of Orange to England in 1688, and entered the English service He distinguished himself in the suppression of a mutiny of a Scottish regiment, and in 1691 was entrusted with the sole command of the forces in Ireland On June 30 he carried Athlone by storm, and on July 12 he defeated, near Aughrim, with terrible slaughter, a great number of the Irish, who were disorganized by the death of their commander, the French general, Saint-Ruth. Galway next capitulated, and Ginkel followed up this victory by a series of bold and successful manoeuvres by which he captured Limerick, the Irish cavalry camp, and the fort on Thomond bridge The signing (Oct 3, 1691) of a capitulation at Limerick completed his conquest or pacification of Ireland For his services he received the formal thanks of the House of Commons, the earldom of Athlone, and the baronetcy of Aughrim He continued in the English service and in 1702 commanded the Dutch contingent under Marlborough He died at Utrecht on Feb 11, 1703, and was succeeded by his son, the 2nd earl (1668–1719) On the death of the 9th earl without issue in 1844, the title became extinct.

GINKGO or **MAIDENHAIR TREE** (*Ginkgo biloba*), a remarkable tree grown since ancient times about temples in China where it is considered a sacred plant Although reported as native in western China, it is not positively known to occur in a truly wild state. It is a smooth, sparingly branched tree, sometimes 120 ft high, with deciduous leaves, 2 to 4 in broad and only about 1 in long, which in form, veining and aspect resemble those of the maidenhair fern (*q v*). Botanically, the closest allies of the ginkgo are the cycads As the sole survivor of a numerous group of plants with a very long geological ancestry the ginkgo may be legitimately regarded as a "living fossil" It has existed essentially unchanged for perhaps ten million years, or probably for a longer period than any other living tree Fossil species occur in the Carboniferous, Permian, Triassic, Jurassic and Tertiary formations in the British Isles, and forms with leaves very similar to those of the living ginkgo are abundant in Triassic and Jurassic rocks of the Pacific coast of North America, especially in Oregon and Alaska The ginkgo is cultivated as an ornamental tree in temperate countries, growing without protection in many parts of Europe and also in North America as far north as the Great Lakes (For its structural peculiarities *see* GYMNOSPERMS *Ginkgoales, Cycadales*)

GINNING: *see* COTTON AND THE COTTON INDUSTRY

GINSBURG, CHRISTIAN DAVID (1831–1914), Hebrew scholar, was born on Dec 25, 1831, at Warsaw where he was educated Shortly after conversion in 1846, he came to England, where he published a translation of the Song of Songs, with a commentary (1857), a translation of Ecclesiastes (1861) and treatises on the Karaites (1862), on the Essenes (1864) and on the Kabbala (1865) From the appearance in 1867 of Jacob ben Chajim's Introduction to the Rabbinic Bible, Hebrew and English, with notices, and the Massoreth Ha-Massoreth of Elias Levita, in Hebrew, with translation and commentary, Dr Ginsburg ranked as an eminent Hebrew scholar In 1870 he was appointed to the committee for the revision of the English version of the Old Testament His life-work culminated in the publication (3 vols) of the Massorah (1880–86), followed by the Masoretico-critical edition of the Hebrew Bible (1894), and the elaborate introduction (1897). His later works include *Facsimiles of Manuscripts of the Hebrew Bible* (1897–98), and *The Text of the Hebrew Bible in Abbreviations* (1903), in addition to a critical treatise "on the relationship of the so-called Codex Babylonicus of AD 916 to the Eastern Recension of the Hebrew Text" (1899) Ginsburg died on March 7, 1914

GINSENG, the root of a species of *Panax* (*P ginseng*), native of Manchuria and Korea, belonging to the family Araliaceae, which is used in China as a medicine Other roots are substituted for it, notably that of *Panax quinquefolium,* distinguished as American ginseng, and imported from the United States At one time the ginseng obtained from Manchuria was considered to be the finest quality, and in consequence became so scarce that an imperial edict was issued prohibiting its collection That prepared in Korea is now the most esteemed variety The root of the wild plant is preferred to that of cultivated ginseng, and the older the plant the better is the quality of the root considered to be. Great care is required in the preparation of the drug



AMERICAN GINSENG, EXPORTED FROM THE UNITED STATES TO CHINA, WHERE THE ROOT IS USED AS MEDICINE

Ginseng of good quality generally occurs in hard, rather brittle, translucent pieces, about the size of the little finger, and varying in length from 2in to 4in The taste is mucilaginous, sweetish, and slightly bitter and aromatic The root is frequently forked, and it is probably owing to this circumstance that medicinal properties were in the first place attributed to it, its resemblance to the body of a man being supposed to indicate that it could restore virile power to the aged and impotent In price it varies from $6 to $12 to the enormous sum of $300 or $400 an ounce

The action of the drug appears to be entirely psychic, and comparable to that of the mandrake of the Hebrews There is no evidence that it possesses any pharmacological or therapeutic properties

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GIOBERTI, VINCENZO (1801–1852), Italian philosopher and politician, was born at Turin where he was educated He was ordained priest in 1825 Partly under the influence of Mazzini, the freedom of Italy became his ruling motive in life,—its emancipation, not only from foreign masters, but from modes of thought alien to its genius, being linked in his mind with papal supremacy, though in an intellectual rather than political way On the accession of Charles Albert he received a court chaplaincy, but he resigned this office in 1833, and shortly afterwards was arrested on suspicion of political intrigue Imprisoned and banished without a trial, Gioberti went to Paris, and a year later, to Brussels, where he remained till 1845, teaching philosophy, and writing philosophical works An amnesty having been declared by Charles Albert in 1846, Gioberti returned to Italy in 1847 and was enthusiastically received He was soon elected president of the Chamber of Deputies At the close of the same year a new ministry was formed, headed by Gioberti, but with the accession of Victor Emmanuel in March 1849, his active life came to an end For a short time he held a seat in the cabinet, though without a portfolio, but an irreconcilable disagreement soon followed, and he was sent on a mission to Paris where he remained until his death on Oct 26, 1852

Gioberti's writings are more important than his political career Writing against the speculations of Rosmini-Serbati, he reconstructs, as he declares, ontology, and begins with the assertion that the *Ens* creates *ex nihilo* the existent, which is the universal idea in God become finite and individual God is the only being (*Ens*), all other things are merely existences God is also the origin of all human knowledge, and we apprehend Him by intuition A knowledge of both being and existences, and of their mutual relations, is necessary as the beginning of philosophy Gioberti is in some respects a Platonist He identifies religion with civilization, and in his *Del primato morale e civile degli Italiani* (1843) concludes that the church is the axis on which the well-being of human life revolves In it he pictures the supremacy of Italy, brought about by the restoration of the papacy as a moral dominion, founded on religion and public opinion In his later works, the *Rinnovamento* and the *Protologia,* he is thought by some to have shifted his ground under the influence of events In his first publication *La Teorica del sovran-naturale* (1838) he supported the reality of revelation and the future life In the *Introduzione allo studio della filosofia* (3 vols, 1839–40) he states his reasons for requiring a new method and new terminology, and brings out the doctrine that religion is the direct expression of the *idea* in this life, and is one with true civilization in history Civilization is a conditioned mediate tendency to perfection, to which religion is the final completion, it is the end of the second cycle expressed by the second formula, the *Ens* redeems existences, the many return to the one In 1846 appeared his essays on the more popular subjects, *Del bello* and *Del buono Del primato morale e civile degli Italiani* and its *Prolegomeni* and his attack on the Jesuits, *Il Gesuita moderno* (1847), no doubt hastened the transfer of rule from clerical to civil hands The hope that the loss of the papal temporal power would lead to a revival of religion expressed in the *Rinnovamento civile d'Italia* (1851), together with the pantheistic ontologism of his philosophy led to Gioberti's writings being placed on the *Index* They were edited by G Massari (Turin, 1856–61)

See G. Massari, *Vita de V Gioberti* (Florence, 1848), A Rosmini-Serbati, *V Gioberti e il panteismo* (Milan, 1848), A Mauri, *Della*

vita e delle opere di V. Gioberti (Genoa, 1853); B Spaventa, *La Filosofia di Gioberti* (Naples, 1863), G. Prisco, *Gioberti e l'ontologismo* (Naples, 1867), P Luciani, *Gioberti e la filosofia nuova italiana* (Naples, 1866–72), D Berti, *Di V Gioberti* (Florence, 1881) *See* also L Ferri, *L'Histoire de la philosophie en Italie au XIXe siècle* (1869); C. Werner, *Die italienische Philosophie des 19 Jahrhunderts*, II (1885), R Mariano, *La Philosophie contemporaine en Italie* (1866), D. Carutti, *Il Pensiero Civile di V Gioberti* (Turin, 1901); G. Gentile, *I Profeti del Risorgimento Italiano* (Florence, 1923).

GIOCONDO, FRA GIOVANNI (*c* 1433–1515), Italian antiquary and architect, was born at Verona, and died on July 1, 1515, at Rome On becoming a Franciscan he went to study in Rome, where he collected over 2,000 inscriptions, which he presented to Lorenzo de' Medici In 1499 Louis XII commissioned him to build the bridge of Notre Dame in Paris; in 1509 he fortified Treviso, and in 1514 assisted Raphael at St Peter's The design of the Palazzo del Consiglio at Verona is generally attributed to him

GIOIOSA-IONICA, a town of Calabria, Italy, province of Reggio di Calabria It is 65 m north-east by rail from the town of Reggio, and 38 m direct, 492 ft above sea-level Pop (1921) town, 4,602; commune, 12,026 Near the station, which is on the east coast of Calabria 3 m below the town to the southeast, are the remains of a small theatre belonging to the Roman period but the name of the city to which it belonged is unknown Remains of baths and other buildings have also been found

GIOJA, MELCHIORRE (1767–1829), Italian writer on philosophy and political economy, was born at Piacenza, on Sept 20, 1767 Renouncing his orders in 1796, he went to Milan, and on the arrival of Napoleon in Italy, advocated a republic under the dominion of the French in a pamphlet *I Tedeschi, i Francesi, ed i Russi in Lombardia* Under the Cisalpine Republic he became historiographer and director of statistics He was several times imprisoned, in 1820 on a charge of being implicated in a conspiracy with the Carbonari After the fall of Napoleon he retired into private life, and died at Milan on Jan 2, 1829

Besides the *Nuovo Prospetto delle scienze economiche* (1815–17), a summary of what had already been written on economics, administration and finance, Gioja's more important productions which reflect his passion for statistics and his inclination towards the English economists, are *Del merito e delle recompense* (1818), *Filosofia della statistica* (2 vols, 1826) and contributions to the *Annali Universali di Statistica* founded by him in 1824 His complete works appeared at Lugano (1832–49)

See monographs by G D Romagnosi (1829) and F Falco (1866), and G Pecchio, *Storia dell' economia pubblica in Italia* (1829).

GIOLITTI, GIOVANNI (1842–1928), Italian statesman, was born at Mondovi, Province of Cuneo, on Oct 27, 1842, and educated at the Lycée and at Turin University, where he graduated in law in 1861. After working in an advocate's office for some years, he was appointed king's procurator in Turin, and then held appointments in the ministry of justice and the ministry of finance. In 1882 he was appointed councillor of State and elected deputy for Cuneo As deputy he took part in the attack on Magliani, minister of finance, which led to the fall of the Depretis cabinet On March 9, 1889 Giolitti was appointed finance minister in the Crispi cabinet, but resigned at the end of 1890 On the fall of the Rudini cabinet in May 1892, Giolitti succeeded to the premiership, but his ministry fell after 18 months in disastrous circumstances The building crisis and the commercial rupture with France had impaired the situation of the state banks, and one, the Banca Romana, had been further undermined by maladministration A bank law, passed by Giolitti failed to effect an improvement The senate refused to confirm Giolitti's conferment of senatorial rank on Tanlongo, director general of the Banca Romana, and an interpellation in parliament on the position of the bank led to Tanlongo's arrest and prosecution A parliamentary commission of enquiry, appointed to investigate the condition of the state banks acquitted Giolitti of personal dishonesty He was, however, found guilty of the suppression of documents relating to the case, and he was obliged to resign His fall left the finances of the state disorganized, the pensions fund depleted, diplomatic relations with France strained in consequence of the massacre of Italian workmen at Aigues-Mortes, and Sicily and the Lunigiana in a state of revolt. After his resignation he was impeached for abuse of power as minister, but the supreme court quashed the impeachment by denying the competence of the ordinary tribunals to judge ministerial acts. Giolitti left the country for a short time and kept in the background for several years. He gradually regained much of his former influence, however, and used the Socialist agitation for his own ends, promising the agitators a free hand under his premiership He again entered the chamber, and became minister for the interior in the Zanardelli cabinet, succeeding Zanardelli, who resigned on account of ill-health, in November, 1903 During his tenure of office, he lost the support of the Socialists by the strong measures he was forced to take to quell serious disorders in various parts of the country. In March, 1905, feeling himself no longer secure, he resigned, indicating Fortis as his successor When Sonnino became premier in Feb. 1906, Giolitti did not openly oppose him, but his followers did, and Sonnino was defeated in May, Giolitti becoming prime minister once more For three years he remained in power, and by clever management of the elections, was returned by a strong majority in 1909 Opposition against him in parliament grew rapidly, however, led by Sonnino, and his cabinet fell in Dec. 1909, the chamber rejecting a bill of fiscal reforms which included a graduated income-tax He played a leading part in Opposition during the succeeding ministries of Sonnino and Luzzatti, and became premier for the fourth time in March 1911 During this period in office, he introduced a new franchise law (Oct 26–Nov 2, 1913) which practically amounted to universal suffrage, raising the electorate from 3,000,000 to 8,000,000 The chief event of Giolitti's fourth cabinet was the Libyan war, he embarked on this enterprise for financial and other reasons, though he himself had no militarist leanings He was accused of unconstitutional conduct in declaring war without the consent of parliament, and for acting during the war as if it were merely an affair of internal politics When peace was concluded he was again returned (1913) with a majority by the extended electorate, which, however, doubled the size of the Socialist party, and changed the opposition from the extreme Right to the Left Giolitti, discouraged by dissension among his supporters, and feeling opposition to his rule increasing not only in parliament, but in the country as a whole, seized the opportunity of a hostile vote by the Radical group to resign on March 10, 1914 He was succeeded by Salandra

When the World War broke out his attitude was in favour of absolute neutrality, and on the eve of Italian intervention he attempted to upset the Salandra cabinet by his personal influence over the parliamentary majority He was frustrated by formidable popular demonstrations in favour of participation on the side of the Entente; the cry of "A morte Giolitti" was heard, and he prudently retired to Cavour until November 11, 1917 Giolitti believed that Italian resources were unequal to war, and that her unpreparedness would have serious consequences. But in the dark hour after Caporetto he appeared again in the chamber, and made an eloquent appeal to Italians to stand firm and united in face of disaster After the War the disappointment over the peace settlement, the heavy burden of suffering and loss caused by the War, and the extreme socialistic policy of the Nitti cabinet brought about the return of Giolitti On October 12, 1919 he made the well-known election speech, the "Discorso di Dronero" outlining his future policy, and explaining his previous attitude, and on June 15, 1920 the fifth Giolitti cabinet was formed He succeeded in forming a cabinet which comprised a number of non-Giolittians of all parties, but only a few of his own "old guard," so that he won the support of a considerable part of the chamber, although the Socialists and the Popolari (Catholics) rendered his hold somewhat precarious His policy of inactivity during the occupation of the factories by the workmen organized by Socialist leaders in Sept. 1920 provoked the indignation not only of the manufacturers but of the middle classes He appears greatly to have over-estimated the strength of the Socialists, and therefore gave them a free hand with the object of avoiding bloodshed, and also perhaps to prove to the workmen that they could not run industry without the capitalists and the technical experts

When he realized the strength of the national reaction, he allowed the Fascists free rein to re-establish order and exercise many of the functions pertaining to the Government, while he assumed an attitude of Olympic calm and posed as being *au-dessus de la mêlée*, so as to avoid compromising himself with any party

In foreign affairs Giolitti succeeded in achieving a solution of the Adriatic problem, and with Count Sforza carried through the Treaty of Rapallo (*q v*). He dissolved the chamber on April 7, 1921, and was confirmed in power by the elections on May 15. But he resigned with his cabinet at the end of June, being succeeded as premier by Signor Bonomi. He played no part in the subsequent events, until at the time of the march on Rome he advised the premier, Signor Facta, to resign On the advent of the Fascist Government he expressed approval of it, and was elected to the chamber in 1924 He presented a list of his own in Piedmont which was not in opposition to, but independent of the Government, but after the Matteotti affair he went over to the opposition His influence was still strong in Piedmont, but he was over 80, and had little power against the Fascist régime In 1922 he published *Memorie della Mia Vita* (2 vols). He died on July 17, 1928

GIORDANI, PIETRO (1774–1848), Italian writer, was born on Jan. 1, 1774, at Piacenza, and died on Sept. 11, 1848, at Parma He studied philosophy and law at his native town, and after an unsuccessful attempt to become a Benedictine, was made professor of literature at Bologna. He was secretary of the Academy at Bologna from 1808 to 1815, when his *Panegirico à Napoleon* resulted in the loss of his position He afterwards travelled in various parts of Italy, became friendly with Manzoni and Canova, and wrote, in excellent Italian prose, numerous works on aesthetics and politics These were edited by Gussali in 14 vols, 1854–62.

See D. Giovanni, *P Giordani* (Milan, 1882), and S Fermi, *Bibliografia delle Lettere a stampa di P Giordani* (Florence, 1923).

GIORDANO, LUCA (1632–1705), Italian painter, was born in Naples, son of the painter Antonio, who imparted to him the first rudiments of drawing He was a pupil of Giuseppe Ribera. He acquired the nickname of Luca Fa-presto (Luke Work-fast), derived from the almost miraculous celerity with which from an early age he handled the brush He copied nearly 20 times the "Battle of Constantine" by Giulio Romano, and with proportionate frequency several great works of Raphael and Michelangelo. His rapidity, which belonged as much to invention as to mere handiwork, and his versatility, which enabled him to imitate other painters deceptively, earned for him two other epithets, "Fulmine" (the Thunderbolt) and "The Proteus," of Painting He visited all the main seats of the Italian school of art, and formed for himself a style combining in a certain measure the ornamental pomp of Paul Veronese and the contrasting compositions and large schemes of Pietro da Cortona Returning to Naples, he practised his art with so much applause that Charles II. of Spain in 1692 invited him over to Madrid, where he remained eight years Soon after the death of Charles in 1700 Giordano, gorged with wealth, returned to Naples He spent large sums in acts of munificence, and was particularly liberal to his poorer brethren of the art He again visited various parts of Italy, and died in Naples on Jan 12, 1705, his last words being "O Napoli, sospiro mio" (O Naples, my heart's love!) One of his maxims was that the good painter is the one whom the public like, and that the public are attracted more by colour than by design

Giordano left numerous oil pictures besides extensive fresco paintings One of the most renowned works is "Christ expelling the Traders from the Temple," in the church of the Padri Girolamini, a colossal work, full of expressive lazzaroni, also the frescoes of S Martino, and those in the Tesoro della Certosa, including the subject of "Moses and the Brazen Serpent", and the cupola-paintings in the Church of S Brigida, which contains the artist's own tomb In Spain he executed a surprising number of works—continuing in the Escorial the series commenced by Cambiasi, and painting frescoes of the "Triumphs of the Church," the "Genealogy and Life of the Madonna," the stories of Moses, Gideon, David and Solomon, and the "Celebrated Women of Scripture," all works of large dimensions His pupils, Aniello Rossi and Matteo Pacelli, assisted him in Spain In Florence, near the end of his life, he painted the Cappella Corsini, the impressive ceiling decoration in the Palazzo Medici and other works In youth he etched with considerable skill some of his own paintings, such as the "Slaughter of the Priests of Baal" He also painted much on the crystal borderings of looking-glasses, cabinets, etc, seen in many Italian palaces, and was, in this form of art, the master of Pietro Garofolo. His best pupil, in painting, was Paolo de Matteis. His influence on Spanish art was detrimental to the local traditions.

Bellori, in his *Vite de' pittori moderni*, is a leading authority regarding Luca Giordano *See* also W Rolfs, *Geschichte der Malerei Neapels* (1910)

GIORGIO, FRANCESCO (1439–1502), Italian engineer, architect, painter and sculptor, was born on Nov 14, 1439, at Siena, and died there in 1502 He was engaged on constructive and decorative work in his native town from 1463 to 1478 when he was employed by the duke of Urbino as architect and military engineer In 1490 he constructed the model for the dome of Milan cathedral, and five years later invented the mines used at the siege of Naples. Some of his pictures, which show the influence of Fra Filippo Lippi, are now in the Siena gallery

His *Trattato di architettura civile e militare* was edited by C Saluzzo in 1841

GIORGIONE (*c.* 1478–1510), Italian painter, was born at Castelfranco In contemporary documents he is always called (according to the Venetian manner of pronunciation and spelling) Zorzi, Zorzo or Zorzon of Castelfranco A tradition, having its origin in the 17th century, represented him as the natural son of some member of the great local family of the Barbarelli, by a peasant girl of the neighbouring village of Vedelago, consequently he is commonly referred to in histories and catalogues under the name of Giorgio Barbarelli or Barbarella This tradition has, however, on close examination been proved baseless On the other hand mention has been found in a contemporary document of an earlier Zorzon, a native of Vedelago, living in Castelfranco in 1460. Vasari, who wrote before the Barbarella legend had sprung up, says that Giorgione was of very humble origin It seems probable that he was simply the son or grandson of the afore-mentioned Zorzon the elder and that the after-claim of the Barbarelli to kindred with him was a mere piece of family vanity

Of the facts of his life we are almost as meagrely informed as of the circumstances of his birth The little city, or large fortified village, for it is scarcely more, of Castelfranco in the Trevisan stands in the midst of a rich and broken plain at some distance from the last spurs of the Venetian Alps. From the natural surroundings of Giorgione's childhood was no doubt derived his ideal of pastoral scenery, the country of pleasant copses, glades, brooks and hills amid which his personages love to wander or recline with lute and pipe How early in boyhood he went to Venice we do not know, but internal evidence supports the statement of Ridolfi that he served his apprenticeship there under Giovanni Bellini, and there he made his fame and had his home. That his gifts were early recognized we know from the facts, recorded in contemporary documents, that in 1500, he was chosen to paint portraits of the Doge Agostino Barberigo and the condottiere Consalvo Ferrante, that in 1504 he was commissioned to paint an altarpiece in memory of Matteo Costanzo in the cathedral of his native town, Castelfranco, that in 1507 he received at the order of the Council of Ten part payment for a picture (subject not mentioned) on which he was engaged for the hall of the audience in the ducal palace; and that in 1507–1508 he was employed, with other artists of his own generation, to decorate with frescoes the exterior of the newly rebuilt Fondaco dei Tedeschi or German merchants' hall at Venice, having already done similar work on the exterior of the Casa Soranzo, the Casa Grimani alli Servi and other Venetian palaces In September or October 1510 he died of the plague then raging in the city, and within a few days of his death we find the great art-patroness and amateur, Isabella d'Este, writing from Mantua and trying in

St. Peter's in Rome For the same patron he executed an elaborate ciborium or altar-piece for the high altar of St. Peter's, for which he received 800 ducats It represents on the principal face a colossal Christ enthroned with adoring angels beside him and a kneeling donor at his feet, and the martyrdoms of St Peter and St. Paul on separate panels to right and left; on the reverse is St Peter attended by St George and other saints, receiving from the donor a model of his gift, with stately full-length figures of two apostles to right and two to left, besides various accessory scenes and figures in the predellas and the margins

Yet a third work by the master at Rome is a repainted fragment at the Lateran of a fresco of Pope Boniface VIII proclaiming the jubilee of 1300 To about 1302 or 1303 would belong, if there is truth in it, the familiar story of Giotto's "O" Pope Benedict XI, the successor of Boniface VIII., sent, as the tale runs, a messenger to bring him proofs of the painter's powers. Giotto would give no other sample of his talent than an O drawn with a free sweep of the brush from the elbow, but the pope was satisfied and engaged him at a great salary to go and adorn with frescoes the papal residence at Avignon Benedict, however, dying at this time (1305), nothing came of this commission

At this point in Giotto's life we come to the greatest by far of his undestroyed and undisputed enterprises, and one which can with some certainty be dated This is the series of frescoes with which he decorated the entire internal walls of the chapel built at Padua in honour of the Virgin of the Annunciation by a rich citizen of the town, Enrico Scrovegni, perhaps in order to atone for the sins of his father, a notorious usurer whom Dante places in the seventh circle of hell The building is on the site of an ancient amphitheatre, and is therefore generally called the chapel of the Arena Since it is recorded that Dante was Giotto's guest at Padua, and since we know that it was in 1306 that the poet came from Bologna to that city, we may conclude that to the same year, 1306, belongs the beginning of Giotto's great undertaking in the Arena chapel The scheme includes a Saviour in Glory over the altar, a Last Judgment, full of various and impressive incident, occupying the whole of the entrance wall, with a series of subjects from the Old and New Testament and the apocryphal Life of Christ painted in three tiers on either side wall, and lowest of all a fourth tier with emblematic Virtues and Vices in monochrome, the Virtues being on the side of the chapel next the incidents of redemption in the entrance fresco of the Last Judgment, the Vices on the side next the incidents of perdition.

When the middle ages came to a close Giotto was laying the foundation upon which the progress of the Renaissance was afterwards securely based In his day the knowledge possessed by painters of the human frame and its structure rested only upon general observation and not upon detailed or scientific study; while to facts other than those of humanity their observation had never been closely directed Of linear perspective they possessed but elementary and empirical ideas, and their endeavours to express aerial perspective and deal with the problems of light and shade were rare and partial. As far as painting could possibly be carried under these conditions, it was carried by Giotto In its choice of subjects, his art is entirely subservient to the religious spirit of the age in which he lived. Many of those truths of nature to which the painters of succeeding generations learned to give accurate and complete expression, Giotto was only able to express by way of imperfect symbol and suggestion. But among the elements of art over which he has control he maintains so just a balance that his work produces in the spectator less sense of imperfection than that of many later and more accomplished masters In some particulars his painting has never been surpassed in mastery of expressive line and of harmonious decorative tint, in the massing and scattering of groups, and in the direct and vital gestures of the figures

Of many other works said to have been executed by Giotto at Padua, all that remains consists of some scarce recognizable traces in the chapter-house of the great Franciscan church of St Antonio. Besides Padua, he is said to have resided and left great works at Ferrara, Ravenna, Urbino, Rimini, Faenza, Lucca and other cities; in some of them paintings of his school are still shown, but nothing which can fairly be claimed to be by his hand It is recorded also that he was much employed in Florence; but the vandalism of later generations has effaced nearly all that he did there Among works whitewashed over by posterity were the frescoes with which he covered no less than five chapels in the church of Santa Croce. Two of these, the chapels of the Bardi and the Peruzzi families, were scraped in the early part of the 19th century, and very important remains were uncovered and immediately subjected to a process of restoration which robbed them in part of their authenticity. The frescoes of the Bardi chapel tell again the story of St Francis, to which so much of his best power had already been devoted, those of the Peruzzi chapel deal with the lives of St John the Baptist and St John the Evangelist Such scenes as the Funeral of St Francis, the Dance of Herodias's Daughter, and the Resurrection of St John the Evangelist, which have to some extent escaped the disfigurements of the restorer, are among acknowledged classics of the world's art The only clues to the dates of any of these works are to be found in the facts that among the figures in the Bardi chapel occurs that of St Louis of Toulouse, who was not canonized till 1317, therefore the painting must be subsequent to that year, and that the "Dance of Salome" must have been painted before 1331, when it was copied by the Lorenzetti at Siena The only other extant works of Giotto at Florence are a fine "Crucifix," not undisputed, at San Marco, and the majestic altar-piece of the Madonna, in the Uffizi

It appears that Giotto towards the end of his life had come under the notice of Duke Charles of Calabria, son of King Robert of Naples, during the visits of the duke to Florence which took place between 1326 and 1328, in which year he died. Soon afterwards Giotto must have gone to King Robert's court at Naples, where he was enrolled as an honoured guest and member of the household by a royal decree dated Jan 20, 1330 Another document shows him to have been still at Naples two years later Tradition says much about the friendship of the king for the painter and the freedom of speech and jest allowed him, much also of the works he carried out at Naples in the Castel Nuovo, the Castel dell' Uovo, and the church and convent of Sta Chiara Not a trace of these works remains According to Vasari he illustrated by order of King Robert St John's Apocalypse, of which various copies are still extant in churches in southern Italy The original version was discovered in the panels in possession of Count Erbach of Fürstenau.

Meantime Giotto had been advancing, not only in years and worldly fame, but in prosperity He was married young, and had, so far as is recorded, three sons, Francesco, Niccola and Donato, and three daughters, Bice, Caterina and Lucia He had added by successive purchases to the plot of land inherited from his father at Vespignano His fellow-citizens of all occupations and degrees delighted to honour him And now, in his 68th year (if we accept 1266/7 as the correct date of birth), on his return from Naples, he received the final and official testimony to the esteem in which he was held at Florence By a solemn decree of the *Priori* on April 12, 1334, he was appointed master of the works of the cathedral of Sta Reparata (later and better known as Sta Maria del Fiore) and official architect of the city walls and the towns within her territory. What training as a practical architect his earlier career had afforded him we do not know, but his interest in the art from the beginning is made clear by the carefully studied architectural backgrounds of many of his frescoes Dying on Jan 8, 1336 (old style 1337), Giotto only enjoyed his new dignities for two years But in the course of them he had found time not only to make an excursion to Milan, on the invitation of Azzo Visconti and with the sanction of his own government, but to plan two great architectural works at Florence and superintend the beginning of their execution, namely the west front of the cathedral and its detached campanile or bell-tower. The unfinished enrichments of the cathedral front were stripped away in a later age. The foundation-stone of the Campanile was laid with solemn ceremony on July 18, 1334 Its lower courses seem to have been completed from Giotto's design, and the first course of its sculptured ornaments (the famous series of primitive Arts and Industries) actually by his own hand, before his death. It

is not clear what modifications of his design were made by Andrea Pisano, who was appointed to succeed him, or again by Francesco Talenti, to whom the work was next entrusted; but the incomparable structure as we now see it stands as a fitting monument to the genius who first conceived it.

The art of painting, as re-created by Giotto, was carried on throughout Italy by his pupils and successors for nearly a hundred years, until a new impulse was given to art by the combined influences of naturalism and classicism in the hands of men like Donatello and Masaccio. Most of the anecdotes related of the master are probably inaccurate in detail, but the general character which tradition has agreed in giving him can never be assailed He was from the first a kind of popular hero He is celebrated by the poet Petrarch and by the historian Villani He is made the subject of tales and anecdotes by Boccaccio and by Franco Sacchetti From these notices, as well as from Vasari, we gain a distinct picture of the man, as a master craftsman, to whose strong combining and inventing powers nothing came amiss, conscious of his own deserts, never at a loss either in the things of art or in the things of life, and equally ready and efficient whether he has to design the scheme of some great spiritual allegory in colour or imperishable monument in stone, or whether he has to show his wit in the encounter of practical jest and repartee

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(S. C.; X.)

GIPPSLAND: *see* VICTORIA.

GIRAFFE, the tallest of all mammals, reaching 18ft. 7in. in height, the type of the family *Giraffidae*. The classic term "camelopard" has fallen into disuse

Skin-covered horns are present in both sexes, and there is often an unpaired one in advance of the pair on the forehead. Among other characteristics may be noticed the length of the neck and limbs, the absence of lateral toes, and the long tufted tail The tongue is remarkable for its length (up to 18in.) and elasticity It is covered with numerous large papillae, and forms an organ for the prehension of food Giraffes inhabit open country and browse on tall trees To drink or graze they are obliged to straddle the fore-legs apart, but they are capable of going long without water They can gallop at over 30 miles an hour When standing among mimosas they are difficult of detection They are almost entirely voiceless One fawn is produced at a birth Formerly giraffes were found in large herds, but persecution led to their extermination in many districts Although in Tertiary times spread over southern Europe and India, giraffes are now confined to Africa south of the Sahara



BY COURTESY OF THE NEW YORK ZOOLOGICAL SOCIETY

THE NUBIAN GIRAFFE
Found only in Africa, south of the Sahara desert, the giraffe is the tallest mammal

Apart from the Somali giraffe (*Giraffa reticulata*), characterized by its deep liver-red colour, there are numerous local subspecies of the ordinary giraffe (*G camelopardalis*)

GIRALDI, GIGLIO GREGORIO (LILIUS GREGORIUS GYRALDUS) (1479–1552), Italian scholar and poet was born at Ferrara Later he removed to Naples, where he lived on familiar terms with Jovianus Pontanus and Sannazaro; and subsequently to Lombardy, where he enjoyed the favour of the Mirandola family At Milan in 1507 he studied Greek under Chalcondylas and shortly afterwards, at Modena, he became tutor to Ercole (afterwards Cardinal) Rangone About the year 1514 he removed to Rome where, under Clement VII., he held the office of apostolic protonotary, but after the sack of Rome (1527) he returned in poverty once more to Mirandola, whence he was driven by the troubles that followed the assassination of the reigning prince in 1533. The rest of his life was one long struggle with ill-health, poverty and neglect He died at Ferrara, and his epitaph makes touching and graceful allusion to the sadness of his end Giraldi was a man of great learning; his *Historia de dus gentium* marked an advance in the study of classical mythology, and his treatises, *De annis et mensibus* and on the *Calendarium Romanum et Graecum*, helped to bring about the reform of the calendar Among his other works are *Progymnasma adversus literas et literatos; Historiae poetarum Graecorum ac Latinorum; De poetis suorum temporum;* and *De sepultura ac vario sepeliendi ritu* Giraldi was also an elegant Latin poet

His *Opera omnia* were published at Leyden in 1696.

GIRALDI, GIOVANNI BATTISTA (1504–1573), surnamed CYNTHIUS, CINTHIO or CINTIO, Italian novelist and poet, born at Ferrara in Nov 1504, was educated at the university of his native town, where in 1525 he became professor of natural philosophy, and, 12 years afterwards, succeeded Celio Calcagnini in the chair of belles-lettres Between 1542 and 1560 he acted as private secretary, first to Ercole II and afterwards to Alphonso II of Este, but having, in connection with a literary quarrel in which he had got involved, lost the favour of his patron in the latter year, he removed to Mondovi, where he remained as a teacher of literature till 1568 He occupied the chair of rhetoric at Pavia till 1573, when he returned to his native town, where on Dec 30 he died. Besides an epic entitled *Ercole* (1557), in 26 cantos, Giraldi wrote nine tragedies, the best known of which is *Orbecche* (1541; vol iv of the *Teatro antico*, 1809) The sanguinary and disgusting character of the plot of this play, and the general poverty of its style are, in the opinion of many of its critics, almost fully redeemed by occasional bursts of genuine and impassioned poetry. Giraldi won a European reputation by his *Hecatommithi* or *Ecatomiti* (modern ed Turin, 3 vols, 1853–54), a collection of tales closely resembling the novels of Giraldi's contemporary Bandello, though inferior in vigour, liveliness and local colour Originally published at Monteregale, Sicily, in 1565, they were frequently reprinted in Italy, a French translation by Chappuys appeared in 1583 and one in Spanish in 1590 The *Hecatommithi* furnished, whether directly or indirectly, the plots of Shakespeare's *Measure for Measure* and *Othello* and of Beaumont and Fletcher's *Custom of the Country*

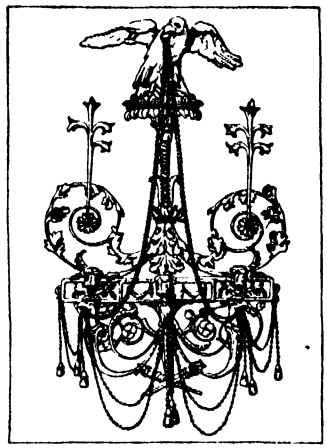
GIRALDUS CAMBRENSIS (GERALD DE BARRI) (*c* 1146–1220), mediaeval historian, was born at Manorbier Castle, Pembrokeshire, the son of William de Barri. He studied at Paris until 1172 when he was appointed to collect tithe in Wales In 1175 he became archdeacon of Brecon, and on the death of his uncle in the following year, an attempt was made to elect him bishop of St David's, but Henry II was unwilling to see anyone with powerful native connections a bishop in Wales After three more years of study at Paris, Giraldus in 1180 was made commissary to the bishop of St David's, and in 1184 one of the king's chaplains. While accompanying Prince John to Ireland he wrote his interesting *Topographia Hibernica,* and his *Expurgatio Hibernica,* a strongly prejudiced history of the conquest In 1188 he went with the primate, Baldwin, to Wales to preach the third crusade, and while there acquired material for his famous *Itinerarium Cambrense.* He then set out for the Holy Land, but in 1189 was sent back to Wales by the king to keep order Having successively refused the sees of Bangor and Llandaff, he retired to Lincoln from 1192–98 and wrote his *Gemma ecclesiastica* and *Vita S Remigii* In 1198 he was elected bishop of St David's, but Archbishop Hubert's objection necessitated three visits to Rome and a violent indication of the independence of St David's from Canterbury In the end, the pope ordered a new election, the prior of Llanthony being elected in 1202 Giraldus spent the rest of his life in retirement, and produced the *Descriptio Cambriae, De rebus a se gestis,* his autobiography, *De Instructione principis,* and the *Vita Galfridi Archiepiscopi Eborecensis*

Giraldus was an excellent Latinist, well versed in the social and intellectual life of his day His eloquence, his humour and naive vanity, his keen, though impressionistic, observation of cus-

toms, traditions, scenery, etc , and his friendships with his great contemporaries, such as Innocent III , Richard Coeur-de-Lion, King John, Stephen Langton, St Hugh of Lincoln and Grosseteste, all contribute to making him one of the most vivid and enterprising of writers As historical material, however, his works must be estimated both in the light of his violent party spirit and of his intense patriotism

His writings were edited by J. S. Brewer, J F. Dimock and G. F. Warner in the Rolls series (1861–91) 8 vols with valuable introductions The *De Invectionibus* has recently been edited by W. S Davies in *Y Cymmrodor,* vol xxx (1920) The *Topographia,* the *Expugnatio,* the *Itinerarium* and the *Descriptio* were translated in Bohn's Library series (1863) and the last two again in Everyman's Library (1908) with a good introduction by W. Llewelyn Williams

GIRANDOLE [from the Ital *girandola*], an ornamental and luxurious candle-holder that came into use about the second half of the 17th century, and was commonly made and used in pairs In the great 18th-century period of French house decoration the famous *ciseleurs* designed some exceedingly beautiful examples Various metals have been used for the purpose and some have been made in hard woods Gilded bronze has been a very frequent medium, but for table purposes silver is still the favourite material



BY COURTESY OF THE METROPOLITAN MUSEUM OF ART

AN 18TH CENTURY GIRANDOLE MADE BY ADAM AND HEPPLEWHITE

GIRARD, JEAN BAPTISTE (known as "Le Père Girard" or "Le Père Gregoire") (1765–1850), French-Swiss educationalist was born at Fribourg and educated for the priesthood at Lucerne In 1804 he began his career as a public teacher, first in the elementary school at Fribourg (1805–23), then (being driven away by Jesuit hostility) in the gymnasium at Lucerne till 1834, when he retired to Fribourg and devoted himself with the production of his books on education, *De l'enseignement régulier de la langue maternelle* (1834, 9th ed 1894, Eng trans by Lord Ebrington, *The Mother Tongue,* 1847); and *Cours éducatif* (1844–46) Father Girard was hailed, in Switzerland, as a second Pestalozzi, and his books influenced educational methods elsewhere He abandoned the system of cramming children's minds with rules and facts, seeking instead to stimulate their intelligence

GIRARD, STEPHEN (1750–1831), American financier and philanthropist, founder of Girard college in Philadelphia, was born in a suburb of Bordeaux, France, on May 20, 1750 His father was a sea captain, and the son cruised to the West Indies and back, 1764–73 In May 1776 he settled in Philadelphia as a merchant In June of the next year he married Mary (Polly) Lum, daughter of a shipbuilder, who, two years later, after Girard became a citizen of Pennsylvania (1778), built for him the "Water Witch," the first of a fleet trading with New Orleans and the West Indies Most of Girard's ships were named after his favourite French authors, such as "Rousseau," "Voltaire," "Helvétius," and "Montesquieu" His beautiful young wife became insane, and spent the years from 1790 until her death in 1815 in the Pennsylvania hospital In 1810 Girard used about $1,000,000 deposited by him with the Barings of London for the purchase of shares of the much depreciated stock of the Bank of the United States—a purchase of great assistance to the United States Government In May 1812 he established the Bank of Stephen Girard He subscribed in 1814 for about 95% of the Government's war loans of $5,000,000, of which only $20,000 besides had been taken In 1793, during the plague of yellow fever in Philadelphia, he volunteered to act as manager of the hospital at Bush hill, again during the yellow fever epidemic of 1797–98 he took the lead in relieving the poor and caring for the sick He died in Philadelphia on Dec 26, 1831. His philanthropy was shown in his disposition by will of his estate, the bulk of which went to Philadelphia to be used in founding a school or college, in providing a better police system, and in making municipal improvements and lessening taxation. Girard's heirs-at-law contested the will in 1836 In 1844 Daniel Webster, appearing for the heirs, made a famous plea for the Christian religion, but Justice Joseph Story handed down an opinion adverse to the heirs (Vidals v Girard's Executors). Work upon the buildings was begun in 1833, and the college was opened in Jan 1848 The principal building, planned by Thomas Ustick Walter (1804–87), has been called "the most perfect Greek temple in existence." To a sarcophagus in this main building the remains of Stephen Girard were removed in 1851 The course of training is partly industrial—for a long time graduates were indentured till they came of age—but it is also preparatory to college entrance

See H A Ingram, *The Life and Character of Stephen Girard* (1884), George P Rupp, "Stephen Girard—Merchant and Mariner," in *1848–1849 Semi-Centennial of Girard College* (1898)

GIRARD, a city of Russell county, Alabama, U S A , on the Chattahoochee river, opposite Columbus, Ga. It is on Federal highway 11, and is served by the Central of Georgia railway The population was 4,942 in 1920 (35% negroes) It is a shipping point for lumber and cotton

GIRARD, a city of Trumbull county, O , U S A , 5m N W of Youngstown, on the Mahoning river It is served by the Baltimore and Ohio, the Erie, the Pennsylvania, and the Youngstown and Northern railways The population was 6,556 in 1920 (23% foreign-born white) and was estimated locally at 10,000 in 1928 The village was incorporated in 1892 and became a city in 1924

GIRARDIN, DELPHINE DE (1804–1855), French author, was born at Aix-la-Chapelle, the daughter of Sophie Gay She published two volumes of miscellaneous pieces, *Essais poétiques* (1824) and *Nouveaux Essais poétiques* (1825) A visit to Italy in 1827, during which she was enthusiastically welcomed by the literati of Rome and even crowned in the capitol, was productive of various poems, of which the most ambitious was *Napoline* (1833). Her marriage in 1831 to Émile de Girardin (*see* below) opened up a new literary career. The contemporary sketches which she contributed from 1836 to 1839 to the feuilleton of *La Presse,* under the *nom de plume* of Charles de Launay, were collected under the title of *Lettres parisiennes* (1843), and obtained a brilliant success *Contes d'une vieille fille à ses neveux* (1832), *La Canne de Monsieur de Balzac* (1836) and *Il ne faut pas jouer avec la douleur* (1853) are among the best-known of her romances, and her dramatic pieces in prose and verse include one-act comedies, *C'est la faute du mari* (1851), *La Joie fait peur* (1854), *Le Chapeau d'un horloger* (1854) and *Une Femme qui déteste son mari,* which did not appear till after the author's death Among the frequenters of her salon were Théophile Gautier and Balzac, Alfred de Musset and Victor Hugo She died on June 29, 1855. Her collected works were published in six volumes (1860–61)

See Sainte-Beuve, *Causeries du lundi,* t iii , G de Molènes, "Les Femmes poètes," in *Revue des deux mondes* (July 1842), Taxile Delord, *Les Matinées littéraires* (1860), *L'Esprit de Madame Girardin, avec une préface par M Lamartine* (1862), G d'Heilly, *Madame de Girardin, sa vie et ses oeuvres* (1868), Imbert de Saint Amand, *Mme de Girardin* (1875); H Malo, *Une Muse et sa mère, Delphine Gay* (1925)

GIRARDIN, ÉMILE DE (1802–1881), French publicist, was born in Paris, the son of General Alexandre de Girardin and of Madame Dupuy, wife of a Parisian advocate He became inspector of fine arts under the Martignac ministry just before the revolution of 1830, and was an energetic and passionate journalist In 1836 he inaugurated cheap journalism in a popular Conservative organ, *La Presse,* the subscription to which was only forty francs a year This undertaking involved him in a duel with Armand Carrel, the fatal result of which made him refuse satisfaction to later opponents In 1839 he was excluded from the Chamber of Deputies, to which he had been four times elected, on the plea of his supposed foreign birth (he was wrongly alleged to have been born in Switzerland), but was admitted in 1842 He resigned early in February 1847, and on Feb 14, 1848, sent a note to Louis Philippe demanding his resignation and the

regency of the duchess of Orleans In the Legislative Assembly he voted with the Mountain He pressed eagerly in his paper for the election of Prince Louis Napoleon, of whom he afterwards became one of the most violent opponents In 1856 he sold *La Presse,* only to resume it in 1862, but its vogue was over, and Girardin started a new journal, *La Liberté,* the sale of which was forbidden in the public streets He supported Émile Ollivier and the Liberal Empire, but plunged into vehement journalism again to advocate war against Prussia His most successful *coup* was the purchase of *Le Petit Journal* Girardin married in 1831 Delphine Gay (*see* above), and after her death in 1855 Guillemette Joséphine Brunold, countess von Tieffenbach, widow of Prince Frederick of Nassau He was divorced from his second wife in 1872

His writings include *De la presse périodique au XIXe siècle* (1837), *De l'instruction publique* (1838), *Études politiques* (1838), *De la liberté de la presse et du journalisme* (1842), *Le Droit au travail au Luxembourg et à l'Assemblée Nationale* (2 vols, 1848), *Les Cinquante-deux* (1849, etc), a series of articles on current parliamentary questions; *La Politique universelle, décrets de l'avenir* (Brussels, 1852), *Le Condamné du 6 mars* (1867), an account of his own differences with the government in 1867 when he was fined 5000 fr for an article in *La Liberté, Le Dossier de la guerre* (1877), a collection of official documents, *Questions de mon temps, 1836 à 1856,* articles extracted from the daily and weekly press (12 vols, 1858)

GIRARDON, FRANÇOIS (1628–1715), French sculptor, was born at Troyes on March 17, 1628 As a boy he had for master a joiner and wood-carver, named Baudesson, under whom he is said to have worked at the château of Liébault, where he attracted the notice of Chancellor Séguier By the chancellor's influence Girardon was sent to Paris and placed in the studio of François Anguier, and afterwards sent to Rome In 1652 he was back in France, in Paris he found it necessary to conciliate Le Brun, the court painter Girardon is reported to have declared himself incapable of composing a group, whether with truth or from motives of policy it is impossible to say This much is certain, that a very large proportion of his work was carried out from designs by Le Brun, and shows the merits and defects of Le Brun's manner An immense quantity of work at Versailles was entrusted to him, and in recognition of the successful execution of four figures for the Bains d'Appolon, Le Brun induced the king to present his protégé personally with a purse of 300 louis In 1650 Girardon was made member of the academy, in 1659 professor, in 1674 *adjoint au recteur,* and finally in 1695 chancellor Five years before (1690), on the death of Le Brun, he had also been appointed *inspecteur général des ouvrages de sculpture* In 1699 he completed the bronze equestrian statue of Louis XIV, erected by the town of Paris on the Place Louis le Grand This statue was melted down during the Revolution, and is known to us only by a small bronze model (Louvre) finished by Girardon himself His Tomb of Richelieu (church of the Sorbonne) was saved from destruction by Alexandre Lenoir, who received a bayonet thrust in protecting the head of the cardinal from mutilation It is a capital example of Girardon's work, and the theatrical pomp of its style is typical of the funeral sculpture of the reigns of Louis XIV and Louis XV , but amongst other important specimens yet remaining may also be cited the Tomb of Louvois (St Eustache), that of Bignon, the king's librarian, executed in 1656 (St Nicolas du Chardonneret), and decorative sculptures in the Galerie d'Apollon and Chambre du roi in the Louvre He died in Paris in 1715

See Corrard de Breban, *Notice sur la vie et les oeuvres de Girardon* (1850)

GIRART DE ROUSSILLON, an epic figure of the Carolingian cycle of romance In the genealogy of romance he is a son of Doon de Mayence His legend is contained in a *Vita Girardi de Roussillon,* dating from the early 12th century and written probably by a monk of the abbey of Pothières or of Vezelai, both of which were founded in 860 by Girart, in *Girart de Roussillon,* a *chanson de geste* of similar date, apparently based on an earlier Burgundian poem, in a 14th century romance in alexandrines, and in a prose romance by Jehan Wauquelin in 1447 The historical Girard, son of Leuthard and Grimildis, was count of Paris in 837, and embraced the cause of Lothair against Charles the Bald In 855 he became governor of Provence for Lothair's son Charles, king of Provence (d 863) His wife Bertha defended Vienne unsuccessfully against Charles the Bald in 870, and Girard retired with his wife to Avignon, where he died But the historical facts are so distorted in *Girart de Roussillon* that the *trouvère* makes him the opponent of Charles Martel, to whom he stands in the relation of brother-in-law He is nowhere described in authentic historic sources as of Roussillon, a title derived from his castle on Mt Lassois, near Châtillon-sur-Seine Southern traditions concerning Count Girart, in which he is made the son of Garin de Monglane, are embodied in *Girart de Viane* (13th century) by Bertrand de Bar-sur-l'Aube, and in the *Aspramonte* of Andrea da Barberino, where he figures as Girart de Frete or de Fratte *Girart de Viane* is the recital of a siege of Vienne by Charlemagne, and in *Aspramonte* Girart de Fratte leads an army of infidels against Charlemagne

See F Michel, *Gerard de Rossillon publié en français et en provençal d'après les mss de Paris et de Londres* (1856), P Meyer, *Girart de Roussillon* (1884), a translation in modern French with a comprehensive introduction For *Girart de Viane* (ed P Tarbé, Reims, 1850) *see* L Gautier, *Les Épopées françaises,* vol iv (1878–94), F A Wulff, *Notice sur les sagas de Magus et de Geirard* (Lund, 1874)

GIRAUD, GIOVANNI, Count (1776–1834), Italian dramatist, of French origin, a native of Rome, produced his first play, *L'Onestà non si vince,* in 1798 In 1809 he became director-general of the Italian theatres His comedies, the best of which are *Gelosie per equivoco* (1807) and *L'Ajo nell' imbarazzo* (1824), were bright and amusing on the stage, but of no particular literary quality

His collected comedies were published in 1823 and his *Teatro domestico* in 1825

GIRAUDOUX, HIPPOLYTE JEAN (1882–), French author and diplomatist, was born on Oct 29, 1882 at Bellac (Haute Vienne) and educated at the *Ecole Normale* in Paris He became head of the press service in the French foreign office, and afterwards secured an appointment in the diplomatic service He wrote a series of novels in which he showed extraordinary originality and wit Although the influence of André Gide is apparent, the style is unmistakably Giraudoux's own, and has undoubtedly influenced contemporary writers René Lalou has described his method as being in literature what impressionism is in painting The most important of his works are, *Simon le Pathétique* (1918), partly autobiographical in character, *L'Admirable Clio* (1920) one of the lightest and yet the most profound of war studies, *Suzanne et le Pacifique* (1921), *Siegfried et le Limousin* (1922), in which the hero, a French poet, becomes a prisoner of war in Germany, loses his memory, rises to a high political position, and then has to decide whether he shall return to France and learn to be a Frenchman once more, *Bella* (1926) in which the principal personages (and, it may be said, the two great conflicting tendencies) in Paris political life are described, and *Juliette aux pays des hommes* (1924) His collection of short stories, *Provinciales* provides a good example of his impressionist methods *Siegfried et le Limousin* was dramatized by Jouvet, and produced at the Champs Elysées, Paris, in June 1928

GIRDER, a main beam of wood employed to support the joisting of a floor, or a latticed framework of steel forming the span of a bridge *See* Bridge and Structional Engineering

GIRDLE, a band of leather or other material worn round the waist, either to confine the loose and flowing outer robes so as to allow freedom of movement, or to fasten and support the garments of the wearer Among the Romans it was used to confine the *tunica,* and it formed part of the dress of the soldier, when a man quitted military service he was said, *cingulum deponere,* to lay aside the girdle Money being carried in the girdle, *zonam perdere* signified to lose one's purse, and, among the Greeks, to cut the girdle was to rob a man of his money

Girdles and girdle-buckles are not often found in Gallo-Roman graves, but in the graves of Franks and Burgundians they are constantly present, often ornamented with bosses of silver or bronze, chased or inlaid

In the Anglo-Saxon dress the girdle makes an unimportant

figure, and the Norman knights, as a rule, wore their belts under their hauberks After the Conquest, however, the artificers gave more attention to a piece whose buckle and tongue invited the work of the goldsmith. That of Queen Berengaria lets the long pendant hang below the knee, following a fashion which frequently reappears.

In the latter part of the 13th century the knight's surcoat is girdled with a narrow cord at the waist, while the great belt, which had become the pride of the cavalier, loops across the hips carrying the heavy sword aslant over the thighs or somewhat to the left of the wearer

But it is in the second half of the following century that the knightly belt takes its most splendid form. Under the year 1356 the continuator of the chronicle of Nangis notes that the increase of jewelled belts had mightily enhanced the price of pearls. The belt is then worn, as a rule, girdling the hips at some distance below the waist, being probably supported by hooks as is the belt of a modern infantry soldier The end of the belt, after being drawn through the buckle, is knotted or caught up after the fashion of the tang of the Garter The waist girdle either disappears or as a narrow strap is worn diagonally to help in the support of the belt. Ornament covers the whole belt, commonly seen as an unbroken line of bosses enriched with curiously worked roundels or lozenges which, when the loose strap-end is abandoned, meet in a splendid clasp About 1420 this fashion tends to disappear, the loose tabards worn over armour in the jousting-yard hindering its display. The belt never regains its importance as an ornament, and, at the beginning of the 16th century, sword and dagger are sometimes seen hanging at the knight's sides without visible support

In civil dress the belt of the 14th century is worn by men of rank over the hips of the tight short-skirted coat, and in that century and in the 15th and 16th there are sumptuary laws to check the extravagance of rich girdles worn by men and women whose station made them unseemly Even priests must be rebuked for their silver girdles with baselards Purses, daggers, keys, penners and inkhorns, beads and even books, dangled from girdles in the 15th and early 16th centuries Afterwards the girdle goes on as a mere strap for holding up the clothing or as a sword-belt. At the Restoration men contrasted the fashion of the court, a light rapier hung from a broad shoulder-belt, with the fashion of the countryside, where a heavy weapon was supported by a narrow waistbelt Soon afterwards both fashions disappeared. Sword-hangers were concealed by the skirt, and the belt, save in certain military and sporting costumes, has no more been in sight in England Even as a support for breeches or trousers, the use of braces has supplanted the girdle

In most of those parts of the Continent—Brittany, for example—where the peasantry maintains old fashions in clothing, the belt or girdle is still an important part of the clothing Italian non-commissioned officers find that the Sicilian recruit's main objection to the first bath of his lifetime lies in the fact that he must lay down the cherished belt With the Circassian the belt still buckles on an arsenal of pistols and knives

Folklore and ancient custom are much concerned with the girdle Bankrupts at one time put it off in open court; French law refused courtesans the right to wear it, St Guthlac casts out devils by buckling his girdle round a possessed man, an earl is "a belted earl" since the days when the putting on of a girdle was part of the ceremony of his creation, and fairy tales of half the nations deal with girdles which give invisibility to the wearer

(O. B)

GIRGA or GIRGEH, a town of Upper Egypt on the west bank of the Nile, 313 m S S.E. of Cairo by rail and about 10 m N N E. of the ruins of Abydos. Pop 19,893, of whom about one-third are Copts The town stands on a sharp bend of the Nile Many of the houses are of brick decorated with glazed tiles The town is noted for the excellence of its pottery Girga is the seat of a Coptic bishop It also possesses a Roman Catholic monastery, considered the most ancient in the country. As late as the middle of the 18th century the town stood a quarter of a mile from the river, but is now on the bank

GIRGENTI, a town in Sicily (*see* AGRIGENTUM).

GIRISHK, a village and fort in Afghanistan, on the right bank of the Helmund 78 m. W. of Kandahar on the road to Herat; 3,641 ft. above the sea The fort is the residence of the governor of the district (Pusht-i-Rud). It commands the fords of the Helmund and the road to Seistan, from which it is about 190 m distant; and it is the centre of a rich agricultural district. Girishk was occupied by the British during the first Afghan War; and a small garrison under a native officer, successfully withstood a siege of nine months The Dasht-i-Bakwa, a level plain of considerable width, stretches beyond Girishk towards Farah

GIRL GUIDES. The object of the Girl Guide movement is to promote among girls the elements of good citizenship, and the sense of service to others These are inculcated through means which appeal to the girl and lead her to train herself Membership is extended to all girls, irrespective of class, creed or country. It has no political or sectarian aims

The Girl Guides movement became by 1928 the widest of all organizations for girls, numbering some 700,000 members throughout the world It was originally a spontaneous effort, promoted by the girls themselves in imitation of their brothers, the Boy Scouts. In order to give this movement some sort of organization, Sir Robert Baden-Powell, with the help of his sister, Miss Agnes Baden-Powell, devised in 1910 the Girl Guide scheme After her marriage to the Chief Scout in 1915 Lady Baden-Powell became commissioner for the county of Sussex and organized that county on the lines of the Boy Scout organization, with commissioners to direct the work in the different districts and to form a link with headquarters, local committees were formed in each town or village to give the required local impetus, encouragement, and financial support to the young officers who were carrying on the work.

In 1917 Lady Baden-Powell was appointed chief commissioner, and from that time onwards the organization of the movement went ahead by leaps and bounds. Commissioners were appointed in every county in Great Britain and in the British dominions and provinces overseas By the end of 1918 every county was complete with its network of organization

At a big gathering of commissioners that year (1918) Lady Baden-Powell was unanimously elected permanent Chief Guide. Two years later Princess Mary became president, and in 1923 the movement was granted a royal charter of incorporation

Organization.—Decentralization is the keyword in the Guide organization The governing body is a council which meets annually and elects an executive of nine members Under the executive come the county commissioners, who are nominated by the chief commissioner, appointed by the executive, and in their turn these select division and district commissioners

Training.—The Girl Guide movement is identical with that of the Boy Scouts in principle, differing only in the details of training A Girl Guide makes a threefold promise to do her best to do her duty to God and the king, to help other people at all times; to obey the Guide Law There are ten guide laws, namely. a Guide's honour is to be trusted; a Guide is loyal; a Guide's duty is to be useful and to help others, a Guide is a friend to all and a sister to every other Guide; a Guide is courteous; a Guide is a friend to animals; a Guide obeys orders, a Guide smiles and sings under all difficulties; a Guide is thrifty, a Guide is pure in thought, word and deed.

The aim is to form character in the oncoming generation, through activities which appeal to the girls themselves The Guides are organized in patrols of six or eight under a leader, two or more patrols forming a company under a captain The affairs of the company are managed by a court of honour consisting of the patrol leaders who meet periodically under the chairmanship of their captain

The movement is broadly subdivided into three sections, to meet the needs of the children at the various stages of their development: Brownies, from 8 to 11 years of age; Guides, from 11 to 16 years of age; Rangers, over 16. Under the term Guides is included Guides in ordinary companies, and also "Lone Guides," *i e*, girls who wish to be members of the movement but are out

of reach of a company or who for some reason have been obliged to give up active company work; and also "Post Guides," *i.e.*, those who, on account of some physical defect, are unable to join ordinary companies, and carry out their Guiding by post.

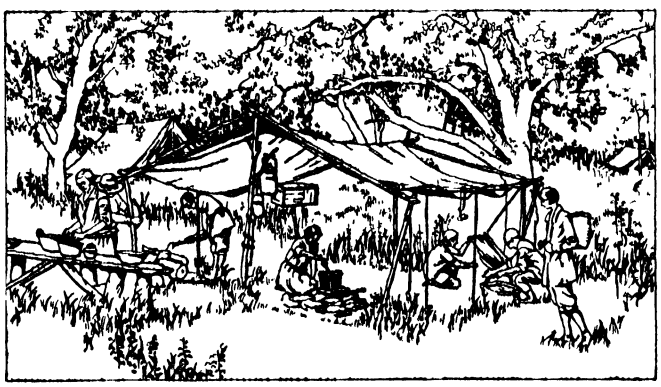
Under the term Rangers are included Rangers, Cadet Rangers and Sea Rangers Cadet Rangers are those girls in schools and colleges who take up Guiding with the special object in view of becoming "Guiders" later on; and Sea Rangers, as the name implies, are those girls of 16 and over who might not have been attracted by the ordinary Guide and Ranger activities, but to whom the "call of the sea" has appealed

Through a system of badges the girls are encouraged to educate themselves to proficiency in some 60 different subjects. The badges particularly encouraged are those which promote among the girls efficiency as home-keepers, wives and mothers Camping and outdoor pursuits are encouraged; swimming and life-saving are taught.

The officers, whether commissioners, secretaries or captains, are grouped under one name "Guiders." At Foxlease park, in the New Forest, presented by Mrs. Anne Archbold and endowed by Princess Mary, Guiders are trained in the different aspects of their work; a similar training school for the north of England has been opened at Waddow, near Clitheroe

An international conference is held biennially when questions affecting the movement throughout the world are brought forward for discussion. Visits of Guides to all countries are encouraged. The first world camp was held at Foxlease in 1924, and was attended by representatives of every nation These Guides came together from all corners of the world, bound in friendship and good will by the ties of membership of one great sisterhood That the Guide training has been taken up with such enthusiasm in every civilized country cannot fail to have its effect on future international relations and so eventually upon the peace of the world. (E K. W.)

GIRL SCOUTS is a United States organization for girls between the ages of 10 and 18 years of age, with a programme of home-making, health, citizenship and out-of-door activity The "scout way" devised by Sir Robert Baden-Powell, the founder of all scouting, is followed by the Girl Scouts. the troop from 8 to 32 members is divided into smaller groups or "patrols" of from 6 to 8, the natural size of the spontaneous clubs or cliques that girls form in their early teens Each patrol elects a leader and these patrol leaders with an adult leader form a "court of honor" or executive committee, which considers suggestions made by the patrols and plans the programmes and activities of the troop. The



BY COURTESY OF THE GIRL SCOUTS OF AMERICA

THE KITCHEN SECTION OF A GIRL SCOUT'S CAMP NEAR MEALTIME

promise which every girl scout takes is, "On my honor, I will try to do my duty to God and my country, to help other people at all times, to obey the Scout laws." The first of the ten simple laws is "A girl scout's honor is to be trusted " The girl scouts learn by making their own plans and working them out. To-day the troop is off for a hike, next week they are taking a course in baby care; they adopt a needy family; they give a play which they have written and costumed themselves, under leadership as indirect as possible, of an older girl or woman By such means they learn responsibility and initiative and the actual application of their simple code of ethics to their everyday activities In each community where girl scouting flourishes there is either a girl scout council or a community committee composed of adults who foster the movement.

There are three ranks in girl scouting To become a tenderfoot a girl voluntarily takes the promise, learns the laws, and begins to "do a good turn daily " She must show observation by telling about her animal pet, know the pledge of allegiance, the executive officers of her community, State and nation, and understand observances in connection with the flag She must practise thrift and know certain knots and woodcraft signs For her second class badge she makes further progress in homemaking, woodcraft, learns to value and safeguard her own health and must perform some service to her home, troop, church or community To be a first class girl scout she shows still greater progress in these requirements, particularly housekeeping, child care and cooking, must be able to swim and understand life-saving methods, start a savings account, train a tenderfoot girl scout and serve her community in some tangible way Girl scouts interested in some particular subject such as art, athletics, music, gardening or horsemanship may win merit badges for special knowledge. The golden eaglet, highest award of the Girl Scouts, is given to a girl who has earned 21 such badges and the letter of commendation in recognition of girl scout spirit as shown by service



BY COURTESY OF THE GIRL SCOUTS OF AMERICA

THE OFFICIAL COSTUME OF THE GIRL SCOUT, ADOPTED IN 1928

Camping plays an important part in girl scouting throughout the country. Every girl scout tries to go to camp for at least one week each summer and to a week-end camp during the winter. It is in these camps that girls learn to watch and study birds, trees and flowers, learn how to camp comfortably, to cook and build fires out-of-doors and to find their way with the sun and stars as guides It is in camp that they frequently become interested in folk-dancing, handicrafts of various kinds, group singing and pageantry, that they may carry on during the rest of the year in their own communities or homes The national Girl Scout camp is Camp Andree Clark, Briarcliff Manor, N Y., where the older girl scouts from throughout the entire country come to learn the best camping methods A leaders' training camp, where courses are given in leadership, troop management and psychology of the adolescent girl, is also established at Briarcliff Manor



BY COURTESY OF THE GIRL SCOUTS OF AMERICA

GIRL SCOUTS LEARNING TO COOK OVER A FIRE BUILT IN THE OPEN

The Girl Scouts were founded in America by Mrs Juliette Low of Savannah, Ga She had lived for many years in England, where she was a friend of Sir Robert Baden-Powell and of his sister, Miss Agnes Baden-Powell, who originally helped him to adapt the scout idea to the needs of English girls The first American troop was organized in Savannah in 1912 (*See* GIRL GUIDES)

GIRLS' FRIENDLY SOCIETY, THE, a girls' club of a religious nature, providing for mental and industrial training and recreation as well The society started in England in 1875 with a small group of girls and spread rapidly The movement spread to the United States in 1886, when a central council was formed at Grace church, New York city, with representatives from the various States. The organization of the society follows as much as possible that of the Protestant Episcopal Church, being diocesan and parochial. Any girl 12 years of age or over, of good character, may become a member, regardless of religious faith, younger girls may join as candidates or probationers, working under the supervision of the older girls The work of the society

is preventive rather than reformatory, offering wholesome recreations in the form of outdoor sports and providing for outings in summer at reasonable rates Classes in cooking, sewing, dancing and singing are formed, under the proper instruction. Besides these interests, the girls enter into church and missionary work The Girls' Friendly Society may be found to-day in every English-speaking country

GIRNAR, a sacred hill in western India, in the peninsula of Kathiawar, 10 m E of Junagarh Five peaks rise about 3,500 ft above the sea; on them are numerous Jain temples, frequented by pilgrims At the foot of the hill is a rock, with an inscription of Asoka (2nd century B C), and also two other inscriptions (dated A D 150 and 455)

GIRODET DE ROUSSY, ANNE LOUIS (1767–1824), French painter, better known as Girodet-Trioson, was born at Montargis on Jan 29, 1767. He lost his parents in early youth, and the care of his education fell to his guardian, M Trioson Girodet entered the school of David, and at the age of 22 he successfully competed for the Prix de Rome At Rome he executed his "Hippocrate refusant les présents d'Artaxerxès" and "Endymion dormant" (Louvre), exhibited at the Salon of 1792

The firm-set forms, the grey cold colour, the hardness of the execution proper to one trained in the school of David, harmonize ill with the literary, sentimental and picturesque suggestions which the painter has sought to render The same incongruity marks Girodet's "Danaë" and his "Quatre Saisons," executed for the king of Spain (repeated for Compiègne), and shows itself to a ludicrous extent in his "Fingal" (Leningrad, Leuchtenberg collection), executed for Napoleon I in 1802 In 1806 he exhibited "Scène de Déluge" (Louvre), to which (in competition with the "Sabines" of David) was awarded the decennial prize This success was followed up in 1808 by the production of the "Reddition de Vienne" and "Atala au Tombeau" He executed a quantity of illustrations, amongst which may be cited those to the Didot, *Virgil* (1798) and to the Louvre, *Racine* (1801–05) His designs for *Anacreon* were engraved by M Chatillon He died on Dec 9, 1824

Girodet's poem *Le Peintre* and essays on *Le Génie* and *La Grâce,* were published after his death (1829), with a biographical notice by his friend M. Coupin de la Couperie, and M Delecluze, in his *Louis David et son temps,* has also a brief life of Girodet (1855)

GIRONDE, a maritime department of south-western France, formed from parts of the old province of Guyenne, viz , Bordelais, Bazadais, and parts of Périgord and Agenais Area, 4,140 sq m Pop (1926) 827,973 It is bounded north by the department of Charente-Inférieure, east by those of Dordogne and Lot-et-Garonne, south by that of Landes, and west by the Bay of Biscay The department lies on the east and the west sides of the Gironde estuary formed by union of Garonne and Dordogne On the west, the *Landes* consist chiefly of morass or sandy plain, divided from the sea by dunes planted with pines which bind the sand together and prevent it from drifting inland On the east the dunes are fringed for some distance by large lakes, Hourtin, Carcans and Lacanau, communicating with each other The Bay of Arcachon forms a vast shallow lagoon, a large part of which has been converted into arable land The estuary of the Gironde, about 45 m. in length, widens northwards from 2 to 6 miles Islands and mud banks divide it into east and west channels and make navigation difficult It is, however, well buoyed and lighted, and has a mean depth of 21 feet There are wide marshes on the right bank north of Blaye, and on the left low-lying polders protected by dikes and composed of fertile salt marshes At the mouth of the Gironde stands one of the finest French lighthouses, the tower of Cordouan built 1585–1611, and extended in the late 18th century

The climate is humid and mild and very hot in summer Wheat, rye, maize, oats and tobacco are largely grown, but the culture of the vine is by far the most important industry carried on (*see* Wine), the six vine-growing districts occupying about one-seventh of the surface of the department The Médoc is a region 50 m long by about 6 m broad, along the left banks of the Garonne and Gironde The Graves country is a zone 30 m long, along the left bank of the Garonne from near Bordeaux to Barsac. The Sauternes country lies south-east of the Graves The Côtes lie on the right bank of Dordogne and Gironde between Dordogne and Garonne, and on the left bank of the Garonne The produce of the Palus, the alluvial land of the valleys, and of the Entre-deux-Mers, on the left bank of the Dordogne, is inferior Fruits and vegetables are largely grown, peaches and pears being especially fine The Médoc breed of horses, the Bazadais breed of oxen and the Bordelais breed of milch cows are well known. Oyster-breeding is on a large scale in the Bay of Arcachon. Resin, pitch and turpentine are obtained from the pine woods, which also supply vine-props, and there are well-known quarries of limestone Manufactures and trade are chiefly carried on at Bordeaux (*q.v*), the chief town, and the third port of France Pauillac, Blaye, Libourne and Arcachon are minor ports

Gironde is divided into the arrondissements of Bordeaux, Blaye, Langon and Libourne, and has 50 cantons and 554 communes The department is served chiefly by the Orléans and Southern companies It forms part of the circumscription of the archbishopric, the appeal-court and the *académie* (educational division) of Bordeaux, and of the region of the XVIII army corps (Bordeaux) Besides Bordeaux, Libourne, La Réole, Bazas, Blaye, Arcachon, St Emilion and St Macaire are the most noteworthy towns Among other places of interest the chief are Cadillac, on the right bank of the Garonne, where there is a 16th century castle, surrounded by fortifications of the 14th century, Labrède, with a feudal château in which Montesquieu was born and lived, Villandraut, where there is a ruined castle of the 11th century, Uzeste, which has a church begun in 1310 by Pope Clement V ; Mazères with an imposing 14th century castle, La Sauve, which has a church (13th cent) and other remains of a Benedictine abbey, and Ste Foy-la-Grande, a bastide created in 1255 and afterwards a centre of Protestantism, which is still strong there La Teste, pop (1926) 5,331, was the capital, in the middle ages, of the famous lords of Buch

GIRONDISTS, the name given to a political party in the Legislative Assembly and National Convention during the French Revolution (1791–93) (Fr *Girondins*) The name was first given them because the most brilliant exponents of their point of view—Vergniaud, Gensonné, Guadet—were deputies from the Gironde In the Legislative Assembly these represented a compact body of opinion which, though not as yet definitely republican, was considerably more advanced than the moderate royalism of the majority of the Parisian deputies Associated with these views was a group of deputies from other parts of France, of whom the most notable were Condorcet, Jacques Pierre Brissot, Roland and Pétion On the policy of the Girondists Madame Roland, whose *salon* became their gathering-place, exercised a powerful influence (*see* Roland); but such party cohesion as they possessed they owed to the energy of Brissot (*q v*) who came to be regarded as their mouthpiece Hence the name *Brissotins,* coined by Camille Desmoulins As strictly party designations these first came into use after the assembling of the National Convention (Sept 20, 1792), to which a large proportion of the deputies from the Gironde who had sat in the Legislative Assembly were returned For the struggle of the Girondists with the *Montagnards* and their ultimate downfall, *see* France· *History*

Bibliography —Of the special works on the Girondists, Lamartine's *Histoire des Girondins* (1847, new ed 1902) is rhetoric rather than history, and is untrustworthy, the *Histoire des Girondins,* by A Gramier de Cassignac (1860) led to the publication of a *Protestation* by J. Guadet, a nephew of the Girondist orator, which was followed by his *Les Girondins, leur vie privée, leur vie publique, leur proscription et leur mort* (1861, new ed 1890); with which *cf* Alary, *Les Girondins par Guadet* (Bordeaux, 1863), also Charles Vatel, *Charlotte de Corday et les Girondins, pièces classées et annotées* (1864–72); *Recherches historiques sur les Girondins* (1873); Ducos, *Les Trois Girondines* (Madame Roland, Charlotte Corday, Madame Bouquey) *et les Girondins* (1896), Edmond Biré, *La Légende des Girondins* (1881, new ed 1896) Memoirs or fragments of memoirs by particular Girondists also exist, *e g*, Barbaroux, Pétion, Louvet, Madame Roland

GIRTIN, THOMAS (1775–1802), English painter and etcher, born on Feb. 18, 1775 He was apprenticed to Edward Dayes, the mezzotint engraver, and soon made J M W. Turner's

acquaintance. His architectural and topographical sketches and drawings soon established his reputation, his use of water-colour for landscapes being such as to give him the credit of having created modern water-colour painting, as opposed to mere "tinting" His etchings also were characteristic of his artistic genius His early death from consumption on Nov 9, 1802 led indeed to Turner saying that "had Tom Girtin lived I should have starved" From 1794 to his death he was an exhibitor at the Royal Academy, and some fine examples of his work have been bequeathed by private owners to the British Museum and the Victoria and Albert Museum

See L Binyon, *Thomas Girtin—His Life and Works* (1900).

GIRVAN, police burgh, parish and fishing town, Ayrshire, Scotland, at the mouth of the Girvan, 21 m S W. of Ayr, and 63 m S W. of Glasgow by the L M S R Pop (1921) 7,272 The principal industry was formerly weaving, but is now fishing, cod and oysters forming the most important catches, there is export of grain and coal The harbour has been enlarged and protected by piers and a breakwater Moreover, the town is in repute for sea-bathing and golf, its situation being very fine The vale of Girvan is one of the most fertile tracts in the shire Girvan is the point of communication with Ailsa Craig

GIRY (Jean Marie Joseph), **ARTHUR** (1848–1899), French historian, was born at Trévoux (Ain) He studied at the Ecole des Chartes under J Quicherat, and at the newly established Ecole des Hautes Etudes, where he became assistant lecturer and afterwards full lecturer His first important work was *Histoire de la ville de Saint-Omer et de ses institutions jusqu'au XIVe siècle* (1877) His lectures led to a great revival of interest in the origins and significance of the urban communities in France Giry himself published *Les Etablissements de Rouen* (1883–85), a study, based on very minute researches, of the charter granted to the capital of Normandy by Henry II, king of England, and of similar charters throughout the French dominions of the Plantagenets, a collection of *Documents sur les relations de la royauté avec les villes de France de 1180 à 1314* (1885); and *Etude sur les origines de la commune de Saint-Quentin* (1887)

As assistant (1883) and successor (1885) to Louis de Mas Latrie, Giry restored the study of diplomatic, which had been founded in France by Dom Jean Mabillon, to its legitimate importance In 1894 he published his *Manuel de diplomatique,* which contained the fruits of his long experience of archives, original documents and textual criticism With the collaboration of his pupils he undertook the preparation of an inventory and, subsequently, of a critical edition of the Carolingian diplomas for the *Monumenta Germaniae historica* Simultaneously with this work he carried on the publication of the annals of the Carolingian epoch on the model of the German *Jahrbucher,* reserving for himself the reign of Charles the Bald The preliminary work on the Carolingian diplomas involved such lengthy and costly researches that the Académie des Inscriptions et Belles-Lettres took over the expenses after Giry's death

For details of Giry's life and works *see* the funeral orations published in the *Bibliothèque de l'Ecole des Chartes,* and afterwards in a pamphlet (1899) *See* also the biography by Ferdinand Lot in the *Annuaire de l'Ecole des Hautes Etudes* for 1901, and the bibliography of his works by Henry Maistre in the *Correspondance historique et archéologique* (1899 and 1900)

GISBORNE, a seaport of New Zealand, in Cook county, provincial district of Hawke's bay, on Poverty bay of the east coast of North island Pop (1926) 14,834 Wool, frozen mutton and agricultural produce are exported from the surrounding district Petroleum has been discovered in the neighbourhood Near the site of Gisborne Captain Cook landed in 1769, and gave Poverty bay its name from his inability to obtain supplies owing to the hostility of the natives

GISLEBERT or **GILBERT OF MONS** (*c* 1150–1225), Flemish chronicler, was provost of the churches of St Germanus at Mons and St Alban at Namur. In official documents he is described as chaplain, chancellor or notary, of Baldwin V, count of Hainaut (d 1195), who employed him on important business After 1200 Gislebert wrote the *Chronicon Hanonense,* a history of Hainaut and the neighbouring lands from about 1050 to 1195, which is specially valuable for the latter part of the 12th century, and for the life and times of Baldwin V

The chronicle is published in Band xxi. of the *Monumenta Germaniae historica* (Hanover, 1826), and separately with introduction by W. Arndt (Hanover, 1869), and by L Vanderkindere in the *Recueil de textes pour servir à l'étude de l'histoire de Belgique* (1904)

See W Meyer, *Das Werk des Kanzlers Gislebert von Mons als verfassungsgeschichtliche Quelle* (Konigsberg, 1888), K Huygens, *Sur la valeur historique de la chronique Gislebert de Mons* (Ghent, 1889); and W Wattenbach, *Deutschlands Geschichtsquellen,* Band II. (1894).

GISORS, a town of France, in the department of Eure, in the pleasant valley of the Epte, 44 m N W of Paris on the railway to Dieppe Pop. (1926) 4,953. In the middle ages Gisors was capital of the Vexin Its position on the frontier of Normandy caused its possession to be hotly contested by the kings of England and France during the 12th century, when with the fortresses of Neaufles and Dangu it was ceded by Richard Coeur de Lion to Philip Augustus During the wars of religion of the 16th century it was occupied by the duke of Mayenne on behalf of the League, and in the 17th century, during the Fronde, by the duke of Longueville Gisors was made a duchy in 1742 and afterwards came into the possession of the count of Eu and the duke of Penthièvre

Gisors is dominated by an 11th and 12th cent stronghold of the kings of England The central tower, the choir and parts of the aisles of the church of St Gervais dates from the middle of the 13th century, and the rest from the Renaissance Gothic and Renaissance styles mingle in the west façade, adorned with a profusion of sculptures, the fine carving on the wooden doors of the north and west portals is particularly noticeable Among the industries of Gisors are felt manufacture, bleaching, dyeing and leather-dressing

GISSING, GEORGE ROBERT (1857–1903), English novelist, was born at Wakefield on Nov 22, 1857 He was educated at the Quaker boarding-school of Alderley Edge and at Owens College, Manchester His life, especially its earlier period, was spent in great poverty, mainly in London, though he was for a time also in the United States, supporting himself chiefly by private teaching He published his first novel, *Workers in the Dawn,* in 1880 *The Unclassed* (1884) and *Isabel Clarendon* (1886) followed *Demos* (1886), a novel dealing with socialistic ideas, was, however, the first to attract attention Gissing's own experiences had preoccupied him with poverty and its brutalizing effects on character He made no attempt at popular writing, and for a long time the sincerity of his work was appreciated only by the few But his unflinching realism, and the minute care of his descriptions of the sordid milieu of shabby London streets left their mark on the English novel Among his more characteristic novels are *Thyrza* (1887), *A Life's Morning* (1888), *The Nether World* (1889), *New Grub Street* (1891), *Born in Exile* (1892), *The Odd Women* (1893), *In the Year of Jubilee* (1894), *The Whirlpool* (1897) Others, *e g*, *The Town Traveller* (1901), indicate a humorous faculty, but his novels are mainly concerned with the life of the poorer middle classes, with lonely men and women engaged in a generally hopeless struggle with fate and with the conflict between education and circumstances The quasi-autobiographical *Private Papers of Henry Ryecroft* (1903) reflects Gissing's studious and retiring tastes He was a good classical scholar and had a minute acquaintance with the late Latin historians, and with Italian antiquities, his posthumous *Veranilda* (1904), a historical romance of Italy in the time of Theodoric the Goth, was the outcome of his favourite studies He died at St Jean de Luz in the Pyrenees on Dec 28, 1903

Bibliography—F Swinnerton, *George Gissing* (1912), Morley Roberts, *The Private Life of Henry Maitland* (1912), M Yates, *George Gissing* (1922), M L Cazamian, *Roman et idées en Angleterre* (1923), *Letters of George Gissing to Members of his Family,* collected & arr by A. & E Gissing (1927), *see* also introductory essay by T Seccombe to *The House of Cobwebs* (1906), a posthumous volume of Gissing's short stories

GITSCHIN: *see* Jičin.

GIUDICI, PAOLO EMILIANO (1812–1872), Italian writer, was born at Mussomeli, Sicily, on June 13, 1812 For a short time in 1848 he was professor of Italian literature at Pisa, but was deprived on account of his liberal views Later he became

professor of aesthetics (resigning 1862) and secretary of the Academy of Fine Arts at Florence, and in 1867 was elected to the chamber of deputies. His works include *Storia della litteratura italiana* (1844), *Storia del teatro* (1860), and *Storia dei comuni italiani* (1861). He died at Tonbridge, England, on Sept. 8, 1872

GIULIANI, GIAMBATTISTA (1818–1884), an Italian Dante scholar, was born at Canelli, near Asti, on June 4, 1818 He was originally a professor of mathematics, but from 1843 onwards devoted himself exclusively to the study of Dante In 1860 he became professor of literature at Florence, where he gave a famous series of lectures on Dante. He completed a critical text of the Convito (2 vols, 1875), and of the Latin works (2 vols., 1878–82) of Dante, but his great commentary was left incomplete He died at Florence on Jan 11, 1884

GIULIO ROMANO or **GIULIO PIPPI** (1499–1546), the head of the Roman school of painting in succession to Raphael This prolific painter, modeller, architect and engineer receives his common appellation from the place of his birth—Rome His name in full was Giulio di Pietro di Filippo de' Giannuzzi

Giulio was quite youthful when he first became the pupil of Raphael, who loved him as a son, and employed him in some leading works, especially in the Loggie of the Vatican, in the saloon of the "Incendio del Borgo" and probably also in the Villa Farnesina. It would appear that in subjects of this kind Raphael simply furnished the design, and committed the execution of it to some assistant, such as Giulio—taking heed, however, to bring it up, by final retouching, to his own standard of style and type Amid the multitude of Raphael's pupils, Giulio showed universal aptitude, he did, among other things, a large amount of architectural planning for his chief. Raphael died when Giulio was 21 years old and bequeathed to him, and to his fellow-pupil Gianfrancesco Penni, his implements and works of art; and upon them it devolved to bring to completion the vast fresco-work of the "Hall of Constantine" in the Vatican—consisting, along with much minor matter, of the four large subjects, the "Battle of Constantine," the "Apparition of the Cross," the "Baptism of Constantine" and the "Donation of Rome to the Pope" The whole of this onerous undertaking was completed within a period of only three years By this time Giulio was regarded as one of the first artists in Rome Among his architectural works is the Villa Madama, with a fresco of Polyphemus, and boys and satyrs; the Ionic façade of this building may have been sketched out by Raphael; and the Villa Lante, where he painted frescoes which are now in the Palazzo Buccari

Towards the end of 1524 his friend the celebrated writer Baldassar Castiglione seconded with success the urgent request of the duke of Mantua, Federigo Gonzaga, that Giulio should migrate to that city, and enter the duke's service for the purpose of carrying out his projects in architecture and pictorial decoration The duke treated his painter munificently In Giulio's multifarious work in Mantua three principal undertakings should be noted (1) In the Castello he painted the "History of Troy," along with other subjects (2) In the suburban ducal residence named the Palazzo del Te he rapidly carried out a rebuilding on a vastly enlarged scale in the Doric order—the materials being brick and terra-cotta, as there is no local stone—and decorated the rooms with his most celebrated works in oil and fresco painting—the story of Psyche, Icarus, the fall of the Titans, and the portraits of the ducal horses and hounds The foreground figures of Titans are from 12 to 14ft high; the room, even in its structural details, is made to subserve the general artistic purpose. The whole of the work on the Palazzo del Te occupied about five years (3) Giulio recast and almost rebuilt Mantua cathedral; erected his own mansion, reconstructed the street architecture to a considerable extent, and made the city, sapped as it is by the shallows of the Mincio, comparatively healthy; and at Marmirolo, some 5m. distant from Mantua, he worked out other important buildings and paintings He was in fact, for nearly a quarter of a century, a sort of Demiurgus of the arts of design in the Mantuan territory Giulio's activity was interrupted but not terminated by the death of Duke Federigo The duke's brother, a cardinal who became regent, retained him in full employment. He was afterwards invited to succeed Antonio Sangallo as architect of St. Peter's in Rome—a splendid appointment, which he had almost resolved to accept, when a fever overtook him and caused his death on Nov. 1, 1546. He was buried in the church of St. Barnaba in Mantua.

Wide and solid knowledge of design, combined with a promptitude of composition that was never at fault, formed the chief motive power and merit of Giulio Romano's art. It would be difficult to name any other artist who, working as an architect, and as the plastic and pictorial embellisher of his architecture, produced a total of work so fully and homogeneously his own; hence he has been named "the prince of decorators" He had great knowledge of the human frame, and represented it with force and truth, he was also learned in other matters, especially in medals, and in the plans of ancient buildings As a general rule, his drawings are finer and freer than his paintings, his colouring is marked by an excess of blackish and heavy tints. Giulio Romano established at Mantua a school of art Very many engravings were made contemporaneously from his works, not only in Italy, but in France and Flanders as well. Like Raphael he entrusted principally to assistants the pictorial execution of his cartoons Primaticcio was one of the leading coadjutors Among the oil pictures of Giulio Romano are the "Martyrdom of Stephen," in the church of that saint in Genoa, a "Holy Family" in the Dresden Gallery and a "St Margaret" in the Vienna gallery

Vasari gives a pleasing impression of the character of Giulio. He was very loving to his friends, genial, affable, liking fine apparel and a handsome scale of living His portrait, painted by himself, is in the Uffizi, Florence

Besides Vasari, Lanzi and other historians of art, the following works may be consulted: C D. Arco, *Vita di G Pippi* (1842); G. C von Murr, *Notice sur les estampes gravées après dessins de Jules Romain* (1865); J P. Richter, *La collezione Heviz e gli affreschi di Giulio Romano al palazzo Zuciari* (1928)

GIUNTA PISANO, Italian painter of the 13th century, a native of Pisa He died between 1255 and 1267 It is said that he painted in the upper church of Assisi, notably a "Crucifixion" dated 1236, with a figure of Father Elias, the general of the Franciscans, embracing the cross This painting no longer exists Three large Crucifixions are ascribed to the same master, whose signature can be traced on them One is in S S Raineri e Leonardo in Pisa and was formerly in the convent of St Anna, the other, which has been moved from the Ospedale of S Chiara to the Museo Civico at Pisa, is completely overpainted, the third is in S Maria degli Angeli at Assisi In these paintings Christ is represented with his head leaning on one side with an expression of pain, and his body bending forward in agony—a conception differing from "the triumphant Christ" of the preceding age. Some recent art critics see in Giunta Pisano a pioneer who, coming from Tuscany to Assisi, influenced the development of Umbrian art

GIURGIU, the capital of the department of Vlashca, Rumania, situated amid mud-flats and marshes on the left bank of the Danube Pop (1928) 25,000 Three small islands face the town, and a larger one shelters its port, Smarda, 2½ m east A railway runs north to Bucharest and north-west to Blejesci and steamers ply to Ruschuk, 2½ m. south-west on the Bulgarian shore, whence railways run to Varna, Sofia and South Bulgaria. Thus Giurgiu, besides having a considerable trade with the home ports lower down the Danube, is the headquarters of commerce between Bulgaria and Rumania. It exports timber, grain, salt and petroleum; importing coal, iron and textiles There are also large sawmills, and pipe-lines for oil run to Baicoi-Bucharest

Giurgiu occupies the site of Theodorapolis, a city built by the Roman emperor Justinian (A D 483–565) It was founded in the 14th century by Genoese merchants who called the town, after the patron saint of Genoa, San Giorgio (St George) As a fortified town, Giurgiu figured often in the wars for the conquest of the lower Danube; especi lly in the struggle of Michael the Brave (1593–1601) against the Turks, and in the later Russo-Turkish Wars It was burned in 1659 In 1829, its fortifications were finally razed, the only defence left being a castle on the island of Slobosia, united to the shore by a bridge.

GIUSTI, GIUSEPPE (1809–1850), Tuscan satirical poet, was born at Monsummano, a small village of the Valdinievole, on May 12, 1809. In 1826 he went to study law at Pisa; he spent eight years in the course, instead of the customary four. He lived gaily, and learned to know the world, its vices and follies The experience thus gained he turned to account in his satires

With the poem called *La Ghigliottina a vapore* (1833) Giusti revealed his genius. From this time he showed himself the Italian Béranger. In 1834 Giusti began nominally to practice as an advocate in Florence To this period belong the *Dies Irae* (1835) on the death of the emperor Francis I. and many of his finest verses which for some years passed from hand to hand His poems were published clandestinely at Lugano, at some risk, as the work was destined to undermine the Austrian rule in Italy. Giusti thoroughly established his fame by his *Gingillino*, exposing the vileness of the treasury officials, and the base means they used to conceal the necessities of the state. The *Gingillino* has all the characteristics of a classic satire. His *Delenda Carthago* (1846), *Alli spettri del 4 Settembre* (1847), *La Republica* (1848), furthered the revolution. Giusti entered heart and soul into the political movements of 1847 and 1848, served in the national guard, sat in the parliament for Tuscany, but finding that there was more talk than action, that to the tyranny of princes had succeeded the tyranny of demagogues, he expressed his opinions freely and in 1848 was regarded as a reactionary. His friendship for the marquis Gino Capponi, who had taken him into his house during the last years of his life, was enough to compromise him in the eyes of Guerrazzi, Montanelli and Niccolini. On May 31, 1850 he died at Florence in the palace of his friend, the marquis Gino Capponi

The best of the many editions of Giusti's poems are those of Carducci (1859, 3rd ed., 1879), G Fioretti-Donati (1913 and 1926), and F. Martini (1914) For translations *see* W D Howells, *Modern Italian Poets* (1887) *See* his letters, *Epistolario*, ed G Frassi (1859), and F Martini (3 vols, Florence, 1904); and *Memoire inédite 1845–49*, ed. F Martini (3 vols, Milan, 1890, 1904).

GIUSTINIANI, the name of a prominent Italian family which originally belonged to Venice, but established itself subsequently in Genoa also, and at various times had representatives in Naples, Corsica and several of the islands of the Archipelago.

In the Venetian line the following are most worthy of mention —

1 Lorenzo (1380–1456), the Laurentius Justinianus of the Roman calendar, entered the congregation of the canons of St George in Alga, and in 1433 became general of that order. About the same time he was made by Eugenius IV bishop of Venice, and on the removal of the patriarchate from Grado to Venice by Nicholas V in 1451, he was promoted to that dignity, which he held for fourteen years He died on Jan. 8, 1456, and was canonized by Alexander VIII., his festival being kept on Sept. 5 The best edition of his works is that of the Benedictine, P. N. A Giustiniani (Venice, 2 vols, 1751).

2. Leonardo (1388–1446), brother of the preceding, was for years a senator of Venice, and in 1443 was chosen procurator of St. Mark. He translated into Italian Plutarch's *Lives of Cinna and Lucullus*, and was the author of some poetical pieces, amatory and religious—*strambotti* and *canzonetti*—as well as of rhetorical prose compositions The popular songs set to music by him became known as *Giustiniani*. (See *Poésie inédite di Leonardo Giustiniani*, ed Wiese [Bologna, 1883])

3. Bernardo (1408–1489), son of Leonardo, entered the Venetian senate, and served on diplomatic missions to France and Rome, and about 1485 became one of the Council of Ten He wrote a history of Venice, *De origine urbis Venetarum rebusque ab ipsa gestis historia* (1492; Ital trans 1545). It is to be found in vol. i. of the *Thesaurus* of Graevius.

4 Pietro, also a senator, lived in the 16th century, and wrote a *Historia rerum Venetarum* in continuation of Bernardo He also wrote chronicles *De gestis Petri Mocenigi* and *De bello Venetorum cum Carolo VIII.* (*Script, rer Ital.* vol xxi.).

Of the Genoese branch of the family the most prominent members were the following:—

5 Agostino (1470–1536) was born at Genoa, and after joining the Dominicans in 1487, studied Greek, Hebrew, Chaldee and Arabic, and in 1514 began the preparation of a polyglot edition of the Bible As bishop of Nebbio, Corsica, he took part in the earlier sittings of the Lateran council (1516–17), but, in consequence of party complications, withdrew to his diocese, and ultimately to France, where he became a pensioner of Francis I, and was the first to occupy a chair of Hebrew and Arabic in the University of Paris. He became acquainted with Erasmus and More and returned to Nebbio, about 1522 He bequeathed his fine library to the republic of Genoa Of his projected polyglot only the Psalter was published (*Psalterium Hebraeum, Graecum, Arabicum, et Chaldaicum*, Genoa, 1616) Besides the Hebrew text, the LXX translation, the Chaldee paraphrase and an Arabic version, it contains the Vulgate translation, a new Latin translation by the editor, a Latin translation of the Chaldee and a collection of scholia Giustiniani printed 2,000 copies at his own expense, including 50 in vellum for presentation to the sovereigns of Europe and Asia. Besides an edition of Job, containing the original text, the Vulgate and a new translation, he published a Latin version of the *Moreh Nevochim* of Maimonides (*Director dubitantium aut perplexorum*, 1520), and also edited in Latin the *Aureus libellus* of Aeneas Platonicus, and the *Timaeus* of Chalcidius. His annals of Genoa (*Castigatissimi annali di Genova*) were published posthumously in 1537

6 Pompeio (1569–1616), a native of Corsica, who served under Alessandro Farnese and the marquis of Spinola in the Low Countries, where he lost an arm, and was known by the sobriquet Bras de Fer He defended Crete against the Turks, and subsequently was killed at Friuli He left in Italian a personal narrative of the war in Flanders, repeatedly published in Latin (*Bellum Belgicum*, Antwerp, 1609)

7 Giovanni (1513–1556), born in Candia, was the translator of Terence's *Andria* and *Eunuchus*, of Cicero's *In Verrem*, and of Virgil's *Aeneid*, viii

8 Orsatto (1538–1603), Venetian senator, translator of the *Oedipus Tyrannus* of Sophocles and author of a collection of *Rime*, in imitation of Petrarch, was one of the latest representatives of the classic Italian school

9 Geronimo, a Genoese (16th century), translated the *Alcestis* of Euripides and three of the plays of Sophocles, and wrote two original tragedies, *Jephte* and *Christo in Passione*

10 Vincenzo, who in the beginning of the 17th century built the Roman palace, made the art collection associated with his name The collection was removed in 1807 to Paris, and in 1815 all that remained of it, about 170 pictures, was purchased by the king of Prussia and removed to the Berlin royal museum

GIVET, town of northern France, in the department of Ardennes, 40 m N by E of Mézières on the Eastern railway between the town and Namur Pop (1926) 5,553; commune, 6,803 Givet lies on the Meuse near the Belgian frontier, and was formerly an important fortress It is divided into three portions—the citadel called Charlemont and Grand Givet on the left bank of the river, and on the opposite bank Petit Givet The fortress, the only survival of the fortifications, at the top of a precipitous rock 705 ft high, was founded by the emperor Charles V in the 16th century, and further fortified by Vauban at the end of the 17th century, it is the only survival of the fortifications of the town, the rest of which were destroyed in 1892 In Grand Givet there are a church and a town-hall built by Vauban, and a statue of the composer, Étienne Méhul, stands in the fine square named after him Petit Givet, the industrial quarter, is traversed by tanneries and glue factories Pencils and tobacco-pipes are also manufactured The town has considerable river traffic, consisting chiefly of coal, copper and stone There is a chamber of arts and manufactures

GIVORS, manufacturing town, south-eastern France, department of Rhône, on the railway between Lyons and St Étienne, 14 m S of Lyons. Pop (1926) 14,213 It stands on the bank of the Rhône, here crossed by a suspension bridge, at its confluence with the Gier and the canal of Givors The chief industries are metal-working, engineering-construction, glass-working, brick-making, rope-making, and the manufacture of glue and earthenware There are coal mines near On the hill above the town are

the ruins of the château of St. Gerald and of the convent of St. Ferréol, remains of the old town destroyed in 1594.

GJALLAR, in Scandinavian mythology, the horn which, when a stranger approached, had to be blown by Heimdal

GJELLERUP, KARL (1857–1919), Danish poet and novelist, was born on July 2, 1857, at Roholte, Zealand His early works, written under the influence of Georg Brandes, were strongly optimistic in character; the best of these is *The Disciple of the Teutons* (1882) But a prolonged journey in southern and eastern Europe brought out other aspects of his many-sided genius, and he wrote dramas and novels showing a deeper comprehension of the spiritual and ethical problems of life In his later years he took up classical, Gothic and Eastern subjects as the basis of his work Of a series of these—*Die Opferfeuer* (1903), *Das Weib der Vollendeten* (1907), *Der Pilger Kamanota* (1906), *Die Weltwanderer* (1910)—the scene is laid in India Gjellerup wrote many of his later works in German From 1892 onwards he lived at Klotzsche, near Dresden, where he died on Oct 11, 1919 He had received the Nobel prize for literature in 1917

GLABRIO. 1 MANIUS ACILIUS GLABRIO, Roman statesman and general, member of a plebeian family When consul in 191 B C he defeated Antiochus the Great of Syria at Thermopylae, and compelled him to leave Greece. Flamininus interceded to save the Aetolians In 189 Glabrio was a candidate for the censorship, but was opposed by the nobles

See Censorinus, *De die natali*, xv , Macrobius, *Saturnalia*, 1 13; index to Livy, Appian, *Syr* 17–21.

2. MANIUS ACILIUS GLABRIO, Roman statesman and general, grandson of the famous jurist P Mucius Scaevola When praetor urbanus (70 B C) he presided at the trial of Verres When consul with L Calpurnius Piso in 67 he brought forward a law (Lex Acilia Calpurnia) against illegal canvassing at elections In the same year he was appointed to supersede L Lucullus in the government of Cilicia and the command of the war against Mithridates, but he did nothing, and was in turn superseded by Pompey.

See Dio Cassius xxxvi 14, 16 24; Cicero, *Pro lege Manilia*, 2. 9; Appian, *Mithrid* 90

GLACE BAY, a city and port of entry of Cape Breton county, Nova Scotia, Canada, on the Atlantic ocean, 14 m E of Sydney, with which it is connected by railway It is the centre of a coal-producing district Though it has a fair harbour, most of the shipping is done from Sydney in summer and from Louisburg in winter Pop (1921) 17,007 It is a transatlantic wireless station

GLACIAL PERIOD or **PLEISTOCENE ICE AGE,** in geology, is the name given to a geological period, probably within the duration of man's occupancy of Europe, characterized, according to the now universal interpretation, by cold conditions approaching arctic severity, the evidence of which is contained in superficial deposits extending over 8,000,000 sq m of Europe and North America, and great areas of Asia, and the southern Hemisphere

The attention of geologists of the 18th and early 19th centuries was directed to the existence of a series of deposits—clays, gravels, brickearths, sands and the like—that seemed to be an exception to the general orderly arrangement of the geological strata, associated as they were with strangely scored blocks of stone foreign to the districts in which they were found, and with scorings and "dressings" of rock surfaces, and seemed to indicate the operation of agencies different from those to which ordinary geological phenomena were attributed It thus came about that the ideas involved in the Mosaic cosmogony and the Noachian deluge were readily seized upon and an explanation seemingly adequate was found ready to hand The deposits were styled *Diluvium*, a term long since abandoned by British and American geologists, but still used by some writers on the Continent

The earliest notes of dissent were sounded by Schimper, Venetz and Charpentier, who recognized in the action of Alpine glaciers forces productive of effects generally comparable with those attributed to a universal deluge, allowance being made for differences of physiographic conditions Though many workers on the Continent adopted and developed this hypothesis, circumstances conspired to delay its acceptance in Britain, the chief, perhaps, being that British geologists were less familiar with the action of glaciers Another reason is to be found in the fact that, as the general direction of transport seemed to be from north to south and many unfamiliar types of crystalline rocks had apparently been transported by a hill-and-valley ignoring agency, a great "wave of translation" seemed to be the only agency adequate to explain the facts This view found its last advocate in the late Sir Henry Howorth. This hypothesis was followed by one admitting the agency of ice but with the corollary, to which the facts seemed to point, of a great ice-sheet extending in all directions from the North Pole. This in turn was modified when it was discovered that in certain parts of Britain marine shells were contained in the deposits This fact was brought to the knowledge of geologists in 1831 by Joshua Trimmer who found shell fragments, not only on the low grounds in many places, but also at altitudes up to 1,350 ft above the sea at Moel Tryfaen near Snowdon Smith of Jordanhill about the same time recognized that shells found in Till (boulder-clay) of Scotland included species whose present habitat is in the Arctic seas

Speculation now took the form of a marine submergence sufficient to cover all the country up to 1,400–1,500 ft with a sea cumbered with icebergs and floe-ice, and from the melting of these their burden of rock-materials, the boulder-clays, etc , were produced In 1838 Buckland, who had only a few years before published his *Reliquiae Diluvianae* (1823), while on a tour in Switzerland made the acquaintance of Louis Agassiz who, though at first sceptical, had been converted to the views of Charpentier and Venetz that the boulders found across the plain of Switzerland and on the flanks of the Jura had been transported by glacier-ice, of which the existing glaciers of the Alps were the dwindled representatives Buckland was at first no less sceptical, but with characteristic open-mindedness he fully accepted Agassiz's conclusions and induced the great Swiss to visit Britain The product of a joint tour was to confirm Buckland in the belief that the diluvial phenomena were attributable to the action of land-ice All the phenomena of glacier-action were recognized—terminal and lateral moraines, ice-worn surfaces (one of which in the Blackford hills has been preserved and its significance recorded on a tablet), *roches moutonnées*, striated and far carried blocks Agassiz described the famous parallel roads of Glen Roy as the strand-lines of a temporary glacier-dammed lake of the type of the Marjelen See, though its full story was not deciphered until Jamieson's demonstration in 1863

Buckland's paper marked a new departure in glacial geology in Britain It was followed by Lyell's memoirs on the Drift of Norfolk, and on the geological evidences of glaciers in Forfarshire It has already been remarked that the older views still found advocates, and even in the 20th century, the marine origin of boulder-clay has found some support It may, however, be safely asserted that the postulate of a great ice-sheet having its radiant-point near the head of the Gulf of Bothnia is the starting point for all modern work on the glaciation of northern Europe.

Geological Evidences.—The geological evidences of ice-action in low latitudes cover, in fact, substantially all the phenomena observed in or about modern glaciers and ice-sheets Of the direct effects of ice upon the subjacent rocks, the most conspicuous must always be the production by the action of the stone-laden basal layers of scratched and abraded rock-surfaces, striated surfaces and *roches moutonnées* The form and direction of the *striae* are often valuable indications of the direction of the last movement of the ice, though, as has been remarked, "the last stroke of the joiner's plane removes the evidence of all the previous movements" *Roches moutonnées*, the smoothed and rounded hammocks of rock compared by de Saussure to the curls on a wig, have commonly acquired a curved outline which is highly characteristic especially taken in conjunction with the hard and unweathered condition in which they occur. Their surfaces are usually well striated and, when freshly exposed, are polished. In many instances they exhibit a tendency to stream-line forms, though this may be modified by "plucking" or the rending away of blocks from the lee-side (downstream) by the dragging of the

ice "Plucking" may also operate by snatching out crescentic or semicircular flakes from the surfaces both of striated floors and of *roches moutonnées.*

Rocky hills or abrupt declivities in the path of a glacier may be *moutonnées,* and the effect of "plucking" on the lee-side will cause a retreat of the face upstream at the same time that the blocks detached will contribute to the burden of stones carried by the base of the glacier. Where a boss of rock of exceptional hardness stands in the path of an ice-stream the lower layers of the ice cleave round it and it is usual to find a gully eroded across the front and along the two sides becoming evanescent towards the rear. The lowland valley of Scotland is replete with examples, such as the Castle rock at Edinburgh, and North Berwick Law In the former case the long slope of the High street has been found to consist of a protected mass of soft coal measure rock forming a characteristic illustration of "crag and tail," but the "tail" in many instances is formed by accumulation of sand, gravel or the like in the "slack-water" in the rear of the crag.

The erosion-effects of ice-streams exhibit themselves in other forms and a great controversy without at present a decisive issue has arisen as to the limit of the scale of magnitude of these effects Whether, for example, it being admitted that grooves and shallow hollows can be produced, the production of lake-basins and the characteristics of valley contours on a large scale can be ascribed to glacial erosion Ramsay, James Geikie, Alfred Russel Wallace, Penck, Prof W M Davis and others have held the opinion that they can. Prof Collet in 1922 remarked "of all the Swiss geographers and geologists, Heim is the only one who will not admit that the great lakes at the foot of the Alps were formed by the action of glaciers" On the other side can be quoted also Bonney, Garwood and Gregory

The Glacial Deposits.—Two principal types of deposits are recognizable—those which have been directly released from the ice upon its melting, without any sorting by the agency of the water, and those which, though transported in part by ice, have been finally sorted and distributed by water To the first category will belong many moraines, the long ridges of materials cast down along the margins of glaciers, generally from the superficial, "rock-trains," of valley glaciers in mountainous regions, and the terminal ridges which may be produced either from the superficial burden or from *englacial* rock-débris carried in the lower layers of the ice Terminal moraines in the case of valley glaciers commonly form crescentic ramparts across the valleys or horse-shoe shaped mounds where a valley debouches in the plain The magnitude of these ridges may vary between small mounds of a foot or two in height and colossal ramparts, like La Serra at the mouth of the Val d'Aosta, 2,000 ft in height Some terminal moraines, like the one just mentioned, may be a single even-crested ridge, but in the case of the moraines of the great ice-sheets they may take the form of a congeries of lumps and hollows

Moraines, as regards their structure, commonly show a confused intermingling of rock-materials of every grade from the minutest of mud-particles up through sand-grains and stones to giant rock-masses of such dimensions that it is difficult to realize that they are not part of the solid fabric of the country, these will be further mentioned later Where the clayey element is very abundant a moraine may be said to consist of true boulder-clay (the Scottish "Till") Boulder-clay occurs, however, in other forms than as moraines Its most common aspect is as sheets of greater or less extent spread over the land, sometimes in undulating relief, but, more commonly, forming extensive plateaux like, for example, that expanse between Manchester and Liverpool or much of Suffolk and north Essex, or the north German plain. This type of boulder-clay is usually tough and hard, indeed in some of the excavations it is necessary to blast it with explosives; but the texture will naturally depend primarily on the nature of the constituents, and in a secondary degree as Sorby showed, upon the pressure to which it has been exposed

The stones in boulder-clay assume in many cases characteristic attitudes—in one known as the "forced arrangement," the forward end of the boulder is uptilted (Hinde) The orientation of a stone of large size will often serve to indicate the direction of travel, the longer axis being in line of movement and if there is a sharp and a blunt end, the sharp end will be foremost It is hardly an exaggeration to say that there is no limit to the size of boulders at Birkenwald near Berlin there is a transported mass of chalk of an estimated volume of 2,000,000 cu. metres, which is believed to have travelled 15 km, and an erratic of chalk at Great Catworth, Huntingdon, though not quite equalling it in magnitude, must have been carried not less than 70 miles. Composite erratics of a succession of secondary rocks such as the Roswell erratic near Ely—long used as a quarry—may perhaps have been originally outliers from an escarpment which have been pushed off their bases Boulder-clay occasionally assumes the form of semi-ovoid mounds to which the name of "drumlins" has been given These may have been built up near the melting end of an ice-stream by the accretions of englacial materials, but they may owe their form to the erosion of a belt of boulder-clay transverse to the front of an over-riding ice-sheet or glacier they may be compared with *roches moutonnées,* and, like them, have taken on a form stable, at least temporarily, under moving ice

Water-borne or Fluvio-glacial Deposits.—Every glacier at its termination, whether on land or in water, discharges its melt-water not merely by tricklets coursing down its sloping front but at some points by the emergence of a subglacial stream of turbid water charged with sand and stones When the glacier is of steep gradient the stream will have the force of a torrent and will carry its load forward to be deposited in order of magnitude of materials—first the coarse, then finer, and last of all the impalpable mud, as the velocity of the stream diminishes, hence in Alpine valleys the river channels may come to be mere stony wildernesses like the floor of the Rhone valley near its debouchure into the Lake of Geneva at Villeneuve Where, as in that instance, the stream discharges into a lake, or, as in Greenland, into a sea or fjord, the turbid water deposits its load as a species of cone or delta, the finest materials forming in deeper water a deposit of stratified or laminated mud, each pair of layers, finer or coarser, representing a period of melting, alternating with one of diminished flow In a glacier of small dimensions the cycle will be diurnal and when the feeder comes from one of larger size the cycle may be an annual one, which is probably the case with the great ice-lobes descending into the Greenlandic fjords There is thus a criterion by which the laminated muds deposited from a glacier-fed stream can be distinguished from those derived from an ice-sheet These will demand further discussions when considering the date of the Ice age

Intimately connected with outwash plains are the Kames or Eskers (Scandinavian *Åsar*) These two terms were in their original significance applied in Ireland and Scotland respectively to phenomena of the same type, but American geologists employ them to designate structures different in form and geological relations Fairchild defines them in the following terms "The term 'kame' is here used as designating deposits, chiefly sand and gravel, having a general knob and basin topography and formed at the margin or periphery of an ice-sheet The term 'esker' . is employed to denote distinct ridges, chiefly gravel, believed to have been deposited in the beds of subglacial streams, being phenomena of radial drainage" The distinction is fundamental —a kame, to an American geologist, is an accumulation parallel to the ice-front, an esker is radial to it As understood by British geologists, "eskers are winding ridges or strings of mounds composed of water-worn sand and gravel They frequently show in their course across country a distinct disregard for the present surface gradient, thus proving that the streams which deposited them could not have flowed entirely on the surface, or else must have been under sufficient hydrostatic pressure to flow uphill" (Wright) Sollas favours the idea that they were formed in the channels of subglacial streams; but Gregory attributes a morainic origin to them, in which opinion Charlesworth concurs, and he applies the term *åsar* to those disposed radially to the ice-front.

The surface beneath the glacial deposits has in general the characteristics of a land-surface· H B Woodward has described examples of "piping" of chalk in such situations which he

regarded as evidence of sub-aerial erosion The evidence outside the glaciated areas of the existence of ice-sheets and glaciers or of cold conditions are no less significant than those direct proofs of ice-action, and they have in recent years received a large amount of attention. When a glacier or ice-sheet obstructs the natural drainage of the ice-free country a lake will be formed, but will usually drain away on the removal of the ice barrier, leaving, however, certain signs by which its former existence may be recognized and which may furnish valuable corroboration, not otherwise obtainable, of the position and fluctuations of the ice-front. The criteria relied on for their identification are mainly four. (1) strand lines, (2) floor deposits; (3) deltas, and (4) drainage channels cutting spurs or watersheds The earliest example to be recognized in Britain was the famous parallel roads of Glen Roy. The channels cut by water overflowing from such lakes furnish some of the most picturesque features of a glaciated country—many thousands have been recognized in the British Isles

Biological Evidence.—The biological evidences of a cold episode in recent geological history are no less patent than the physical Reference has already been made to Smith of Jordanhill's recognition in the Drift deposits of shells whose modern equivalents now live in boreal or even arctic seas Mammals such as the musk ox and reindeer, whose modern representatives are restricted to high latitudes, had already been identified.

It is necessary to amplify a little the allusion to the occurrence of marine shells—a few whole and many more fragments—in the glacial deposits, which retarded for more than half a century the recognition of the true explanation of our glacial phenomena. The shelly Drift can, with few exceptions, be shown to occupy positions shown by independent evidence to have been invaded by ice that had crossed the sea-bed in its progress and thus had an opportunity of incorporating in its lower layers such relics of marine life It was objected by advocates of the submergence hypothesis that even if the ice could pick up such shells it would inevitably grind them to powder This objection has been met by Garwood and Gregory's discovery of perfect shells on the surface of the Ivory glacier in Spitzbergen at a higher elevation than the raised beach from which the glacier had rifled them Later, Lamplugh and others have described the moraine of the Sefstrom glacier, also in Spitzbergen, in which vast numbers of marine shells in perfect condition have been thrust out of the fjord entangled in boulder-clay. Another way in which marine organisms can be uplifted has been described by Debenham He found on the surface of two of the antarctic glaciers which are partially afloat marine muds with delicate organisms He attributed their occurrence to the freezing of the glacier on to the sea floor, and melting at its upper surface causing the gradual emergence of the entangled mud

Glacial Epochs in Older Geological Periods.—It was once the general opinion (shared by the present writer) that the Pleistocene Ice age was a unique episode in the history of the earth, but so long ago as 1848 Cumming, in his *Geology of the Isle of Man*, surmised on very insufficient evidence that the Basement Conglomerate of the Carboniferous might be of glacial origin A few years later Ramsay (1855) made a similar suggestion regarding conglomerates of Permian age in the midlands. It was probably as hazardous a speculation as Cumming's, but, by a strange coincidence, within four years, a true glacial Till of nearly equivalent geological age was discovered by the Blandfords in India Shortly after this Sutherland (1870) described an ancient boulder-clay in Natal of Permo-Carboniferous age, and Stow followed in the same year with a fuller account Thus on two continents deposits of approximately the same geological date were found to bear evidence of glacial origin; not only this, but in both countries the beds were associated with others containing a new and strange flora of ferns (*Glossopteris*) of types not recognized in European rocks of the same age. The glacial deposits of South Africa have now been traced over an area of many thousands of square miles and in places may be seen to rest on true *roches moutonnées*, as for example at the junction of the Vaal and Orange rivers Similar deposits have been recognized in Australia, with some doubt in New Zealand, Tasmania, the Falkland Islands, Brazil, Bolivia and the Argentine, in most cases accompanied by *Glossopteris*.

Some doubt attaches to the geological age of Tillites (the name given to the ancient indurated boulder-clays) in localities in North America, *e g*, Alaska, Nova Scotia and Prince Edward's island. At Squantum near Boston (U.S A), however, though some doubt exists as to geological age, the deposit is avouched by Coleman to be a typical ancient boulder-clay After eliminating all doubtful records there remains a body of unchallengeable evidence of glaciation in Permo-Carboniferous times on a scale even vaster than that of the Pleistocene period, extending over enormous areas, and approaching in Africa, India, Australia and Brazil so near to the present position of the Equator as to constitute a most baffling problem and which finds at present only partial solution in the speculations of Wegener.

Glacial deposits have now been recognized in rocks of many geological ages from the indubitable Tillites of the pre-Cambrian rocks of Canada and India to the great glacial series of Cambrian age in South Australia and the Silurian Tillites of Alaska No authentic signs of glacial conditions can be recognized in the Devonian rocks; the Permo-Carboniferous have been mentioned above Sporadic signs of glacial conditions have been recognized in rocks of Mesozoic and Cainozoic age, but nothing that could bear comparison with the earlier or with Pleistocene Ice ages.

The Quaternary Ice Age.—The traces of a great ice-sheet in Europe having its radiant point, not, as might be expected *a priori*, on the mountains of the Jotunheim but in the low grounds at the head of the Gulf of Bothnia, are to be found over an area of about two million square miles It spread across northern Russia as far as the Urals and a sinuous margin passes across to the Carpathians, with two great lobes descending the valleys of the Don and the Dnieper In its further course it abutted against the opposing slopes of the Riesengebirge, Thüringer Wald and Harz and covered the north German plain. The edge in Holland is marked by a low moraine ridge charged with erratics Its extension in the southern part of the North sea is largely conjectural, but it must have coalesced with native British streams that invaded the eastern and midland counties at one time, leaving deposits spread over part of the London area and traceable thence into Buckinghamshire, Oxfordshire and Warwickshire. Along its western margin it influenced the flow of ice-streams pouring off the mountain and hill centres of the British Isles, though it is doubtful if it actually invaded Britain, saving perhaps parts of Lincolnshire and East Anglia

A second great ice-sheet was constituted by the glaciers of the Alps, which spread in all directions, filling the great valleys and debouching on the plains The whole area between the Alps and the Jura was filled with ice which left its deposits and erratics at high levels upon the confronting slope, in a few instances thrusting lobes through the passes To the south it invaded the plains of Lombardy, excavated, as some would say, the great Italian lake-basins, and cast down the colossal moraines of the Dora Baltea and Dora Riparia The lesser mountain chains of Europe had their own glacier systems, and great extensions of the glaciers of the Himalayas and probably every other mountain chain of Asia have been recognized It is of interest to note that the famous cedars of Lebanon are growing on morainic material

In North America three ice-sheets have been identified. The Labradorean on the north-east had its centre, or radiant point, in northern Quebec, whence it spread in every direction. Its southerly flow covered most of eastern Canada and reached as far as New York and Cincinnati The Keewatin sheet, radiating from relatively low ground to the west of Hudson bay, expanded in all directions so as to come on the one hand into confluence with the Labradorean sheet and on the other to meet the third sheet. The Cordilleran diverges from an axis west of the Rocky mountains, and when it was at its full development lobes were thrust through some of the passes and may have come in contact with the Keewatin ice In a south-westerly direction it reached Vancouver island and Queen Charlotte's islands and the Pacific ocean Three hundred miles within the lobate front of the

Keewatin-Labradorean sheet lies the Driftless area of Wisconsin —an area several hundred miles in extent left untouched between the two sheets. These three ice-sheets are computed to have covered an area of 4,000,000 sq. miles. Besides extensions of glaciers from some of the other mountainous centres of North America, Greenland was at some stage of the glacial period covered with ice to a greater extent than at present, and contributed with other areas of arctic America to a total of ice-covered land in the Old and New World of the Northern Hemisphere of about 8,000,000 sq miles

In the Southern Hemisphere evidence exists of a greater development of glaciers than at the present time Thus in Australia, New Zealand and Tasmania, glaciers extended much below existing limits, in some cases, and in others to areas where no glaciers are now found. In British East Africa Gregory found moraines 5,400 ft. below the present limits In South America the same facts of greater glacier extension are disclosed It must be observed, however, that no proof has yet been adduced that the glaciers of the Southern Hemisphere were at a maximum simultaneously with those of the Northern Hemisphere, and it would be in agreement with some speculations regarding the cause of Ice ages if the northern and southern glaciations were alternate. Nor does it follow that temperature is the only factor governing the growth of glaciers; on the contrary the pole of greatest cold in the Northern Hemisphere, near Verkojansk, has no perennial snow though the subsoil is frozen probably to a depth exceeding 700 ft. as at Irkutsk

CLASSIFICATION

Correlation of the Glacial Deposits.—The question of succession of glacial deposits in such a country as Great Britain has presented a problem of great complexity. not only is there great lithological diversity, but the deposition has been governed so largely by local conditions of relief and drainage that, even now, after the deposits over the greater part of the country have been carefully mapped by the official surveyors, correlation between, *e g*, Lancashire and Norfolk has hardly been attempted One contributory cause has been the fact that the ice-streams have, in the cases chosen for illustration, come from widely separated sources and nowhere come into unmistakable contact. The presence of organic remains can be used only after careful elimination of such as are *remaniés* (*i e.*, mere erratics) and when this is done their testimony is still equivocal. For some purposes the provenance of the erratics characterizing the respective deposits may be utilized

James Geikie in the 2nd edition of his *Great Ice Age* (1877) was probably the first geologist to attempt a general classification of British deposits and their correlation with those of the Continent, but his views were largely coloured by Croll's splendid exposition of an astronomical theory of the Ice age with its necessary implication of glacial alternating with interglacial periods, and, further, by the doctrine of the great submergence which then dominated British geology, and to which he appeared to have adhered with some modification to the end Geikie was content, in the work cited, to specify one composite "Great succession of Glacial and Interglacial periods," a "Last Interglacial period," and "Last Glacial period," but in his last publication he differentiated the following:

6th Glacial epoch, Upper Turbarian, indicated by the deposits of peat which underlie the lower raised beaches

5th *Interglacial epoch, Upper Forestian*

5th Glacial epoch, Lower Turbarian, indicated by peat deposits overlying the lower forest-bed, by the raised beaches and carse-clays of Scotland, and in part by the *Littorina*-clays of Scandinavia

4th *Interglacial epoch, Lower Forestian,* the lower forests under peat beds, the *Ancylus*-beds of the great freshwater Baltic lake and the *Littorina*-clays of Scandinavia

4th Glacial epoch, Mecklenburgian, represented by the moraines of the last great Baltic glacier, which reach their southern limit in Mecklenburg; the 100 ft. terrace of Scotland and the *Yoldia*-beds of Scandinavia.

3rd *Interglacial epoch, Neudeckian,* intercalations of marine and freshwater deposits in the boulder-clays of the southern Baltic coasts

3rd Glacial epoch, Polandian, glacial and fluvio-glacial formations of the minor Scandinavian ice-sheet; and the "upper boulder-clay" of northern and western Europe

2nd *Interglacial epoch, Helvetian,* interglacial beds of Britain and lignites of Switzerland.

2nd Glacial epoch, Saxonian, deposits of the period of maximum glaciation when the northern ice-sheet reached the low ground of Saxony, and the Alpine glaciers formed the outermost moraines.

1st *Interglacial epoch, Norfolkian,* the forest-bed series of Norfolk.

1st Glacial epoch, Scanian, represented only in the south of Sweden, which was overridden by a large Baltic glacier The Chillesford clay and Weybourne crag of Norfolk and the oldest moraines and fluvio-glacial gravels of the Arctic lands may belong to this epoch

This classification was subjected to a searching criticism by Lamplugh in 1906. He pointed out that by the method adopted, except as regards the uppermost members, the sequence involved a continual change of locus—thus, for relics of the 1st Glacial epoch it was necessary to go to Sweden, where no trace of the Norfolkian 1st Interglacial epoch, is found, and so on through the series Lamplugh could further quote geologists of each country in turn who disclaimed belief in the order or position in the sequence of each member He ascribed the assumed sequences to the temporary oscillations of an ice-sheet, but disputed the suggestion of complete, or even of considerable, deglaciation It may also be remarked that differences of alimentation of different portions of an ice-sheet having an area of 2,000,000 sq m must have caused large fluctuations in the extension of the ice Charlesworth has shown in a recent discussion of the glaciation of the northwest of Ireland how variations of pressure brought first one then another of contending ice-streams over the same spot Geikie's 4th Interglacial, 5th Glacial, 5th Interglacial and 6th Glacial stages are all based on variations in the plant constituents of the peat beds of Scotland and the north of England, and whatever may be the value of this evidence it would seem quite inadequate to sustain the burden of two glacial and two interglacial epochs, which, if Croll's astronomical theory of the Ice age were accepted, would comprise in all four periods of 10,500 years each. The beautiful methods of de Geer, to be mentioned later, give an approximation to an actual chronology of the time, in years, that has elapsed since the Yoldia beds of Scandinavia were laid down It is 12,500 years and into that brief space must be crowded Geikie's four climatic phases, as well as the first 18 centuries of the present era, which can hardly be regarded as part of the 6th Glacial epoch, and will therefore constitute a "6th Interglacial epoch."

Penck and Brückner's Classification.—A classification which, unlike Geikie's, has the merit of a more limited range of locality, and of being based on the observations of a pair of geologists working in concert, is that of Penck and Bruckner (*Die Alpen im Eiszeitalter*) To accord with the stratigraphical succession their table is inverted—the oldest at the bottom.

Daun Stadium, snowline 300 metres lower than at present

Geschnitz Stadium, snowline 600m lower than at present

Buhl Stadium, snowline 900m. lower than at present

4th Wurm Glaciation (divided by Achen interstadial), snowline 1,200m lower than at present

Riss-Wurm Interglacial, brief period warmer than at present

3rd Riss Glaciation, maximum glaciation of France, Switzerland, Po and Rhine valley, snowline about 1,300m below present.

Mindel-Riss Interglacial, period of uplift, very long duration

2nd Mindel Glaciation, maximum glaciation of eastern, north-eastern and south-eastern Alps, snowline 1,300m. below present

Gunz-Mindel Interglacial, doubtful

1st Gunz Glaciation, not well represented—snowline probably 1,200 m. lower than at present

There are here four recognized glacial periods, and, with some doubt, three, or with the Achen interstadial dividing the Gunz period, four interglacial. This classification, though designed only for the Alpine region, has been applied by many geologists to

other districts, or even continents, and with some degree of probability has been adopted as a standard to which other classifications are made to conform

British Glacial Deposits.—These have not been reduced to a general scheme of classification and the reason for the failure is clear instead of the comparatively simple advances and retreats of a single ice-front, the British glaciation was effected by a number of ice-streams of moderate magnitude originating, some in one hill or mountain centre, and some in another, and influenced by reason of their relatively small size and mutual interference and by minor features of relief Added to their internecine conflicts there was at all times the influence of the Scandinavian ice-sheet to obstruct free access to the coasts of the North sea, and to shift the lines of ice-flow to more westerly courses

In the basin of the Irish sea only two boulder-clays separated by "Middle sands" are commonly observed, except where an oscillating ice-margin abutted on the hills, when the boulder-clays may interdigitate with many repetitions of sands and gravels due probably to the sorting action of water near the melting edge, or to the intercalation of hill-wash

In Yorkshire, while inland there are an older and newer boulder-clay, never seen either in superposition, or even in the same district, on the coast three, or possibly four, boulder-clays can be identified, not only by the test of superposition, but by characteristics of colour and the assemblages of the far transported erratics which they contain In ascending or chronological order they are (1) Basement clay, (2) Purple clay, sometimes in two divisions separated by sands and gravels, (3) Hessle clay The first of these is a leaden-coloured clay with occasional included patches of sea-bottom It contains a few Scandinavian rocks, and rocks from the Lake District and the Pennine chain The Purple clay is characterized by a redder colour and by the presence of numerous large blocks of Shap granite and Carboniferous limestones The Hessle clay is by far the best characterized, as it contains in great profusion rocks from the Tweed valley and the Cheviots Between the Purple clay and the Hessle clay, that normally succeeds it, there is found at one locality in Lincolnshire at an elevation of about 80ft above sea-level a bed of estuarine silt with marsh plants and brackish-water shells This is the only "interglacial" bed in Britain that is beyond challenge

The ice of the Hessle-clay phase at its maximum failed to cross the Cleveland hills, but the comparative obstruction of its movements in the North sea, by the opposition of the Scandinavian ice-sheet, deflected much of its flow into the Vale of York and a great moraine at Escrick, 5m S of the city of York, seems to mark its utmost extension Beyond that line scattered shreds of a much older, greatly denuded, boulder-clay are found The contrast between the two glaciations is very striking and the difference between the sharp and well-preserved topography of the later (Hessle) and the almost complete obliteration of that produced by the earlier glaciation gives a measure of their relative ages The same contrast will be seen in America

American Glacial Deposits.—The glacial deposits of North America, like those of Europe, increase in complexity as the distance from the ice-radiants increases This might be attributed, either to the fact that though the ice front retreated it never wholly disappeared, or that, though it might entirely disappear, any traces of interglacial conditions would be less likely to be preserved beneath a new ice-sheet Both opinions are held by American geologists

The most complete succession of deposits is naturally to be found in the peripheral areas and the classification of deposits in the Mississippi valley is as follows

	Illinoian Till Sheet
Wisconsin Till Sheet.	Sangamon Interglacial
Peorian Interglacial	
	Kansan Till Sheet
Iowan Till Sheet	Aftonian Interglacial
Yarmouth Interglacial	
	Nebraskan Till Sheet

The Nebraskan Till and Aftonian Interglacial are not admitted by all American geologists. Each Till sheet overlaps its predecessor from north to south, but the Kansan is considered to have been laid down by the Keewatin ice, which was confined to the states on the western side of the Driftless area of Wisconsin, viz, Nebraska, Iowa, Kansas and Missouri, and to have retreated in a northerly direction, before the advance of the Labradorean ice, which in parts of Illinois and Wisconsin overrode the Kansan drift Between these two sheets of Till, beds of peat and other subaerial deposits are traceable over an area indicating an advance of the Labradorean ice for not less than 150 years over the country laid bare by the Kansan retreat The Iowan marks a re-advance of the Keewatin ice but its relations to the Labrador ice is not definitely settled. The so-called Iowan Till is in some places separated from the Illinoian by a terrestrial surface upon the weathered Illinoian Till, of which the Iowan is by some considered to be an upper division The Wisconsin Till, whether a single sheet or in two stages is still uncertain is underlain by a weathered terrestrial surface in many sections

It is evident that many and extensive fluctuations of the ice-margins must have taken place but there is no means of deciding whether this amounted to a complete deglaciation or only a partial shrinkage Coleman has described sections near Toronto, discovered by Hinde, which give support to the supposition of complete disappearance of the ice, or at least its withdrawal from the area of the Great Lakes and subsequent re-advance in great force At the Scarboro Heights sections show three beds of boulder-clay separated by sedimentary beds Fossiliferous silts intervening between the older boulder-clay and the next have yielded a large suite of freshwater shells, and an abundant flora comprising many timber-trees such as oaks, elms and maples, some of which are now extinct, while others are limited to latitudes four or five degrees south of Toronto It is unfortunate that the associated boulder-clays cannot be referred to equivalents south of the Great Lakes Coleman is of the opinion that these deposits are unmistakable evidence of, at the least, one complete removal of the ice from the Labradorean centre

Methods of Correlation.—The question may now be approached In what way may the glacial succession in discontinuous areas be correlated, *e g*, can the glacial deposits of Britain be equated with those studies in the Alpine field by Penck and Bruckner, on the one hand, and those of America on the other? The answer of most geologists would, probably, be yes, and Sollas, Wright, Brooks and Osborne, to name a few authors, have made the attempt, though not always on exactly the same bases The method most generally adopted has been to take the Alpine succession of Penck and Bruckner with its several stages of glaciation and deglaciation and to place in parallelism the sequence observed in other areas This process receives support from the consideration that if these large scale advances and recessions are due to other than merely local causes, other areas must have been similarly affected There are, however, defects arising from the fact that each advance of the ice may not extend as far as its immediate, or any predecessor, and consequently in a peripheral region, such for example as the east of England, though it may show a corresponding number of fluctuations, they may not record the same episodes as those recognizable in areas nearer to the source of the ice When the comparison is between Europe and America the meteorological arguments advanced by Harmer to show that these two continents could not have been simultaneously glaciated must also be considered

The use of biological and anthropological data stands on a different footing from these and is, in fact, the application of the geological test of "characteristic fossils" It is in many ways more trustworthy, though it too has its limitations, for latitude and the distribution of land and sea no less than the character of the vegetation and conditions of the terrain, have had their influence upon the distribution of the Pleistocene mammalia which are adopted as criteria of age Some of the same factors must also have operated to control the dispersal of early man To cite but a single instance—Magdalenian man who hunted the reindeer in southern Europe during the closing stages of the Ice age is represented to-day by the Eskimo

Using the two classes of evidence separately, or conjointly where possible, a sequence of human culture and in some cases of race, can be correlated with the contemporary mammalian fauna and these in turn with the more or less direct products of the ice, or of the deglaciated land, and with deposits of rivers outside the glaciated areas

Culture Stages.—The culture stages that are of most value for this purpose are—the oldest being at the bottom of the table.

(Mayet, 1919)	Neolithic Azilian
(Glaciation, neo Würmian)	Magdalenian (late)
Postglacial	Magdalenian
(Fourth period of regression of glaciers)	Magdalenian (early) Solutrian Aurignacian (late)
IV Glaciation of Wurm	Aurignacian
(Fourth period of extension of glaciers)	Aurignacian (early) Mousterian (late)
Third Interglaciation Riss-Wurm	Mousterian
(Third period of regression of glaciers)	Mousterian (early) Close of Acheulian
III Glaciation of Riss	Acheulian
(Third period of extension of glaciers)	Close of Chellean
Second Interglaciation Mindel Riss	Chellean
(Second period of regression of glaciers)	pre-Chellean?
II Glaciation of Mindel	
(First Interglaciation Gunz Mindel)	
I Glaciation of Günz	

Minor modifications have been proposed by Obermaier, Boule and others It will be seen from the table that Mayet would refer relics of Chellean man to a warm period anterior to the Riss glaciation The Acheulian he includes in the Riss glacial stage but with an overlap into the milder Riss-Wurm interglacial when it linked on to the Mousterian, which in its turn extended in its latest stages into the Wurm glacial stage, and that embracing the greater part of the Aurignacian, though the latest Aurignacian overlapped into a fourth period of glacial retreat which covered the Solutrian, and a part of the Magdalenian The main Magdalenian period, however, was marked by a recrudescence of glaciation that Mayet styles the Neo Wurmian

A mere enumeration of the mammalia associated with these stages of culture would furnish an imperfect basis for classification of the deposits apart from the implements and weapons of man, but one decisive contrast is afforded between the Chellean and later faunas; viz, the presence in Chellean deposits of the straight-tusked elephant (*Elephas antiquus*) which does not occur in Acheulian or later deposits being replaced by the mammoth (*E. primigenius*) which survived in Europe till the close of the Magdalenian period Similarly the soft-nosed rhinoceros (*R leptorhinus*) gives place to the woolly rhinoceros (*R tichorhinus*) A hippopotamus closely related to the existing Nilotic species is characteristic of Chellean deposits in this country The Chellean fauna has a distinctly warm aspect and it furnishes perhaps the best indication of geological age of any of the Pleistocene faunas

It is fortunate that where the cultural criteria are lacking, the mammalian evidence may fix the age of deposits and vice versa thus the mammalian remains are the sole evidences in the north of England, while in the south many river-terraces, though lacking the mammalia, rarely fail to reward prolonged search for implements The terraces of rivers in the country beyond the glaciated area can be brought into relation with the phases of the Ice age by these means.

Evidence of Laminated Muds.—These criteria, valuable as they are in Europe, are entirely without application to the problem of correlating European and North American deposits, but there is a sanguine hope entertained by some geologists that a part at least of the difficulty may be removed by using an entirely different class of evidence. Allusion has been made to deposits of laminated mud thrown down from the turbid melt-waters of glaciers and ice-sheets, and to the rhythmical succession of layers corresponding to the diurnal or annual melting These muds or "varves" have proved a means—thanks to de Geer—of establishing a chronology in terms of years for the closing stages of the Ice age when the great Scandinavian ice-sheet was shrinking back to its source in the mountains The melting-edge retreated stage by stage across southern Sweden, which was then covered by sea, with occasional halts marked by terminal moraines De Geer argued that each pair of laminae—a dark and a light—would represent a season of melting and of cessation By careful measurement of the layers and their representation as a graph it was possible to recognize sequences many miles apart When a moraine intervened between the sections the duration of the halt could be discovered by noting the number of layers which were lacking on the inner side of the moraine De Geer with the assistance of a willing corps of helpers traversed the whole country from the extreme south of Scania to the place where the ice-sheet broke up into a detail of smaller glaciers The drainage of Lake Ragunda exposed a series of muds that completed the series down to the year 1796 This beautiful demonstration, which has been endorsed by all who have examined the evidence gives a definite chronology for the retreat of the ice from the first uncovering of the site of Stockholm, viz, 9,000 years De Geer and his followers believe they can recognize the same sequence of layers not only in Iceland, but also in North America If this is established it will dispose finally of the idea of alternate glaciations on opposite sides of the Atlantic, and the close general agreement between this measurement and the calculations based upon the recession of the Falls of Niagara seems to show that there is no grave error.

CAUSE OF THE ICE AGE

The special instance of the cause of the Ice age is but a special aspect of the general question of climates in geological time—genial conditions as well as frigid—and it is possible that the explanation, whatever it may be, has not yet been formulated though speculation has engaged the minds of astronomers, geologists and meteorologists for more than a century W B Wright has discussed with great perspicuity a number of proposals and his work (*The Quaternary Ice Age*) and C E P Brooks' *Evolution of Climate* must be consulted by all interested in the question

The causes suggested by various authors arranged themselves roughly in the two categories of Astronomical and Telluric Disregarding the chronological order of their enunciation there is convenience in considering, if only to dismiss, one or two of the first One cause suggested was the variation of solar radiation The sun has been considered to be a variable star, and the 11-year Sun-spot period gives some countenance to this as a possible cause of variation of the intensity of solar radiation of longer period, but as it is unsupported by definite evidence it cannot be fruitfully discussed Another explanation is based on the supposition that there are cold regions in space; this cause, however, is manifestly insufficient, the amount of radiant heat received from star-shine is entirely inadequate to produce an appreciable change in the climate of the earth A third is based on changes in the position of the earth's axis of rotation Sir G H Darwin has examined this question and on the hypothesis of an absolutely rigid earth he concluded that the maximum displacement possible was 3°, but on the assumption of some degree of plasticity it was possible for the pole to wander 10° to 15°, an amount disproportionate to the observed climatic effects.

The Astronomical Theory.—The theory that now holds the field owed its inception to Herschel's *Outlines of Astronomy* and is based upon the fact that the form of the earth's orbit varies in the degree of its departure from a circle. When the eccentricity is at a maximum, the effect of the precession of the equinoxes will be to give each hemisphere in turn for a period of 10,500 years a short hot summer and a long cold winter, and this will be followed by another equal period of long mild summers and short winters of moderate intensity Sir Robert

Ball puts the contrasts in this way. the year will be unequally divided into seasons of 166 days and 199 days respectively, but the solar radiation will be in the ratios 63.37 He puts the results as follows.

Glacial	229 heat measures spread over 166 days
	136 heat measures spread over 199 days.
Interglacial	229 heat measures spread over 199 days
	136 heat measures spread over 166 days.

E P. Culverwell exposes the fallacy of taking an entire hemisphere as a unit, and presents the maximum effects of winter in Aphelion at maximum eccentricity by comparing latitudes which at present receive a corresponding amount of sun-heat. A single illustration will suffice. Oxford, under the extremest conditions, would receive the same amount of sun-heat as Edinburgh receives now. A further objection to the astronomical theory consists in the fact that for each glacial and each interglacial period it provides only 10,500 years, which is certainly inadequate for the growth of an ice-sheet which shall extend from the Gulf of Bothnia to Norfolk—a distance of about 1,400 miles Croll, who first elaborated Herschel's proposition, admitted the insufficiency of the hypothesis which would not diminish the total amount of sun-heat received annually by the hemisphere having its winter in Aphelion, and proposed several ways in which the effects of winter cold could be accentuated by fogs generated in summer over the snowfields by the chilling of moisture-laden winds It is true that fogs do occur in the Arctic regions but, as has been pointed out by Wright, the heat thereby liberated raises the temperature of the snow and thus tends to neutralize the argument. Wallace, however, made the valuable suggestion that heat cannot be stored in the same way that cold in the form of snow can be stored, and that a snow field or ice-sheet tends to perpetuate itself and so to carry over the effects from one precessional period to another though with fluctuations of the margins

Croll and others have attempted to explain the Ice age or to supplement Croll's argument by modification of ocean currents, especially by the severance of the Isthmus of Panama, whereby the Gulf Stream would be deflected into the Pacific. To this hypothesis many objections can be urged, one of them quite fundamental, viz., that while it is true that the lowest part of the ridge dividing the two oceans is only 154ft. high, there is no evidence that it has ever been submerged since the Miocene period; on the contrary, the existing marine faunas of the two shores are so different as to indicate that there can have been no communication since about the middle of the Tertiary period J W Gregory concludes that there is "no evidence, afforded either by stratigraphy or zoology, to show that the Atlantic and Pacific oceans have been united across Central America in post-Miocene times." Even if a free communication had existed during the Glacial period it could have affected only that part of the Gulf Stream which emerges through the Straits of Florida, and not the equally important part which sweeps outside the Antilles.

Another agency invoked to reinforce Croll's argument was that the chilling of high latitudes in the Northern Hemisphere would increase the strength of the northern trade winds and cause a general displacement to the south of the equatorial current which feeds the Gulf Stream, whereby less warm water would pass into the north Atlantic circulation This and other expedients seem necessary to supplement the astronomical theory, and when all is said, there remain strong grounds for doubting its sufficiency.

Telluric Causes.—Turning now to telluric causes—geographical and other—the first and simplest is the suggestion of Arrhenius that a decrease in the amount of carbonic dioxide in the atmosphere would cause a fall of temperature sufficient to produce a glacial period Chamberlin has with a wealth of geological detail elaborated this hypothesis, but Ångström has shown that the quantity of CO_2 now present in the atmosphere absorbs all the radiations the gas is capable of intercepting.

Two hypotheses have been advanced having this in common that both would invoke elevation of the land as the primary cause of the Ice age, but they differ in that one would require epeirogenic uplift, *ie*, uplift on a continental scale, while the other would find more local elevation sufficient. It is generally admitted that the chilling effect of altitude, other things being equal, will induce the formation of snow fields and glaciers so that no question of adequacy need be raised, and discussion is confined to that of evidence. Both explanations derive some support from the existence of submarine prolongations of fjords or river valleys extending to great depths across the continental shelf. They have been recognized on many coasts not only in high latitudes, as off the coast of Norway, but at the mouth of the Adour, and at the entrance to the Straits of Gibraltar. Similar features characterize the west coast of Africa where a submerged groove of great depth prolongs the course of the Congo. The Lightning channel, between the Faeroes and Iceland, furnishes another example and the whole Atlantic coast of North America from Labrador to the Gulf of Mexico, typically illustrated by the submerged troughs of the Delaware and Hudson traceable to a depth of 3,500ft., have been cited as evidence of an uplift to nearly that amount in glacial times No proof has been produced connecting this uplift, if it ever occurred, with the date of the Ice age, and Dana and other geologists have referred the erosion of these valleys to the Mesozoic period The occurrence of dead shells of shallow water Mollusca over wide areas of sea-floor off the west coast of Norway down to 2,600 metres has been regarded by Nansen as proving an uplift of, at the least 8,000ft, but the facts would bear a quite different construction and may be interpreted as evidence of transport, by floating ice

Pre-glacial Land Levels.—It is useful in this connection to examine the evidence of preglacial land levels, and the records of events preceding the first indications of ice-action in the British Islands Wright remarks that throughout the southern half of the British isles and the north of France the level of the sea in pre-glacial times was practically the same as at the present day The shallow North sea, the English Channel, the Irish sea and many of the minor indentations, such as the Clyde and the Moray firth, existed then, much as they are to-day. A pre-glacial cliff with, in some instances, a beach at the foot, can be traced at intervals from Flamborough head southward to both sides of the Straits of Dover and along the south coast of England far up the coast of Wales, and along the south of Ireland The Flamborough section is of particular importance, for on the beach which lies at its foot, a few erratics have been found, showing that some transport, perhaps by floating ice, was already taking place. An extensive denuded plain of marine erosion, having about the same slope as the existing sea floor, fronts the beach, and is traceable almost to the Wash The sea, however, withdrew from the beach, which then became covered with landwash and blown sand, containing mammalian remains including hippopotamus, and *Elephas antiquus*, animals very characteristic, as already remarked, of the Chellean stage After an interval, so brief that little or no erosion of the cliff took place, the whole was buried beneath the oldest of the three or four boulder-clays of the Yorkshire coast region. At the other side of the headland, a deposit with estuarine shells underlies the boulder-clay.

Before its full significance can be discussed, however, it is necessary to make a cast back to the immediately preceding geological period, the Pliocene Of this period the geological record in the southern part of the North sea is singularly complete. It opens with the Coralline crag a rather shallow water accumulation containing a fauna bearing a strong resemblance to that found at present on the coast of Spain and in the Mediterranean, but with a large infusion of elements at present found in the British sea and a very few forms now restricted to higher latitudes. Indications of floating ice are not wholly wanting. A slight upheaval brought this deposit above the sea, but it was again depressed to receive the Red crag, a series of beach or inshore deposits forming a succession of beaches of a sea that retreated from south to north. The oldest of these deposits is at Walton-on-the-Naze where it occupies a position about 40ft. above sea-level. The newest is near Aldeburgh. In this series can be readily recognized the gradual substitution of a fauna very near to that of the Coralline crag, with its marked southern affinities, by one in which, along with many of the shells now found in the British seas, there is a large infusion of shells of high northern and some

even of Arctic range. During all this period the delta of the Rhine on the opposite coast in Holland and Belgium was steadily sinking. Harmer has argued that the profusion of shells found in the beaches of the Red crag and the comparative scarcity on the east was the result of prevalent on shore easterly winds, and as an indication "that the climate of regions to the north of Great Britain had . . . by that time become considerably colder than now, and therefore frequently anticyclonic in winter, an ice-sheet having permanently established itself on the Scandinavian highlands."

The further Pliocene history of the North sea is a story of steadily accentuating cold, subject to the qualification that a freshwater bed, the Forest bed proper, brings an anomalous warm flora and fauna into the midst of a series in which plants and animals alike bespeak a climate of great severity.

The next member of the sequence on the coast of Norfolk is the Cromer Till—a mass of boulder-clay of pronounced type, containing, *inter alia*, erratics from the Oslo district of Norway This Pliocene and Early Pleistocene record of progressive and apparently uninterrupted refrigeration is a fact which seems to refute decisively the hypothesis that the glaciation was caused by continental uplift, and equally opposes the view that it was the effect of those astronomical causes invoked by Croll The duration of Pliocene time must have greatly exceeded the possible duration of any progressive change of climate postulated by the theory

Continental Uplift.—The hypothesis of continental uplift has received a new impulse in recent years by the recognition by La Mothe and Depéret of four successive raised beaches and river terraces at altitudes ranging from 300ft down to about 60ft above the respective present levels of the Mediterranean, and the rivers discharging into it The lower three of these have been considered to correspond with the last three interglacial episodes, but geological opinion is sharply divided as to the connection

It is to be deprecated that in allusion to the events of the Ice-age or to discoveries connected with the successive stages of primitive cultures free use is made of time scales for which little justification exists. The only definite measure at present available is that of de Geer and the various estimates of the age of the Falls of Niagara which give measures so far accordant as to make it fairly safe to assume that the glaciation of North America and Northern Europe was simultaneous The hypothesis that would explain the great extensions of glaciers in almost every mountain centre in the world in recent geological time by supposing them to have been uplifted so as to produce a lowering of the snow line involves a series of coincidences not easy of acceptance, especially when synchronized in their advances and retreats

The final disappearance of the ice-sheets of northern Europe and North America was attended by a rise of the centres whence they respectively emanated. The Scandinavian region, as is shown by raised beaches which on all the coasts show a steady increase of elevation as they are traced up the fjords, has risen since the departure of the ice to a maximum of over 800ft which is attained, as according to the doctrine of isostasy it should be, not at the mountainous axis of the Scandinavian peninsula, but just where by other evidence it was proved that the maximum weight of ice rested. Near the outer margin of the ice sheet Scotland had been pressed down to an extent proportional to the weight imposed, and the recovery recorded in raised beaches is correspondingly less, whereas Scandinavia has not yet completed its recovery.

In North America, the shrinking Labrador sheet gradually withdrew behind the watershed between the Mississippi and the St. Lawrence drainage basins, and great lakes came into existence between the watershed and the retreating ice front. The strand-lines or beaches rise towards the site of the ice-radiant in a manner analogous to the rise of the Scandinavian beaches. When the ice reached in its retreat to the north of Niagara the lake drainage fell over the steep escarpment and the famous Falls thus came into existence The gorge of Niagara, 7m in length, was produced by the cutting back of the Falls and estimates of the lengths of time occupied in the operation have furnished a measure of the date of this stage of retreat, but many complications are introduced into the problem by the fact that at one stage an alternative route for much of the drainage was opened by way of the Mattawa, a tributary of the Ottawa river There is a general agreement between the results obtained and those given by de Geer's measurements of the seasonal clays in Sweden (P F. K)

GLACIER, a mass of compacted ice originating in a snow-field (French, *glace*, ice, Lat *glacies*) Glaciers occur in those portions of the globe where the rate of precipitation is greater than the rate of melting of the snow These conditions are fulfilled in high mountain tracts and in the Polar regions The lower limit of a snow-field, above which the snow lies throughout the whole of the year, is known as the *snow-line* The altitude of the snow-line, changes locally as well as at different latitudes, varying from 15,000 to 18,000 ft in the tropics to sea level in the Polar regions The main features of the type of glaciation of a region depend upon the topography, the geographical position and the elevation above sea level Apart from the Polar ice-sheets, four distinct types of glaciation have been recognized —the Alpine, Piedmont, Spitzbergen and Greenland types, but as many of the fundamental facts were first studied in regions where the Alpine type occurs, this will be described first

Alpine Types.—In mountain regions snow accumulates on gentle slopes, in high mountain valleys, in hollows and depressions and on the summits of dome-like peaks Owing to the weight of accumulated snow, the lower layers become compacted together into dense clear ice with a granular structure throughout. This is known as *névé* or *firn* The ice thus formed is more or less stratified as the result of successive falls of snow and of melting between falls, and by the accumulation, between successive falls, of films of dust from the air or from the snow which has melted. Wind causes the drifting of the snow, produces a rippled surface on the névé and carries loose snow to lower altitudes The névé is comparatively easy to cross on foot; very little debris cumbers its surface but concealed *crevasses* (cracks in the ice) are a source of danger The most important crevasse in this part is the *bergschrund* which has the form of a great symmetrical arc at the head of the névé It lies but a short distance from the exposed rock surface and the rock wall is exposed to disintegration by frost action, and the debris thus formed drops to the bottom of the crevasse Frost action also affects all exposed rocks in these high mountain tracts, producing sharp pointed pinnacles (aiguilles), arêtes and precipitous crags, snow capped peaks being protected from frost action The disintegrated rock falls downward and much of it finally comes to rest upon the edge of the névé where it forms a *moraine*

Glaciers creep down the mountain side The greatest movement naturally takes place in the summer when the average temperature is above freezing point The rate of movement also depends upon the mass of snow and ice, the slope and smoothness of the valley floor and the slope of the upper surface of the ice The rate and direction of movement can be determined by driving stakes into the ice which it is found does not move as one block but yields under the pressure of its own weight by cracking and regelation and moves slowly The movement can be compared to that of a river, the greatest rates being in the centre, the upper layers and in restricted parts of its channel Because of its higher rigidity, however, shearing of one mass upon another takes place producing foliation within the mass

The character of the ice changes as it passes down to lower altitudes and at a point where in summer the melting is in excess of the precipitation, the granular ice appears beneath the snow This point is taken as the lower limit of the névé and below it the valley glacier commences It is known as the *firn-line* but it does not necessarily coincide in altitude with the snow-line on adjoining mountains Below the *firn-line*, boulders and other debris occur on the surface of the ice Some of the boulders sink to the bottom but flat varieties do not sink, they protect the ice beneath them from the rays of the sun, so that they remain perched (as *ice-tables*) on a column of ice as the surrounding ice is melted Dust and small particles of rock absorb heat from the sun's rays quicker than does ice and therefore they melt

the ice beneath them and sink into shallow pits known as *dust-wells,* the action ceasing when the rays can no longer reach them. The moraines increase in size by the addition of material as they pass to lower altitudes. At the confluence of the main glacier with a tributary glacier, the two adjacent lateral moraines meet and pass into the middle of the lower combined glacier producing a *median moraine.* The lower reaches of a valley glacier may contain several median moraines *Ground moraines* are formed by attrition along the bed of a glacier and they are augmented by debris falling down crevasses At the lower end of a glacier the melting ice dumps a large portion of its rock burden in the form of mounds, generally crescent-shaped, across the valley producing a *terminal moraine.* (*See* MORAINE)

Crevasses are more obvious in the valley glacier than in the névé. They are due to strain set up in the glacier by movement over an uneven surface, or round sharp bends or by differential movement due to other causes They may be transverse or longitudinal and may be covered by fresh snow thus producing ice-bridges across them. When a glacier passes over a very steep slope the crevasses open wide and produce wedges and pinnacles of ice known as *seracs* Frequently the slope may be so steep that the glacier breaks completely along the crevasses and the masses of ice fall to lower levels, where they are moulded again into a solid mass as a reconstructed or recemented glacier Glaciers in hanging valleys and on cliff faces, which end in ice-falls are known as *glacierets, hanging glaciers* or *cliff glaciers* These names are also applied to accumulations of névé which are not large enough to produce a valley glacier Water from surface melting and water which flows on to the glacier from the surrounding rocks forms lakes or surface streams on the glacier. Such lakes are not of a permanent character, the colour of the water in them is clear blue and they may lie partly upon the ice and partly upon the solid rock Lakes frequently occur at the confluence of two surface streams In the majority of cases surface water ultimately finds its way down a crevasse and so are initiated *en-glacial* and *sub-glacial streams.* These streams are laden with sediment Some surface streams disappear down a *moulin,* which is a cylindrical hole through the ice, the position of which is often fairly permanent and in which the stream sets up a swirling motion so that it bores out a deep pot-hole, known as a *giant's kettle* (*q v*) in the rock beneath

The lower end of a valley glacier may advance or retreat This is regulated by a variety of factors, such as the amount of snow which falls in the catchment area, the rate of movement, and the rate of melting Observations have been carried out for a number of years on various Alpine and other glaciers in order to obtain accurate information relative to the movement and attempts have been made to ascertain the relation that it bears to variations in meteorological conditions It appears that in a period of between 35 and 40 years many glaciers pass through a cycle of advancing and retreating

Glaciers which extend well down below the snow-line may affect to a considerable extent the drainage of the surrounding country In such cases tributary streams may be dammed back to form lakes, *e g,* Lake Marjelen, and the level of the water may be high enough to cause the effluent to escape over a low lateral col, thus forming an *overflow channel,* the level of which may ultimately be lowered to permit the draining of the lake and so divert the stream There is clear evidence of the existence of such lakes during and at the close of the Great Ice Age, and the effects of them are seen in the occurrence of overflow channels, lake terraces, permanently modified drainage and in hills of sands and gravels representing lacustrine deltas

A large part of the morainic material carried by a glacier is dumped at its lower end, forming a terminal moraine. The streams which emerge are heavily laden with sediment, much of which is quickly unloaded forming debris strewn valleys and *outwash plains* or *frontal aprons* Such deposits are rudely stratified and among them large depressions known as *kettles* sometimes occur and these probably mark the sites of large blocks of ice enclosed for a time in the debris. Sands and gravels from the effluent streams are deposited in the rear of the terminal moraines and form rounded mounds, elongated parallel to the direction of the valley. They are known as *drumlins.* Similar ridges transverse to the valley are termed *kames.* Drumlins and kames are more frequently associated with ice-sheets than valley glaciers, as also are *eskers, osars* and *serpentine kames,* which are long narrow ridges supposed to have been formed by deposition directly from en-glacial and sub-glacial streams The water of effluent streams is dirty grey in colour, due to a large amount of clayey matter suspended in the water in a colloidal state.

Piedmont Type, etc.—The Piedmont type of glaciation is characteristic of Alaska and consists of great valley glaciers meeting to form a large sheet of nearly stagnant ice The Malaspina glacier, 1,500 sq m. in extent, is the best example of this type. It has an almost level surface covered with a great amount of debris, sufficient to support dense forests There is approximate equilibrium between the supply of ice and the loss by melting *The glaciation of Greenland* is very different. Here the greater part of the country is covered by an ice-sheet which slopes toward the coast at a very low angle Valley glaciers occur only in the coastal regions where also rocky peaks, *nunataks,* project through the ice-sheet Nunataks vary much in size, are sometimes covered by Arctic vegetation and are frequently fringed by crescent-shaped moraines, formed by the driving upward of the ground moraine The latter is not so large as in the Alpine type of glaciation, for the greater part consists of material torn off from the rock surface beneath the ice-sheet For long stretches along the coast the ice forms vertical or overhanging cliffs, known as *Chinese Wall fronts,* their steepness being due to the fact that the lower layers contain more debris and in consequence melt more quickly. The Greenland ice-cap, as well as the great Polar ice-caps, sends into the sea a large number of *icebergs* during the summer These drift to lower latitudes and gradually disappear by melting In *Spitzbergen* there is a central ice-cap on a high plateau, the sides of which are deeply trenched by radial valleys containing valley glaciers Some of the latter have Chinese Wall fronts when they reach the sea, but others have normal "Alpine" fronts In the former case the movement of the glacier is comparatively rapid In some parts of the Himalayas, the glaciers are retreating as they are in North America

Evidences of Past Glaciation.—As already pointed out, the topography and drainage of a region may be considerably modified by glaciation Glaciers, assisted by frost action upon exposed rock surfaces, are important eroding agents, but authorities are not agreed upon the extent of such erosion Cirques, with their steep walls and backward-graded floors, arêtes and pyramid-shaped mountain peaks can all be traced to the eroding action of frost hanging valleys, *U*-shaped valleys, truncated spurs and steps in a valley floor to the deepening action of valley glaciers. roche moutonnées, rounded, striated, grooved and polished rock surfaces, and striated and polished erratics to the smoothing action of moving ice: and the scratching power of rocks frozen into the glacier: the occurrence of erratics and perched blocks to the transporting power of moving ice. Giant's kettles, overflow channels and old lake terraces (*e g.,* the Parallel Roads of Glenroy) are evidences of water action associated with glaciers Boulder clay is the deposit left behind by a retreating ice sheet Lateral and terminal moraines, with associated "kettles" are formed by the melting of a valley glacier. drumlins, kames and outwash plains by fluvio-glacial action: eskers, osars and serpentine kames by deposition by en-glacial and sub-glacial streams. Icebergs breaking away from the Polar ice-sheets transport material for a considerable distance A large number of the lakes in higher latitudes are of glacial origin. (*See* LAKE.)

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(J. I. P.)

GLACIER

PLATE I

THE MER DE GLACE

The Mer de Glace, near Chamonix, in the French Alps, is a glacier 3½ miles long, formed by the junction of three others, the Glacier du Géant, the Glacier de Talèfre and the Glacier de Leschaux

GLACIER



BY COURTESY OF (5) W. S. BARCLAY, (4, 8) THE CANADIAN NATIONAL RAILWAYS, (11) THE NEW ZEALAND HIGH COMMISSION; PHOTOGRAPHS, (1) THE UNION PACIFIC SYSTEM, (2, 6) E. M. NEWMAN, FROM PUBLISHERS PHOTO SERVICE, (7) WILSE, BY COURTESY OF THE NORWEGIAN STATE RAILWAYS, (3) ELMENDORF, FROM EWING GALLOWAY, (9) THE KEYSTONE VIEW COMPANY, INC., (10) EWING GALLOWAY

VARIOUS TYPES OF GLACIERS

1. Haller Glacier, Rocky Mountain National Park, Colorado. Glacier of the Alpine type, showing lake
2. Monte Rosa Glacier from Gornergrat, Switzerland. The recess on the right is hundreds of feet in height
3. Crest of Mount Hood from the Eliot Glacier, Oregon. Below and to the left a portion of the glacier is visible
4. Mendenhall Glacier near Juneau, Alaska. This glacier is of the piedmont type, a large nearly stagnant ice sheet
5. La Romanche Glacier, Beagle Channel, Tierra del Fuego, at the southern extremity of South America
6. Upper Rhône Glacier near Gletsch, Switzerland. A valley glacier of the Alpine type with crevasses
7. Svartisen Glacier, Norway
8. Taku Glacier, southeastern Alaska. Piedmont type
9. Balmaceda Glacier, Last Hope Sound, Chile, South America. Huge blocks of ice stand above the glacier's surface
10. Tschierva Glacier. View from Alp Ota, near Pontresina, Switzerland. Alpine type, showing valley formation
11. Franz Josef Glacier and Castle Rock, Westland, South Island, New Zealand. Crevasses and jagged ice formations show on the surface

GLACIER BAY NATIONAL MONUMENT, a reservation (1,820 sq.m. in area) in south-eastern Alaska, extends inland from Glacier bay to include Muir and Brady glaciers and ice-covered peaks of the first rank, among which are Mts. Fairweather, Lituya, La Perouse and several others. Besides containing tidewater glaciers of first rank, the region is also valuable as a field of scientific study of glacier behaviour, of resulting movements and the development of flora and fauna after glacial retreat

GLADBACH, the name of two towns in Germany distinguished as Bergisch-Gladbach and Munchen-Gladbach

1. BERGISCH-GLADBACH is in Rhenish Prussia, 8 m N E of Cologne by rail. Pop. (1925) 18,140 It possesses four large paper-mills and among its other industries are percussion caps, nets, machinery, iron founding, and fire-clay Ironstone, peat and lime are found in the vicinity. Near Gladbach is Altenberg, with a remarkably fine church, built for the Cistercian abbey at this place

2. MÜNCHEN-GLADBACH, also in Rhenish Prussia, 16 m W S W of Düsseldorf on the main line of railway to Aix-la-Chapelle Pop (1885) 44,230, (1925) 114,236 Its industries are the spinning and weaving of cotton, the manufacture of silks, velvet, ribbon and damasks, and dyeing and bleaching There are also tanneries, machine works and foundries The beautiful minster has a Gothic choir (1250), a nave (early 13th cent) and a crypt of the 8th century The town is the headquarters of important insurance societies A Benedictine monastery was founded near Gladbach in 793, and so it was called Munchen-Gladbach (Monks' Gladbach) The monastery was suppressed in 1802 It became a town in 1336; weaving was introduced here towards the end of the 18th century, and, having belonged for a long time to the duchy of Julich, it came into the possession of Prussia in 1815.

GLADIATORS (from Lat *gladius*, sword), professional combatants who fought to the death in Roman public shows That this form of spectacle, which is almost peculiar to Rome and the Roman provinces, was originally borrowed from Etruria is shown by various indications On an Etruscan tomb discovered at Tarquinii there is a representation of gladiatorial games, the slaves employed to carry off the dead bodies from the arena wore masks representing the Etruscan Charon, and we learn from Isidore of Seville (*Origines*, x) that the name for a trainer of gladiators (*lanista*) is an Etruscan word meaning butcher or executioner. The older Roman name for the fighters was *bustuarii*

The first gladiators are said, on the authority of Valerius Maximus (ii 4 7), to have been exhibited at Rome in the Forum Boarium in 264 B C by Marcus and Decimus Brutus at the funeral of their father On this occasion only three pairs fought, but the taste for these games spread rapidly, and the number of combatants grew apace In 174 B C Titus Flamininus celebrated his father's obsequies by a three-days' fight, in which 74 gladiators took part Julius Caesar engaged such extravagant numbers for his aedileship that his political opponents took fright and carried a decree of the senate imposing a certain limit of numbers, but notwithstanding this restriction he was able to exhibit no less than 300 pairs During the later days of the republic the gladiators were a constant element of danger to the public peace The more turbulent spirits among the nobility had each his band of gladiators to act as a bodyguard, and the armed troops of Clodius, Milo and Catiline played the same part in Roman history as the armed retainers of the feudal barons or the condottieri of the Italian republics Under the empire, notwithstanding sumptuary enactments, the passion for the arena steadily increased Augustus, indeed, limited the shows to two a year, and forbade a praetor to exhibit more than 120 gladiators, yet allusions in Horace (*Sat* ii 3 85) and Persius (vi 48) show that 100 pairs was the fashionable number for private entertainments, and in the Marmor Ancyranum the emperor states that more than 10,000 men had fought during his reign Claudius was devoted to this pastime, and would sit from morning till night in his chair of state, descending now and then to the arena to coax or force the reluctant gladiators to resume their bloody work Under Nero senators and even well-born women appeared as combatants. Even the emperor Titus ordered a show which lasted 100 days; and Trajan, in celebration of his triumph over Decebalus, exhibited 5,000 pairs of gladiators. Domitian at the Saturnalia of A.D. 90 arranged a battle between dwarfs and women Even women of high birth fought in the arena, and it was not till A D 200 that the practice was forbidden by edict. How widely the taste for these sanguinary spectacles extended throughout the Roman provinces is attested by monuments, inscriptions and the remains of vast amphitheatres From Britain to Syria there was not a town of any size that could not boast its arena and annual games After Italy, Gaul, North Africa and Spain were most famous for their amphitheatres; and Greece was the only Roman province where the institution never thoroughly took root



A GLADIATOR S TESSERA Tesserae were used as emblems, tokens, etc., and consisted of four inscribed ivory or stone slabs fastened into a quadrangular tablet

Gladiators were commonly drawn either from prisoners of war, or slaves or criminals condemned to death Thus in the first class we read of tattooed Britons in their war chariots, Thracians with their peculiar bucklers and scimitars, Moors from the villages round Atlas and negroes from central Africa, exhibited in the Colosseum Down to the time of the empire only greater malefactors, such as brigands and incendiaries, were condemned to the arena; but by Caligula, Claudius and Nero this punishment was extended to minor offences, such as fraud and peculation, in order to supply the growing demand for victims For the first century of the empire it was lawful for masters to sell their slaves as gladiators, but this was forbidden by Hadrian and Marcus Aurelius Besides these three regular classes, the ranks were recruited by a considerable number of freedmen and Roman citizens who had squandered their estates and voluntarily took the *auctoramentum gladiatorium,* by which for a stated time they bound themselves to the *lanista* Even men of birth and fortune not seldom entered the lists, either for the pure love of fighting or to gratify the whim of some dissolute emperor, and one emperor, Commodus, actually appeared in person in the arena

Gladiators were trained in schools (*ludi*) owned either by the state or by private citizens, and though the trade of a *lanista* was considered disgraceful, to own gladiators and let them out for hire was reckoned a legitimate branch of commerce Thus Cicero, in his letters to Atticus, congratulates his friend on the good bargain he has made in purchasing a band, and urges that he might easily recoup himself by consenting to let them out twice. Men recruited mainly from slaves and criminals, whose lives hung on a thread, must have been more dangerous characters than modern galley slaves or convicts, and, though highly fed and carefully tended, they were of necessity subject to an iron discipline In the school of gladiators discovered at Pompeii, of the 63 skeletons buried in the cells many were in irons But hard as was the gladiators' lot (so hard that special precautions had to be taken to prevent suicide) it had its consolations A successful gladiator enjoyed far greater fame than any modern prize-fighter or athlete He was presented with broad pieces, chains and jewelled helmets, such as may be seen in the museum at Naples, poets like Martial sang his prowess, his portrait was multiplied on vases, lamps and gems, and high-born ladies contended for his favours

There were various classes of gladiators, distinguished by their arms or modes of fighting The Samnites fought with the national weapons—a large oblong shield, a vizor, a plumed helmet and a short sword The Thraces had a small round buckler and a dagger curved like a scythe, they were generally pitted against the Mirmillones, who were armed in Gallic fashion with helmet, sword and shield, and were so called from the fish (*μορμύλος* or *μορμύρος*) which served as the crest of their helmet In like manner the Retiarius was matched with the Secutor; the former had nothing on but a short tunic or apron, and sought to entangle his pursuer, who was fully armed, with the cast-net (*iaculum*) that he carried in his right hand; and if successful, he despatched him with the trident (*tridens, fuscina*) that he carried in his left We may also mention the Andabatae who are believed to have fought on horse-

back and wore helmets with closed vizors; the Dimachaeri of the later empire, who carried a short sword in each hand; the Essedarii, who fought from chariots like the ancient Britons; the Hoplomachi, who wore a complete suit of armour; and the Laquearii, who tried to lasso their antagonists

The shows were announced some days before they took place by bills affixed to the walls of houses and public buildings, copies of which were also sold in the streets These bills gave the names of the chief pairs of competitors, the date of the show, the name of the giver and the different kinds of combats. The spectacle began with a procession of the gladiators through the arena, after which their swords were examined by the giver of the show. The proceedings opened with a sham fight (*praelusio, prolusio*) with wooden swords and javelins. The signal for real fighting was given by the sound of the trumpet, those who showed fear being driven on to the arena with whips and red-hot irons When a gladiator was wounded, the spectators shouted "*habet*" (he is wounded), if he was at the mercy of his adversary, he lifted up his forefinger to implore the clemency of the people, with whom (in the later times of the republic) the giver left the decision as to his life or death. If the spectators were in favour of mercy, they waved their handkerchiefs; if they desired the death of the conquered gladiator, they turned their thumbs downwards. (A different account is given by Mayor on Juvenal iii. 36, who says: "Those who wished the death of the conquered gladiator turned their thumbs towards their breasts, as a signal to his opponents to stab him; those who wished him to be spared turned their thumbs downwards as a signal for dropping the sword") The reward of victory consisted of branches of palm, sometimes of money. Gladiators who had exercised their calling for a long time, or such as displayed special skill and bravery, were presented with a wooden sword (*rudis*), and discharged from service. The first Christian emperor was persuaded to issue an edict abolishing gladiatorial games (325), yet in 404 we read of an exhibition of gladiators to celebrate the triumph of Honorius over the Goths, and it is said that they were not totally extinct in the West till the time of Theodoric.

The attention of archaeologists has been recently directed to the tesserae of gladiators These tesserae, of which about 60 exist in various museums, are small oblong tablets of ivory or bone, with an inscription on each of the four sides The first line contains a name in the nominative case, presumably that of the gladiator, the second line a name in the genitive, that of the *patronus* or *dominus;* the third line begins with the letters SP (for *spectatus*=approved), which shows that the gladiator had passed his preliminary trials; this is followed by a day of a Roman month; and in the fourth line are the names of the consuls of a particular year.

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GLADIOLUS, a genus of monocotyledonous plants, belonging to the family Iridaceae. They are herbaceous plants growing from a solid fibrous-coated corm, with long narrow plaited leaves and a terminal one-sided spike of generally bright-coloured irregular flowers The segments of the limb of the perianth are very unequal, the perianth tube is curved, funnel-shaped and widening upwards, the segments equalling or exceeding the tube in length. There are about 150 known species, a large number of which are South African, but the genus extends into tropical Africa, forming a characteristic feature of the mountain vegetation, and as far north as central Europe and western Asia One species *G illyricus*, though very rare, is found wild in England, in the New Forest and the Isle of Wight. Some of the species have long been cultivated in flower-gardens, where both the introduced species and the modern varieties bred from them are very ornamental and popular

The modern varieties of gladioli have almost completely driven the natural species out of gardens, except in botanical collections. The most gorgeous groups—in addition to the *gandavensis* type—are those known under the names of *Lemoinei, Childsi, nanceianus* and *brenchleyensis*. The last-named, owing to the brilliant scarlet colour of the flowers, was always a great favourite for planting in beds. The flowers of the best varieties of the *Childsi* type are of great size and substance, often measuring 7 to 9in. across, while the range of colour is marvellous, with shades of grey, purple, scarlet, salmon, crimson, rose, white, pink, yellow, etc., often beautifully mottled and blotched in the throat The plants are vigorous in growth, often reaching a height of 4 to 5 feet

A deep and rather stiff sandy loam is the best soil for the gladiolus, and this should be trenched up in October and enriched with well-decomposed manure, consisting partly of cow dung, the manure being disposed altogether below the corms, a layer at the bottom of the upper trench, say 9in. from the surface, and another layer at double that depth. The corms should be planted in succession at intervals of two or three weeks through the months of March, April and May; about 3 to 5in. deep and at least 1ft. apart.

The gladiolus is easily raised from seeds, which should be sown in March or April in pots of rich soil placed in slight heat, the pots being kept near the glass after they begin to grow, and the plants being gradually hardened to permit their being placed out-of-doors in a sheltered spot for the summer. The time occupied from the sowing of the seed until the plant attains its full strength is from three to four years. The approved sorts are multiplied by secondary corms or offsets or "spawn," which form around the principal corm, but in this they vary greatly, some kinds furnishing abundant increase, while others persistently refuse to yield offsets. The stately habit and rich glowing colours of the modern gladioli render them exceedingly valuable as decorative plants during the late summer months They are, moreover, very desirable and useful flowers for room decoration, for while the blossoms themselves last fresh for some days if cut either early in the morning or late in the evening, the undeveloped buds open in succession, if the stalks are kept in water, so that a cut spike will go on blooming for some time

GLADSHEIM, in Scandinavian mythology, the region of joy, home of Odin and Valhalla (*q v*).

GLADSTONE, HERBERT JOHN GLADSTONE, 1ST VISCOUNT (G C M G, cr 1910) (1854–), English statesman, son of W E Gladstone (*q.v*), was born in London on Jan. 7, 1854, and educated at Eton and at University college, Oxford He lectured on history at Keble college for three years (1877–80) and then entered on a parliamentary career, representing Leeds from 1880–1910 From 1880 to 1881 he acted as private secretary to his father, and in 1881 became a lord of the treasury His other political offices were financial secretary to the War Office (1886); under-secretary at the Home Office (1892–94); first commissioner of works (1894–95); chief whip to the Liberal party (1899–1906) and secretary of State for home affairs (1905–10) In 1910 he was created a viscount, was appointed the first governor-general and high commissioner for South Africa, a post which he held until the outbreak of the World War During the war he was the head of the war refugees organization (1914–19) He was made G C B in 1914. He wrote *W. E. Gladstone* (1918) and *After Thirty Years* (1928)

GLADSTONE, JOHN HALL (1827–1902), English chemist, was born at Hackney, London, on March 7, 1827. He studied under Thomas Graham at University College, London, and Liebig at Giessen, where he graduated as Ph D. in 1847 In 1850 he became chemical lecturer at St Thomas's hospital, and in 1853 was elected F R S From 1874 to 1877 he was Fullerian professor of chemistry at the Royal Institution, in 1874 he was first president of the Physical Society, and in 1877–1879 president of the Chemical Society In 1897 the Royal Society recognized his 50 years of scientific work by awarding him the Davy medal Gladstone is particularly known for his work on optical refractivity (partly in conjunction with Dale), for his investigations into the chemistry of the lead-accumulator (with A Tribe and W Hibbert) and for his use (with Tribe) of the "zinc-copper couple" in the preparation of organic compounds. As early as 1856 he showed the

importance of the spectroscope in chemical research, and he was one of the first to notice that the Fraunhofer spectrum at sunrise and sunset differs from that at midday Gladstone always took a great interest in educational questions, and from 1873 to 1894 he was a member of the London School Board. He died in London on Oct. 6, 1902.

GLADSTONE, WILLIAM EWART (1809–1898), British statesman, was born in Liverpool on Dec. 29, 1809. The Gledstanes were an ancient Border stock who held lands in the Douglas country. William Gledstanes, of the branch from whom Gladstone descended, was laird of Arthurshiel in Lanarkshire in 1551; but the lands were lost and the 18th century found the Gledstanes maltsters in the town of Biggar One of them, Thomas, became a corn-merchant at Leith. His son, John Gladstone, became a merchant-prince at Liverpool, a member of parliament, a friend of Canning, a baronet and a Scottish landlord and Sir John's second wife drew Highland blood from the Robertsons of Inshes and the Mackenzies of Coul. Their famous son recalled his mother as "a beautiful and admirable woman," and bore witness to his father's large, strong nature and deep sense of duty. William was sent to Eton in 1821, and spoke later of his own slow development there But under Hawtrey and Keate he learned to work well. His contemporaries recalled his good looks, his growing scholarship, his contributions to the *Eton Miscellany*, his early and remarkable contributions to debate and, above all, the fine influence of his character. Arthur Hallam was not the only friend who noted that

In 1828 Gladstone went up to Christ Church, Oxford, serious-minded, deeply interested in religion and in politics, an unbending Tory in his fear of revolution, but always generous in his feeling for the poor He read classics, philosophy and mathematics. He was offered a Christ Church studentship. But he tried for the Ireland and the Newdigate in vain. He took long and vigorous walks. He talked, no doubt, as vigorously. He brooded upon poetry and religion Neither Pusey nor Newman had as yet much influence on his mind. He attended sermons and taught in Sunday school. He founded a college debating society, called after him the "W.E G " He shone with splendour at the Union, where Manning and the Wilberforces were already famous, and where other friends were making names He became secretary and president of that young, renowned society, and in May 1831, in a debate on Lord Grey's Government and parliamentary reform, he delivered a speech regarded by competent judges as the most eloquent and impressive ever heard within its walls Before the end of that year he had secured a double first at Oxford Before another year was over, the duke of Newcastle, who had heard from his son, Lord Lincoln, of young Gladstone's achievements as an opponent of reform, invited him to stand for Newark, and in January 1833 he took his seat in the assembly which he was to charm, to move, to dominate for 60 memorable years.

It was his father's counsel which made him a statesman His own choice would have been the Church But he soon began to justify his father's wisdom, and it was in defence of the system of slave labour as administered on his father's estate in Demerara that he made, in June 1833, his maiden speech. He was soon speaking again, on the Irish Church and on university questions, always with notable success He became a lord of the Treasury in Peel's Government of 1834, under-secretary for the colonies a year later, and he at once concentrated on his task. He was already keenly interested in colonial questions, and no politician was ever readier to learn Before long he was recognized as one of the few members of parliament who understood colonial interests. He gradually convinced himself that it was in local autonomy that the real solution of the imperial problem would be found. But Peel's Government could not stand Gladstone was soon released from his labours, free to devote himself to every kind of reading, and free also to prepare his famous book on *The State in its Relations with the Church* (1838) Old friends, among whom James Hope and Henry Manning were conspicuous, linked him in sympathy with the Oxford movement. He could not follow them or Newman to the goal they found, but he could believe still in the duty of the State to give active and exclusive support to one religion, and plead for the political supremacy and spiritual independence of the Church "Oxford had not taught me," he said later, "nor had any other place or person, the value of liberty as an essential condition of excellence in human things." Macaulay reviewed the treatise. Many praised it. But Peel expressed neither sympathy nor respect. In 1840 its author followed it up by a volume on *Church Principles*, which made less mark A year previously the young controversialist had married Miss Catherine Glynne of Hawarden, a marriage which brought him long-enduring happiness as well as a historic and delightful home A year later he was drawn back into the full current of politics by the Tory triumph of 1841

Gladstone returned to office with Peel as vice-president of the Board of Trade It was not the office which he wished for. He was called to new and unfamiliar problems. But again his readiness to learn and his rare power of concentration prepared the way for great administrative success He had the chief share in drawing up the revised tariff of 1842, with its masterly rearrangement and reduction of duties—a long step towards free trade. His industry in that laborious task, his incessant speeches, his gifts of exposition, his intimate knowledge of a complicated subject impressed and delighted the house Next year, at the age of 33, he joined the cabinet as president of his department, and soon carried his reform of the tariff further He still supported duties on corn: but his daily study of business had begun to "beat like a battering ram" on his protectionist armour. Meanwhile he carried through parliament the great Railway Bill of 1844 When he resigned in 1845 on the question of Maynooth, the unbending Oxford churchman, "Oxford on the surface but Liverpool below," was renowned already as a commercial minister, if thought a little fastidious in his scruples And the four hours' speech on the sugar question, with which he soon after came to the defence of the Government, proved him again a master of detail. At 36 Gladstone was one of the most striking figures in the House of Commons His superb health, his astonishing powers of work—he could do in four hours, said Graham, what took any other man 16, and he worked 16 hours a day—his never-failing intrepidity of spirit, his combination of impetuosity and ardour with easy self-command, his rich imagination tamed and disciplined by study, and the sense that he breathed something of "an ampler ether, a diviner air," profoundly impressed all who knew him His contemporaries noted his fine appearance and fine manners The pale, expressive, intellectual face, the deep-set, flashing eyes, the strongly-marked features, the erect and dignified bearing, the free and graceful gestures, the voice of incomparable flexibility and strength, gave him a natural equipment such as few orators have possessed And to this he added a rare mastery of the subjects which he spoke on and a rare capacity for moving, persuading and inspiring men

In Dec 1845, when Peel re-formed his Government to repeal the Corn Laws, Gladstone became colonial secretary and thereby vacated his seat at Newark. The duke of Newcastle, a protectionist, could not support his re-election, and he remained a cabinet minister outside parliament all through the memorable session of 1846 At the general election of 1847 he became member for the University of Oxford, an honour which Peel and he both regarded as one of the dearest prizes of their lives. Years followed of steady, if unconscious, development on Liberal lines, years, too, of great parliamentary achievements, notably his opposition to Palmerston in the Don Pacifico debate, and his tribute in July 1850 to the chief whom he always regarded, as on the whole, the greatest man that he had ever known In 1851, after wintering in Italy, he startled Europe by his famous letters to Lord Aberdeen, impeaching the tyranny of the Government of Naples, the first occasion on which he appeared as the spokesman of oppressed and suffering nations In the political crises of that year the Peelites received overtures from both sides. But when Lord Derby formed an unstable Government in 1852 it was not possible for Gladstone to join it He remained outside and tore Disraeli's budget to pieces in one of the greatest unpremeditated speeches of his life The coalition under Lord Aberdeen came into power, and Gladstone took the place at the Exchequer which

he was to make, for the first time, one of the greatest offices of State, and to illumine with a genius such as no finance minister, not even Peel or Pitt, had shown before

Lord Aberdeen's administration, though overshadowed by the Crimean War, gave Gladstone the opportunity of proposing a memorable budget and of carrying through parliament a great scheme of university reform The budget of 1853, introduced in a five hours' speech which he perhaps never surpassed, reviewed and examined the whole system of the income-tax, and arranged for its gradual reduction and its extinction in seven years' time It established a succession duty on real estate, reduced the tea duty, abolished the duty on soap, and, continuing Peel's policy of enfranchising business and lowering the price of food, it swept away nearly 140 duties and diminished nearly 150 more The Crimean War broke in upon these projects, and in 1854 the income-tax had to be increased Gladstone insisted on meeting war expenditure, as far as possible, out of income For the war he shared responsibility, but he shared also the misgivings of his chief And he turned with relief to university reform A typical Oxford man, brought reluctantly to realize the necessity of change, he had special qualifications for this task And his conduct of the Bill of 1854 revealed again his mastery of his subject and his ascendancy in the house But in Jan 1855 the widespread dissatisfaction with the conduct of the war destroyed Lord Aberdeen's administration, and Gladstone and other Peelites, after some hesitation, withdrew from the Government, of which Lord Palmerston became the head Then for a time he reserved himself for criticism—criticism of Cornewall Lewis's finance, criticism of Palmerston's high-handed policy in China, criticism of the act which established the divorce court, criticism of Palmerston's Conspiracy Bill after the Orsini plot On Palmerston's fall Gladstone was pressed to take office under Lord Derby But he preferred to stand apart, devoting himself to Homeric studies—the three volumes of 1858 showed characteristic enthusiasm and industry—visiting Corfu on a mission which resulted in the ultimate union of the Ionian islands with Greece, and finally returning to criticize with detachment Disraeli's first Reform Bill in the House of Commons The general election of 1859 brought Palmerston back to office, and Gladstone, who had voted with the Tories in the division which turned Lord Derby out, caused some surprise by joining Palmerston as chancellor of the Exchequer But he believed the country needed his services He had proved himself no office-seeker, and he may scarcely have realized that his action meant his permanent enlistment in the Liberal party

The 15 years which followed were years of brilliant effort and almost uninterrupted power A succession of great budgets, introduced in wonderful speeches and reflecting a period of great prosperity, made Gladstone the most conspicuous figure in the Government from 1859–65 The budget of 1860, combined with Cobden's commercial treaty with France, carried the policy of free trade still further, and brought the number of dutiable articles down to 48 The proposal to repeal the paper duty, a proposal which created the cheap press, was defeated by the House of Lords, and Gladstone frankly warned the peers that he would not flinch from asserting the rights of the Commons over taxation. In 1861 he made good his warning by including all his financial proposals, including the repeal of the paper duty, in a single Money Bill, which the peers could only accept or reject as a whole. In 1863 he had a substantial surplus and was able to reduce the income-tax to sevenpence again He reduced it further to sixpence in 1864 and to fourpence in 1865 He would not abandon the hope of getting rid of it altogether. Sugar and tea duties came down too. The country saw with delight the minister taking off tax after tax, and yet announcing a larger surplus every year And these financial triumphs were accompanied by votes and speeches which showed his ever-widening Liberal outlook, his ever-growing dissatisfaction with the military expenditure and other characteristic actions of his chief. Against increasing armaments he fought to his last day.

One famous utterance of these days, when, in 1862, he described Jefferson Davis as having made a nation, Gladstone himself afterwards condemned as a mistake "of incredible grossness." Another, in 1864, asserting the moral right of every Englishman "to come within the pale of the constitution," frankly delighted Liberal opinion. Lord Palmerston was not alone in understanding the phrase to assert the moral right of every man to a vote. The dissolution, however, in July 1865, found Gladstone rejected at Oxford, "unmuzzled" as he told his friends in Lancashire, where he was immediately provided with a seat. Palmerston died in October, and Gladstone, who had strong claims on the first place, readily agreed to serve under Lord Russell As leader of the Commons he introduced the modest Reform Bill of 1866, and defended it undauntedly in a series of speeches which proved too strong for Lowe and a Palmerstonian House of Commons When the Government were defeated a great crowd of Londoners marched to cheer Gladstone in his home Lord Derby and Disraeli came into power, and promptly introduced a wider Reform Bill and Gladstone, in spite of the factious groups around him, remodelled it as it passed through the house At Christmas, Lord Russell's retirement left him undisputed leader of the Liberal party, and in 1868 he carried, over the heads of the Government, his famous resolutions for the disestablishment of the Irish Church. The general election of that autumn ended in his return to power, as prime minister—unseated indeed in Lancashire, but elected for Greenwich—at the head of the strongest and most strenuous Government of those times

The great measures of Gladstone's first administration have long since passed into history The disestablishment of the Irish Church was carried by an admirable mixture of firmness and conciliation through the House of Lords The Irish Land Act of 1870 did much to give security to Irish tenants The same year saw the passing of Forster's Education Act, the establishment of competitive examinations for the civil service, the outbreak of the Franco-Prussian War, and a new pact to protect the neutrality of Belgium Army reform followed and the abolition of the purchase of commissions, which Gladstone enforced by royal warrant when the House of Lords refused assent University tests were swept away, it had taken years to bring the old member for Oxford to agree to this The ballot was adopted after some resistance from the peers The settlement of the Alabama claims afforded a striking and significant example of the value of international arbitration as a method of avoiding war, and Gladstone's own power over popular feeling was illustrated afresh by an astonishing meeting at Blackheath, where he spoke for two hours in the open air to many thousands of people and completely conquered an audience disposed to be unsympathetic and disorderly at first.

But the Government's difficulties increased Their proposals for a university in Ireland were defeated They were weakened by resuming office when Disraeli refused to come in Tiresome points of judicial and ecclesiastical patronage led to decisions in which the prime minister was accused of evading the law On Lowe's removal to the Home Office, Gladstone reluctantly took over the Exchequer, and the question arose whether he had not thereby vacated his seat In Jan 1874 he suddenly dissolved parliament and held out hopes of abolishing the income-tax, now reduced to threepence, which he had always regarded as a possibility to be kept in view The election resulted in a Tory majority The prime minister travelled down to Windsor, taking *The Merchant of Venice* and *Thomas à Kempis* with him Disraeli returned both to office and to power Gladstone, now aged 64, with a long record of service and activity behind him, reserved the right to withdraw from parliament, though he took a prominent part in opposing Archbishop Tait's Bill for regulating public worship Early in 1875 he laid down the leadership of the Liberal party and Lord Hartington was elected leader in his place.

Sunshine, men said, had gone out of politics But the eyes of the country were on Gladstone still His health was unimpaired: his doctor laughed at misgivings on the subject His public interests, his powers of work, his zest for life, for literature, for politics, were as inexhaustible as ever, and he had hardly made up his mind to retire before the Eastern Question (*q v*) called him back When the iniquities of Turkish misrule began to stir the heart of Europe, Gladstone inevitably became the spokesman of

the indignation aroused Parliamentary colleagues might hang back; Lord Beaconsfield might profess himself indifferent to "coffee-house babble"; fears of Russian influence might obscure the issue and enable rash politicians to beat up a "jingo" spirit and to bring the country within sight of war But as the public realized the growing danger of the Government's adventurous policies in Europe, in South Africa and in Afghanistan, British opinion turned the more readily to a statesman whose ripe experience and formidable arguments gave his warnings an unusual weight In 1879 Gladstone entered on an electoral campaign which became a rallying-point for Liberals all over the country and the series of speeches in which he unfolded to vast Scottish audiences which hung upon his words, the principles which, as he conceived, should govern the policy of this country, seemed to many to sound a new note of equity in the conduct of international affairs Students of his career have regarded these speeches, the maxims of foreign policy laid down in Midlothian and reiterated elsewhere, as Gladstone's greatest contribution to the public life of Europe Friends of peace and arbitration have found in him the first statesman of high rank to plead, in a world still ruled by obsolete traditions of diplomacy, for a finer and truer conception of national duty, dignity and greatness.

Gladstone had roused the country almost single-handed When the battle was won and Lord Beaconsfield swept from office, all attempts to form a Liberal Government under any other leader vanished like mists before the sun Queen Victoria, over whom Lord Beaconsfield had acquired an unrivalled personal ascendancy, had, unhappily, learned to regard Lord Beaconsfield's great opponent as a "violent, mischievous and dangerous" politician Her letters leave no doubt of the lasting prejudice excited against a statesman who had enjoyed her high regard until Lord Beaconsfield's influence became supreme And her attitude towards her prime minister from 1880 onwards, though eased at times by her fine manners, unquestionably added to the difficulties of his task On this subject it is characteristic that Gladstone never allowed a word of complaint to escape him But he felt keenly the growing alienation of a sovereign whom he served through life with a tender and considerate loyalty not often surpassed At 70 he took up again with undiminished vigour the burden of the State, and the years of his second administration, from 1880 to 1885, were some of the most strenuous and eventful of his life The troubles bequeathed by Lord Beaconsfield were dealt with, though not without leaving seeds of further trouble in the future But the call of Ireland was, from the first, insistent, and even Gladstone found it difficult to watch at each step the widespread negotiations of his colleagues When the hope of federation in South Africa failed and the Boers protested against annexation, delays and mistakes at the Colonial Office undoubtedly aggravated a difficult situation The Boers rose in arms Military mistakes then followed, and the chapter of accidents ended in a grave setback at Majuba Hill Ministers refused, with unusual moral courage, to treat that setback as sufficient reason for abandoning their policy of conciliation or for stopping negotiations already begun But to some their action gave the impression of weakness, and party critics not unnaturally accused them of surrendering to defeat

Even greater difficulties arose in Egypt, when Arabi Pasha's outbreak and the refusal of France and Turkey to co-operate, forced an unwelcome responsibility upon Britain The difficulties were never adequately grasped, the consequences of the action taken never perhaps sufficiently examined The determination of Gladstone and his cabinet to avoid, as far as possible, any policy of annexation did not prevent very serious commitments In much that followed Gladstone's share was less than that of some of his colleagues He declared strongly in 1882 against the policy of restoring order in the Sudan He was the only member of the cabinet who objected to despatching troops to Suakin in 1883 He was absent from London when the decision to send out Gordon was taken He would have been the last indeed to deny his responsibility for that or for any other episode in the unhappy series of miscalculations which ended in the tragedy at Khartoum. But the critics who, after the disaster, voiced the deeply-stirred emotions of the nation did not always remember that the abandonment of the Sudan was recommended by Sir Evelyn Baring and by Gordon himself, and that Gordon went there with explicit instructions not to hold, but to evacuate the country.

Events abroad, however, were only a part of the difficulties of Gladstone's second administration He spoke of it afterwards as "a wild romance of politics," a succession of accidents and hairbreadth escapes There was a grave crisis over the Franchise Bill of 1884 But the fine temper shown by the prime minister, helped by the queen's influence, brought it safely into port There was, all through, a rising tide of troubles in Ireland, an alarming increase of disorder, a demand for new and exceptional legislation to settle the land question and to put down crime The great Land Act of 1881, with its obvious benefits for Irish tenants, virtually broke the Land League agitation But the Coercion Act which accompanied it roused a storm of defiance in the country, and was followed by a startling increase in serious crime Forster's methods failed, and their failure deeply impressed his chief Parnell's arrest was followed by the Kilmainham Treaty, by the "black act" in Phoenix Park, by angry reproaches from the Government's critics But Gladstone's conviction of the impossibility of governing Ireland without the support of Irish representatives grew When in June 1885 a sudden combination between Conservatives and Parnellites threw him out of office, he was already contemplating new departures A brief Conservative administration was followed by a general election which returned 333 Liberals, 251 Conservatives and 86 Parnellites to the House of Commons Gladstone came back to power for the third time at the age of 76, and entered with unquenchable ardour on the most astonishing period of his career

Of all the many interests which engrossed him from the days of his earliest speeches in parliament, Irish questions, the Irish Church, Irish land, Irish university education, the whole difficult problem of Irish government, had again and again occupied his mind To those who knew him best and watched his utterances closely, his declaration for Home Rule was scarcely a surprise Months before, a critic so acute as Healy had pointed out in public the movement of Gladstone's mind But a new departure so momentous startled many of his followers, and not even the skill with which the great measure was drafted, and the consummate gifts employed to recommend it to the House of Commons, could avert the defeat of the Home Rule Bill of 1886 Six years of vigorous opposition followed, marked by a Liberal recovery in the country, by the Parnell triumph before the special commission, by the Parnell tragedy which stemmed "the flowing tide" Gladstone's fourth premiership was chiefly remarkable for a fresh attempt to carry a Home Rule Bill in 1893. The Liberal majority was too small for success But the power, the vitality, the astonishing resources of argument and eloquence, dexterity and understanding with which the prime minister of 83 fought every detail of his bill fascinated opponents hardly less than friends. The opposition of the House of Lords to the measures of the Liberal Government provoked a warning of the coming issue between the peers and the democracy, which proved to be Gladstone's last speech in parliament, his last appearance in the House of Commons But the refusal of some trusted colleagues to support him in his life-long determination to keep down expenditure on armaments was the immediate cause of a resignation for which age and failing sight and hearing supplied unanswerable pleas His chief political opponent declared that the country lost by his withdrawal the most brilliant intellect ever devoted to the public service since parliamentary government began

CLOSING YEARS

Such men cannot retire, can rarely rest Yet, if there could be no complete relief from activities, there was a serene and noble dignity about the closing years Gladstone's career had stirred men's passions deeply and some political ill-will survived, to break out again in foolish malice even after death, when a miserable libel based on his work in reclaiming women of bad character, was revived, repeated and disposed of in the law courts for ever.

In his charities he had no fear of misconstruction and was generous to excess. There was much in him, no doubt, which the average Englishman failed to understand. He was sometimes quite indifferent to opinion. A certain simplicity and modesty of nature made him perhaps too literal and unsuspecting; and the contrast between this genuine simplicity and his reserves, refinements and ambiguities of expression bewildered his critics and provoked accusations of bad faith But as party feelings cooled such accusations died away. Men looked back upon his 60 years of public service and saw a life "set up on high," not free, indeed, from errors and miscalculations, but lived from first to last among ideals as pure and standards as exalted as any English statesman ever sought. The habits of mind, the scholarship, the theology, the views of science might seem to some old-fashioned or mistaken But even in science there was always an extraordinary readiness to learn. Outside parliament he was essentially a student, a book-lover, a prolific writer. He could revel in Dante, in Aristotle or Augustine, in *Don Quixote* and Byron, in Blackstone, Chillingworth and Jewel "Usual occupations . . . Bible, Alfieri, *Wallenstein*, Plato, Gifford's *Pitt, Biographia Literaria*," is a note of 1833 Devoted to Wordsworth, he was a fine critic of Tennyson. Scott was a life-long favourite, but *Robert Elsmere* engrossed him in 1888 Homer, like Dante, was a constant and familiar companion He lectured on Homer to the Oxford Union when over 80. He completed his translation of the Odes of Horace on the day of his final retirement in 1894 He was devoted to theology. In 1895 he was editing Bishop Butler and establishing a library at St. Deiniol's to promote churchmanship and divine learning Hawarden, a home to him for nearly 60 years—the management and restoration of the Hawarden property taught him many a lesson in finance—became a centre of all kinds of studies as well as a storehouse of documents of high value to the State.

At Hawarden Gladstone was engrossed in literature, in writing and in correspondence Only his rigid method and economy of time enabled him to keep his correspondence down He was visited by many friends who delighted in his conversation The Lyttelton family stood for much in kinship. Lord Acton stood for much in literature Lord Granville and Lord Spencer, Lord Rosebery and John Morley stood out latterly as intimate colleagues. As time passed the people of England flocked in multitudes to see him. But he was happiest of all in his home life; in a marriage which brought him over 58 years of intimate companionship; in a family whose affection was touched indeed with awe and admiration, but inseparable from enjoyment, playfulness and fun; in children who could remember nothing masterful or dictatorial about him, only the gentlest and kindliest of teachers, a lover of truth and of every form of industry, a hater of every form of waste, an example not of religion thrust upon them, but of religion made unconsciously the basis of ordinary life. Of these children one son, William Henry, served for many years in parliament. Another, Herbert, Viscount Gladstone, became prominent in public life. A grandson, William, succeeded to Hawarden and fell in the World War. And others of the family have maintained in different callings the great traditions inherited from their home. The religion which Gladstone taught them knew no narrow tenets At first an earnest Evangelical, he became a life-long friend of Tractarian opinions, of Bishop Wilberforce, of Dr. Pusey, of Keble college. He pleaded for tolerance for ritualist developments, for the authority and spiritual freedom of the Church. His sympathies with the Greek Church, too, were strong. But he separated himself decisively from Newman and Manning. He spoke vigorously against the tendencies of Vaticanism and the dangerous claims of Rome He nominated Dr. Temple to a bishopric; Church patronage gave him many anxious hours. He won the love and trust of Nonconformists. His defence of the Affirmation Bill of 1883 was among his noblest speeches. It was the spirit, not the form, of religion which dominated and inspired his life. From that he drew his rare self-mastery, his conviction of right, his assurance of duty and, in great issues of statesmanship or conduct, his fine fearlessness in leading men.

Gladstone's place in the long line of British statesmen only the future can decide. Walpole and Palmerston had few rivals in the art of managing parliaments. Chatham had no superior in eloquence, Fox in the instinct for debating, Burke in the richness of his mind. Pitt may have had more mastery of his followers, Peel a sense of public duty as unwavering and as fruitful in results. But in the combination of intellectual powers and physical resources, in range of genius, character, achievement, Gladstone stands second to no English public man. The length and fullness of his record are astonishing. Where else can 60 years of such activities be shown? And in every field of politics there is the same rare power of concentration, the same untiring industry, the same mastery of administrative and legislative details, the same passion for the public interest, the same ever-deepening love of human freedom. The greatest financier and practical economist who ever gave life to the commerce of this country, he was also one of the first members of parliament to give serious study to colonial problems, to set himself to solve and settle the endless complexities of Irish government, to make British foreign policy an example to the world. Right with him was might He did more than any man of his generation to advance the cause of peace and arbitration, to plead for humanity in the government of States. His last words in politics, in 1896–97, were appeals on behalf of Armenia and Greece Is it any wonder that his name became a household word in southern Europe, that in Italy and Rumania, Bulgaria and Macedonia, men mourned his passing as the passing of a friend?

It is strange, perhaps, that this great worker should have been also the greatest speaker of his age. Several of his predecessors had been masters of the House of Commons, but he was a master on the platform also, unrivalled by virtue of his own intense conviction in his power of convincing multitudes of men It is stranger still that this outspoken leader of democracy should have been to the last one of the courtliest of courtiers, one of the loyalest of churchmen, one of the most inveterate lovers of the past. To Oxford, as the shadows closed, "the God-fearing and God-sustaining university of Oxford," he sent a touching message of farewell The fires of life were dying The "vulnerable temper" had long since been exquisitely disciplined, but the old intimate interests and affections survived Health broke at last completely. Pain was added to his trials, pain very nobly borne In May 1898 the end arrived. A vast procession of mourners passed beside his bier at Westminster. He was laid to rest in the Abbey with every honour that his countrymen could pay. Friends and opponents joined in eulogy, but Lord Salisbury's tribute to "a great Christian statesman" touched perhaps the central truth. Far more than genius or renown, or political achievement, it was the sense of Gladstone's moral grandeur which won the final homage of mankind. (C. E M)

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GLADSTONE, a city of Delta county, Michigan, in the upper Peninsula, at the head of Little Bay de Noc, an inlet of Green bay (Lake Michigan). It is on Federal highways 2 and 41, and is served by the Soo Line railway. The population was 4,953 in 1920 (24% foreign-born white) It is a division headquarters of the railroad; has a deep-water harbour, with coal and flour docks and a grain elevator; is a receiving and distributing centre

for automobiles shipped across the lake and consigned to places farther west; and manufactures sporting goods, firearms, hardwood flooring, veneer and other articles. The city was founded in 1880 and incorporated in 1889 Since 1923 it has had a council-manager form of government

GLAGOLITIC, an early Slavonic alphabet in which is written an early liturgy still used among the Dalmatians and Roman Catholic Montenegrins by special licence of the Pope. (*See* ALPHABET.)

GLAIR, the white of an egg, and hence a term for a preparation made of this, used in bookbinding and in gilding to retain the gold and as a varnish The adjective "glairy" is used of substances having the viscous and transparent consistency of the white of an egg.

GLAISHER, JAMES (1809–1903), English meteorologist and aeronaut, was born in London on April 7, 1809 After serving for a few years on the ordnance survey of Ireland, he acted as an assistant at the Cambridge and Greenwich observatories successively, and when the department of meteorology and magnetism was formed at the latter, he was entrusted with its superintendence, which he continued to exercise for thirty-four years, until his retirement from the public service In 1845 he published his well-known dew-point tables, which have gone through many editions In 1850 he established the Meteorological Society, acting as its secretary for many years, and in 1866 he assisted in the foundation of the Aeronautical Society of Great Britain He made a series of balloon ascents between 1862 and 1866, mostly in company with Henry Tracey Coxwell, with the object of carrying out observations on the temperature, humidity, etc, of the atmosphere at high elevations He died on Feb 7, 1903, at Croydon

GLAMIS, village and parish, Forfarshire, Scotland, 5¾ m W by S of Forfar by the L M S railway Pop (1921) 1,099 The name is sometimes spelled Glammis and the *i* is mute. it is derived from the Gaelic, *glamhus,* "a wide gap," "a vale" In the village is a sculptured stone, supposed to be a memorial of Malcolm II, although Fordun's statement that the king was slain in the castle is now rejected About a mile from the station stands Glamis castle, the seat of the earl of Strathmore and Kinghorne, a fine example of the Scottish Baronial style, enriched with certain features of the French château In its present form it dates mostly from the 17th century, but the original structure was as old as the 11th century, for Macbeth was thane of Glamis Robert II bestowed the thanedom on John Lyon, who had married the king's second daughter by Elizabeth Mure and was thus the founder of the existing family Patrick Lyon became hostage to England for James I in 1424 When, in 1537, Janet Douglas, widow of the 6th Lord Glamis, was burned at Edinburgh as a witch, for conspiring to procure James V's death, Glamis was forfeited to the crown, but it was restored to her son six years later when her innocence had been established The 3rd earl of Strathmore entertained the Old Chevalier in 1715 and fell on the battlefield at Sheriffmuir. Sir Walter Scott spent a night in the "hoary old pile" when he was about twenty years old, and gives a striking relation of his experiences in his *Demonology and Witchcraft.* The hall has several historical portraits, including those of Claverhouse, Charles II and James II of England At Cossans, in the parish of Glamis, there is a remarkable sculptured monolith, and other examples occur at the Hunters' hill and in the old kirkyard of Eassie

GLAMORGANSHIRE (Welsh *Morganwg*), a maritime county occupying the south-east corner of Wales, and bounded north-west by Carmarthenshire, north by Carmarthenshire and Breconshire, east by Monmouthshire and south and south-west by the Bristol Channel and Carmarthen Bay Area 520,456 acs Pop. (1921) 1,252,481 Its extreme breadth from the sea inland is 29 m, while its greatest length from east to west is 53 m

Structurally and physically it may be considered in two sections—(1) the northern upland section forming a part of the South Wales coal-field; (2) the lower section or Vale of Glamorgan—a region in which old rocks much worn down are covered by newer deposits. The coal-field is a geological basin with its thick, hard grit bands standing out as bold uplands. (*See* WALES)

The body of the county forms a sort of quarter-circle between the rivers Taff and Neath Near the apex of the angle formed by these rivers is the loftiest peak in the county, the great Pennant scarp of Craig y Llyn or Carn Moesyn (1,970 ft). To the south and south-east extends a great coalfield, its surface forming an irregular plateau with an average elevation of 600 to 1,200 ft, but with numerous peaks about 1,500 ft. or more; Mynydd y Caerau, being 1,823 ft Out of this plateau have been carved, to the depth of 500 to 800 ft below its general level, three distinct series of narrow valleys, those in each series being more or less parallel The Cynon, the Great and Lesser Rhondda (tributaries of the Taff) and the Ely flow to the S.E, the Ogwr or Ogmore (with its tributaries the Garw and Llynfi) flow south through Bridgend, and the Avan brings the waters of the Corwg and Gwynfi to the south-west into Swansea Bay at Aberavon. To the east of this high ground and divided from it by a spur of the Brecknock mountains culminating in Carn Bugail (1,570 ft.), is the Rhymney, which forms the county's eastern boundary On the west other spurs of the Beacons divide the Neath from the Tawe and the Tawe from the Loughor, which, with its tributary the Amman, separates the county on the north-west from Carmarthenshire The rivers are all comparatively short, the Taff, the chief river, being only 33 m long.

To the south of this central hill country, which is wet, cold and sterile, and whose slopes form the coal-field's southern edge, there stretches out to the sea an undulating plain Geologically it is a deeply eroded anticlinorium of Old Red Sandstone largely concealed by Trias and Lias Silurian rocks form a small inlier about 2 sq m. in area at Rumney and Penylan, north of Cardiff and consist of mudstones and sandstones of Wenlock and Ludlow age The Old Red Sandstone, which forms the "ground-work" of the vale, consists in the lower parts of red marls and sandstones, while the upper beds are quartzitic and pebbly, and form bold scarps which dominate the low ground formed by the softer beds below Cefn-y-bryn, another anticline of Old Red Sandstone (including small exposures of Silurian rocks), forms the prominent backbone of the Gower peninsula The next formation is the Carboniferous Limestone which encircles and underlies the coal-field, on the south of which, west of Cardiff, it forms a bold escarpment of steeply-dipping beds surrounding the Old Red Sandstone It shows up through the Trias and Lias in extensive inliers near Bridgend, while in Gower it dips away from the Old Red Sandstone of Cefn-y-bryn On the north of the coalfield it is just reached near Merthyr Tydfil The Millstone Grit crops out above the limestone.

After the Coal Measures forming the north of the county (*see* above) had been deposited, the southern part of the region was subjected to powerful folding, the resulting anticlines were worn down, and then submerged slowly beneath a Triassic lake in which accumulated the Keuper conglomerates and marls which spread over the district west of Cardiff and are traceable on the coast of Gower The succeeding Rhaetic and Lias which form most of the coastal plain (the fertile Vale of Glamorgan) from Penarth to near Bridgend were laid down by the Jurassic sea The coast of south Glamorgan ends in low cliffs notched by little streams A well-marked raised beach is traceable in Gower Sand-dunes are present locally around Swansea Bay, and between the rivers Ogmore and Neath where Kenfig town lies buried Moraines, chiefly formed of gravel and clay, occupy many of the Glamorgan valleys, and these, together with the striated surfaces which may be observed at higher levels, are clearly glacial in origin

Down to the middle of the 19th century most of the Glamorgan valleys were famous for their scenery, but industrial operations have completely destroyed this in the valleys of the north The rainfall varies from an average of about 25 in at Porthcawl and other parts of the Vale of Glamorgan to about 37 in at Cardiff, 40 in at Swansea and to upwards of 70 in in the northern part of the county

Early Settlement.—The earliest known traces of man within the county are the remains found in the caves of the south coast

of Gower (*q.v.*). These are of Palaeolithic date. Many flint implements have been found on the south coast particularly at the mouth of the Ogmore river. There are many cairns and tumuli on the hills of the north such as those on Garth mountain near Cardiff, Crug-yr-avan and a number east of the Tawe. There is little evidence of a strong megalithic culture, although there is a well-preserved stone circle at Carn Llecharth near Pontardawe, and fine dolmens at Cefn Bryn in Gower and at St Nicholas and St Lythan's, near Cardiff. Several prehistoric beakerpots have been found in the vale of Glamorgan and the valley ways, especially that of the Taff, have yielded socketed axes of the late Bronze Age. Important sites on the coast and along the inland valleys are guarded by indigenous hill-top forts occupied probably in Romano-British times.

In Roman times the country from the Neath to the Wye was occupied by the Silures. There are Ogham stones at Loughor and Kenfig. The conquest of the Silures by the Romans began about A.D. 50 by Ostorius Scapula and was continued by Julius Frontinus. The important station of Gaer on the Usk near Brecon was connected by two branch roads, one running from Cardiff through Gelligaer (where there was a strong hill fort) and Penydarren, and another from Neath through Coelbren. An important Roman road ran along the Vale from Caerleon through Cardiff to Neath (Nidum).

Glamorgan was an important centre of Celtic Christianity. Llandaff is associated with St Dubricius and St Teilo (6th century). To this period also belongs the establishment of the great monastic settlements of Llancarvan, Llandough and Llantwit Major (Llanilltyd Fawr). After the withdrawal of the Romans, the coasts were raided by Saxons. The Scandinavians who came in the 9th and succeeding centuries left more abundant traces both in the place-names of the coastal areas and in such camps as that on Sully Island, the Bulwarks at Porthkerry and Hardings Down in Gower. Meanwhile the native tribes had been reorganized into a principality known as Glywyssing, till about the end of the 10th century when it acquired the name of Morganwg (the territory of Morgan), a prince who died in A.D. 980. Morganwg then comprised the whole country from the Neath to the Wye.

The Norman conquest was effected at the end of the 11th century by Robert Fitzhamon, lord of Gloucester. His followers settled in the "Vale," which became known as the "body" of the shire, while in the hill country the Welsh retained their customary laws and much of their independence. Glamorgan, whose bounds were contracted between the Neath and the Rhymney, then became a lordship marcher, its status and organization being that of a county palatine. The inhabitants of Cardiff, the *caput baroniae*, were granted municipal privileges, and in time Cowbridge, Kenfig, Llantrisant, Aberavon and Neath also became chartered market-towns. The manorial system was introduced throughout the "Vale," the manor in many cases becoming the parish. The distinction between the compact villages with English tenure on the lowlands and the Welsh scattered farms with tribal customs on the highlands, was very marked in this county. The distinction is often preserved in the parish names, *e.g.*, Coity Anglia and Coity Wallia near Bridgend. The religious houses included the Cistercian abbeys of Neath and Margam founded in 1129 and 1147, respectively, the Benedictine priory of Ewenny (1141) and that of Cardiff (1147). Dominican and Franciscan houses were also founded at Cardiff in the following century. Gower (with Kilvey) or the country west of the morass between Neath and Swansea had a separate history (*see* GOWER).

For the first two centuries after Fitzhamon's time the lordship of Glamorgan was held by the earls of Gloucester, who acquired it originally through marriage. The first earl built Cardiff Castle and was patron of Geoffrey of Monmouth. The lordship passed by descent through the families of Clare (who held it from 1217 to 1317), Despenser, Beauchamp and Neville to Richard III., on whose fall it escheated to the crown. Raids from the hills were frequent. Cardiff Castle was seized by the Welsh about 1153. At last Caerphilly Castle was built to keep them in check, but this provoked an invasion in 1270 by Prince Llewelyn ap Griffith, who besieged the castle. In 1316 Llewelyn Bren headed a revolt in the same district. In 1404 Owain Glyn Dwr swept through the county, burning castles and carrying all before him. By the Act of Union of 1535 the county of Glamorgan was incorporated as it now exists, by the addition to the old county of the lordship of Gower and Kilvey, west of the Neath.

The lordship of Glamorgan, shorn of its quasi-regal status, was granted by Edward VI. to William Herbert, afterwards 1st earl of Pembroke, from whom it has descended to the present marquess of Bute.

The rule of the Tudors promoted the rapid assimilation of the inhabitants of the county, and by the reign of Elizabeth even the descendants of the Norman knights had largely become Welsh both in speech and sentiment. Welsh continued to be the prevalent speech, except in the peninsular part of Gower and perhaps Cardiff, till the last quarter of the 19th century. Since then it has lost ground in the maritime towns and the south-east corner of the county generally, while it is failing to hold its own even in the industrial districts of the north.

In common with the rest of Wales the county was mainly Royalist in the Civil War, but later dissatisfaction made the county declare for Parliament. There was, however, a subsequent Royalist revolt in Glamorgan in 1648, but it was crushed by Colonel Horton at the battle of St Fagan's.

Industrial Development.—Down to the middle of the 18th century the county had no industry of importance except agriculture. The coal which underlies practically the whole surface except the Vale of Glamorgan and West Gower was little worked till about 1755, when it began to be used instead of charcoal for the smelting of iron. The iron works were mostly on the northern outcrop of the coal-field and by 1811 there were 25 blast furnaces in the county, among them those of Aberdare, Dowlais and Merthyr Tydfil. Down to about 1850, if not later, the chief collieries were owned by the ironmasters and were worked for their own requirements, but when the suitability of the lower seams in the district north of Cardiff for steam purposes was realized, an export trade sprang up and soon assumed enormous proportions, so that "the port of Cardiff" (including Barry and Penarth), from which the bulk of the steam coal was shipped, became the first port in the world for the shipment of coal. This remarkable development coincided with the ever increasing demand for railway construction, steam ships and navies.

The rapid opening up of the deeper seams in the southern section of the industrial region meant a great influx of population which settled around the pit-heads. The steep sides of the valleys would not allow of town development and so the workmen's houses grew up in the Rhondda and some other valleys in long straggling rows in the valley bottoms. The mining villages therefore, while lacking all traditions of settlement from the past, offered few facilities for the development of a new corporate civic life. Large numbers of small colliery companies exploited these valleys from which the coal was rushed to the coast for export as long as the demand lasted. There was little or no development of by-product trade in the valleys—a factor that caused serious difficulties for the east of the county when the general demand for steam coal fell considerably after the war of 1914–18.

The evolution of the south-west of the county where the coal-field reaches nearest the sea was different. The triangle formed by Port Talbot, Ystalyfera and Loughor has concentrated on the metallurgical industries which have focused on Swansea "the metallurgical capital of Wales."

The manufacture of iron and steel is carried on at Dowlais, Merthyr Tydfil and at Port Talbot, Briton Ferry, Pontardawe, Swansea, Gorseinon and Gowerton. During the last quarter of the 19th century the use of the native ironstone was almost wholly given up, and the necessary ore is now imported, mainly from Spain. As a result several of the older inland works, such as those of Aberdare, Ystalyfera and Brynaman were abandoned, and new works established on or near the sea-board, *e.g.*, the Dowlais company in 1891 opened large works at Cardiff. The tin-plate industry is mainly in the Swansea-Llanelly area, though

there are works near Llantrisant and at Melin Griffith near Cardiff, the latter being the oldest in the county. Copper-smelting is carried on on a large scale in the west of the county, at Port Talbot, Cwmavon, Neath and Swansea, and on a small scale at Cardiff, the earliest works having been established at Neath in 1584 and at Swansea in 1717. There are nickel works at Clydach near Swansea. Swansea has almost a monopoly of the manufacture of spelter or zinc Lead, silver and other metals or their by-products are treated in or near Swansea Limestone and silica quarries are worked, while sandstone and clay are also raised Swansea and Nantgarw were formerly famous for their china, and coarse ware is still made at Ewenny

The development of the anthracite coalfield lying to the north and west of Swansea (from which port it is mostly shipped) dates mainly from the closing years of the 19th century when the demand for this coal grew rapidly. Its extended use in modern industry together with the organization provided for its international marketing tends to concentrate the industrial development of Glamorganshire more and more in the south-western section

The low-lying land on the south from Caerphilly to Margam is very fertile, and here the standard of agriculture is fairly high Everywhere on the Coal Measures the soil is poor, while vegetation is also injured by the smoke and rubbish tips Leland (*c* 1535) describes the lowlands as growing good corn and grass but little wood, while the mountains had "redde dere, kiddes plenty, oxen and sheep" The land even in the "Vale" seems to have been open and unenclosed till the end of the 15th or beginning of the 16th century, while enclosure spread to the uplands still later About one-fifth of the total area is still common land, more than half of which is unsuitable for cultivation The total area under cultivation in 1926 was 223,620 acres, under half of the total area of the county The chief crops raised are oats, turnips and swedes, barley, wheat, potatoes and mangolds Dairying has been largely abandoned for stock-raising Good sheep and ponies are reared in the hill-country Pig-keeping is much neglected, and despite the mild climate very little fruit is grown

Communications.—The physical features are well suited for communication purposes The coal trains could run easily from the high ground of the coalfield to the "Vale" and thence to the coal exporting ports on the coast, the uphill return journey being done with empty wagons Thus a large number of small private lines ran down from the coal valleys focusing on Cardiff, Barry, Port Talbot and Swansea, which are well supplied with dock accommodation Gradually the smaller railway lines became amalgamated and since 1923 they have all been run by the G W R The G W R main line runs between the highland and the sea, serves Cardiff, Bridgend, Port Talbot, Neath, Swansea and Loughor It sends numerous branches up the northern valleys Swansea is connected with Brecon and with Mid Wales and Shrewsbury by L M S lines The canals of the county are the Glamorgan canal from Cardiff to Merthyr Tydfil (25½ m), with a branch (7 m) to Aberdare, the Neath canal (13 m) from Briton Ferry to Abernant, Glyn Neath, the Tennant canal connecting the rivers Neath and Tawe, and the Swansea canal (16½ m), running up the Swansea Valley from Swansea to Abercrave in Breconshire Comparatively little use is now made of these canals, excepting the lower portions of the Glamorgan canal

Population and Administration.—The rapid rise of population with the development of its industries and coal-mining is one of the most remarkable features in the social life of Wales during the last century In the three decades between 1831 and 1861 the population increased 35 2, 35 4 and 37 1 per cent respectively, and from 1881–91, 34 4 per cent The average increase in the decennial periods subsequent to 1861 were about 25% until 1901 when the population stood at 859,931 In 1921 it had reached 1,252,481

It has been shown that before the railway's advent this increase in population was derived mainly from the neighbouring counties of Caermarthen, Brecon and Cardigan, but subsequent immigrants have been drawn from a much wider field

The county is divided into seven parliamentary divisions, each returning one member These divisions are Aberavon, Caerphilly, Gower, Llandaff and Barry, Neath, Ogmore and Pontypridd In addition there are three members for Cardiff, and two each for Merthyr, Swansea and the Rhondda Urban District There are six municipal boroughs, Aberavon, Cardiff, Cowbridge, Merthyr Tydfil, Neath and Swansea. Cardiff, Merthyr Tydfil and Swansea are county boroughs

Glamorgan is in the south Wales circuit, and both assizes and quarter sessions are held at Cardiff and Swansea alternately All the municipal boroughs have separate commissions of the peace, and Cardiff and Swansea have also separate courts of quarter sessions. The county has 13 other petty sessional divisions; Cardiff, the Rhondda and the Merthyr and Aberdare district have stipendiary magistrates The county is in the dioceses of Llandaff and Swansea and Brecon.

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GLANDERS or **FARCY** (*equinia*), a specific infective and contagious disease prevailing in most parts of the world Caused by *Bacillus mallei,* it affects chiefly the horse, ass, and mule but is communicable to man In Equidae it is one of the most serious of maladies, and specially affects the lungs, respiratory mucous membrane, and the lymphatic system It occurs particularly among horses kept in foul, crowded, badly ventilated stables or such as are over-worked, badly fed, or debilitated It may be contracted by inhalation of the bacilli, ingestion of the virus with food or water, or inoculation of a wound of the skin or a mucous membrane Carnivorous animals—lions, tigers, dogs, and cats—have become infected through eating the flesh of glandered horses, and men attending diseased horses are liable to be infected (*see* below)

Sometimes a distinction is made between glanders with nasal ulcers and other symptoms of respiratory disease, and glanders of the skin, or *farcy,* but there is no essential difference Both are due to the same organism, and both may be acute or chronic Acute glanders is always rapidly fatal, and chronic glanders may become acute or terminate by apparent recovery

The symptoms of acute glanders are initial fever, thirst, loss of appetite, hurried pulse and respiration, emaciation, languor, and disinclination to move Sometimes the legs or joints are swollen, but the characteristic symptoms are a greyish-yellow viscid discharge from one or both nostrils, a peculiar enlarged and nodulated condition of one or both submaxillary lymphatic glands, which though they may be painful very rarely suppurate, and on the nasal membrane small yellow pimples or pustules, running into deep, ragged-edged ulcers, and sometimes on the septum large patches of deep ulceration The discharge from the nose adheres to the nostrils and upper lip, and causes snuffling and frequent snorting The lymphatic vessels of the face often appear as painful subcutaneous "cords" passing across the cheek These vessels sometimes present nodules which break and discharge a glutinous pus As the disease progresses, the ulcers on the nose increase in number, enlarge or become confluent, extend in depth, and may perforate the septum The nasal discharge, now more abundant and tenacious, is streaked with blood and offensive, the respiration is noisy or roaring, and there may be coughing with bleeding from the nose Painful oedematous swellings appear on the muzzle, throat, between the fore legs, at the flank or on the limbs, and "farcy buds" may form on some of the swollen parts Pneumonia and pleurisy, with extreme prostration, and diarrhoea precede death, which is due to asphyxia or to exhaustion

are brought down from the huts on the pastures, and, after being mixed with the dried powder, are ground in a mill, then put into shapes and pressed The canton forms a single administrative district and contains 28 communes It sends representatives elected by the Landsgemeinde to the Federal Standerat and Nationalrat The canton still keeps its primitive democratic assembly or *Landsgemeinde* (meeting annually in the open air at Glarus on the first Sunday in May), composed of all male citizens of 20 years of age or more. It acts as the sovereign body, so that no "referendum" is required, while any citizen can submit a proposal It names the executive of 6 members, besides the Landammann or president, all holding office for three years The communes (forming 18 electoral circles) elect for three years the *Landrat*, a standing committee of members in the proportion of 1 for every 500 inhabitants or fraction over 250 The present constitution dates from the year 1887

GLARUS (Fr *Glaris*), the capital of the Swiss canton of the same name 42½ m S E. by rail from Zurich, is connected by rail with Elm and Linthal It is built on the left bank of the Linth (opposite it is the industrial suburb of Ennenda on the right bank), at the north-eastern foot the Vorder Glarnisch (7,648 ft), while on the east rises the Schild (7 501 ft) In May 1861 practically the whole town was destroyed by a fire fanned by a violent *Fohn* wind, rushing down the Linth valley The town is 1,578 ft. above the sea-level, and in 1920 had a population of 5,027, almost all German-speaking, while 1,431 were Roman Catholics

The District of Glarus is said to have been converted to Christianity in the 6th century by the Irish monk, Fridolin, who was the founder of the Benedictine nunnery of Sackingen, on the Rhine between Constance and Basel, that about the 9th century became the owner of the district The Habsburgs gradually drew to themselves the exercise of all the rights of the nuns, so that in 1352 Glarus joined the Swiss Confederation, and gained complete freedom after the battle of Nafels (1388) Zwingli the Reformer was priest here 1506–16 and Glarus early adopted Protestantism, but there were many struggles between the two parties, and to secure peace it was arranged that, besides the common *Landsgemeinde,* each party should have its separate *Landsgemeinde* (1623) and tribunals (1683) The parish church is used by both Roman Catholics and Protestants. The slate-quarrying industry appeared early in the 17th century, while cotton-spinning was introduced about 1714, and calico-printing by 1750 In 1798, in consequence of the resistance of Glarus to the French invaders, the canton was united to other districts under the name of canton of the Linth The old system of government was restored in 1814, but in 1836 by the new Liberal constitution one *Landsgemeinde* only was retained

GLAS, GEORGE (1725–1765), Scottish seaman and merchant adventurer in West Africa, son of John Glas (*q v.*), was born at Dundee in 1725 He commanded a ship which traded between Brazil, the north-west coasts of Africa and the Canary islands During his voyages he discovered on the Sahara seaboard a river navigable for some distance inland, and here he proposed to found a trading station The spot is plausibly identified with Gueder, a place in about 29° 10′ N , possibly the haven where the Spaniards had in the 15th and 16th centuries a fort called Santa Cruz de Mar Pequeña Glas made an arrangement with the Lords of Trade whereby he was granted £15,000 if he obtained free cession of the port he had discovered to the British Crown; the proposal was to be laid before parliament in the session of 1765 Having chartered a vessel, Glas, with his wife and daughter, sailed for Africa in 1764, reached his destination, made a treaty with the Moors of the district, and named his settlement Port Hillsborough.

In Nov 1764 Glas and some companions, leaving his ship behind, went in the longboat to Lanzarote, intending to buy a small barque From Lanzarote he forwarded to London the treaty he had concluded for the acquisition of Port Hillsborough. A few days later he was seized by the Spaniards, taken to Teneriffe and imprisoned at Santa Cruz (See *Calendar of Home Office Papers* 1760–65) In March 1765 the ship's company at Port Hillsborough was attacked by the natives and several members of it killed The survivors, including Mrs. and Miss Glas, escaped to Teneriffe In October following, Glas was released from prison, and, with his wife and child, he set sail for England on board the barque "Earl of Sandwich " On Nov 30 Spanish and Portuguese members of the crew mutinied, killing the captain and passengers Glas was stabbed to death, and his wife and daughter thrown overboard (The murderers were afterwards captured and hanged at Dublin) After the death of Glas the British Government appears to have taken no steps to carry out his project

In 1764 Glas published in London, *The History of the Discovery and Conquest of the Canary Islands,* which he had translated from the ms. of an Andalusian monk named Juan Abreu de Galindo, then recently discovered at Palma To this Glas added a description of the islands

GLAS, JOHN (1695–1773), Scottish divine, founder of the Glasite church, was born at Auchtermuchty, Fife, where his father was parish minister, on Oct 5, 1695 He became minister of Tealing, Dundee, and in 1725, in a letter to Francis Archibald, minister of Guthrie, Forfarshire, he repudiated the obligation of national covenants In the same year his views found expression in the formation of a society "separate from the multitude" numbering nearly a hundred, and drawn from his own and neighbouring parishes Its members pledged themselves to follow Glas's doctrine From the scriptural doctrine of the essentially spiritual nature of the kingdom of Christ, Glas in his public teaching drew the conclusions (1) that there is no warrant in the New Testament for a national church, (2) that the magistrate as such has no function in the church, (3) that national covenants are without scriptural grounds, (4) that the true Reformation cannot be carried out by political and secular weapons but by the word and spirit of Christ only This argument is most fully exhibited in Glas's treatise entitled *The Testimony of the King of Martyrs* (1729)

Glas was summoned (1726) before his presbytery, and he was in 1728 suspended from the discharge of ministerial functions, and finally deposed in 1730 The members of his society for the most part continued to adhere to him, thus constituting the first "Glassite" or "Glasite" church The seat of this congregation was shortly afterwards transferred to Dundee (whence Glas subsequently removed to Edinburgh), where he officiated for some time as an "elder " He next laboured in Perth for a few years, where he was joined by Robert Sandeman (*see* Glasites), who became his son-in-law, and eventually was recognized as the leader and principal exponent of Glas's views, these he developed in a direction which laid them open to the charge of antinomianism Ultimately in 1730 Glas returned to Dundee, where the remainder of his life was spent In 1739 the General Assembly removed the sentence of deposition which had been passed against him, and restored him to the character and function of a minister of the gospel of Christ, but not that of a minister of the Established Church of Scotland He died in 1773

A collected edition of his works was published at Edinburgh in 1761 (4 vols , 8vo), and again at Perth in 1782 (5 vols , 8vo) Glas's *True Discourse of Celsus* (1753), from Origen's reply to it, is a competent and learned piece of work The *Testimony of the King of Martyrs concerning His Kingdom* (1729) is a classic repudiation of erastianism and defence of the spiritual autonomy of the church under Jesus Christ

GLASGOW, city, county, royal burgh and port, Lanarkshire, Scotland, situated on both banks of the Clyde, 401½ m N W of London by the West Coast railway route, and 47 m W S W of Edinburgh by the L N E R The valley of the Clyde is closely confined by hills, and the city extends far over these The commercial centre of Glasgow, with the majority of important public buildings, lies on the north bank of the river, which traverses the city from west-south-west to east-north-east, and is crossed by a number of bridges The uppermost is Dalmarnock Bridge, dating from 1891, and next below it is Rutherglen Bridge, rebuilt in 1896, superseding a structure of 1775 St Andrew's suspension bridge gives access to the Green to the inhabitants of Hutchesontown, a district which is approached also by Albert Bridge, leading from the Saltmarket Above this bridge is the tidal dam and weir Victoria Bridge (1856) took the place of a bridge erected by Bishop Rae in 1345, and demolished in 1847 Then follows a suspension bridge (1853) by which foot-passengers from the south

side obtain access to St. Enoch Square and, finally, the bridge variously known as Glasgow, Jamaica Street, or Broomielaw Bridge (1835). Towards the close of the century it was reconstructed and reopened in 1899, but owing to its inadequacy to cope with the constantly increasing traffic George V. bridge, a short distance downstream, was opened in 1927. Between the two road-bridges is a bridge belonging to the L M S R

Buildings.—The municipal buildings (1889) stand on the eastern side of George Square, the heart of the city, and several additional blocks have been built or rented for the municipal staff A sanitary department was opened in 1897, including a bacteriological and chemical laboratory Added buildings, connected with the older ones by two bridges, were completed in 1923. Up till 1810 the town council met in a hall adjoining the old tolbooth. It then moved to the structure at the foot of the Saltmarket, now used as court-houses, and, after two further moves, the present quarters were occupied On the south side of George Square is the General Post Office On the west side stand the Bank of Scotland and the Merchants' House, the head of which (the dean of gild), along with the head of the Trades' House (the deacon-convener of trades) has been *de facto* member of the town council since 1711, an arrangement devised with a view to adjusting the frequent disputes between the two gilds The Royal Exchange is a fine Corinthian building Argyll Street, the busiest thoroughfare, leads to Trongate, where a few remains of the old town are now carefully preserved On the south side of the street, spanning the pavement, stands the Tron Steeple, a stunted spire dating from 1637, all that is left of St Mary's church, burned down in 1793 On the opposite side, at the corner of High Street, stood the ancient tolbooth, or prison, a turreted building, five storeys high, with a fine Jacobean crown tower The only remnant of the structure is the tower known as the Cross Steeple

St. Mungo's Cathedral.—The cathedral stands in the north-east quarter of the city 104 ft above the Clyde It is a beautiful example of Early English work, impressive in its simplicity Its form is that of a Latin cross, with imperfect transepts At the centre rises a fine tower, with a short octagonal spire. The choir, locally known as the High Church, serves as one of the city churches, and the extreme east end of it forms the Lady chapel The chapter-house, which projects from the north-eastern corner, was built in the 15th century and has a groined roof supported by a pillar The crypt beneath the choir is borne on 65 pillars and lighted by 41 windows The sculpture of the capitals of the columns and bosses of the groined vaulting is exquisite and the whole is in excellent preservation Strictly speaking, it is not a crypt, but a lower church adapted to the sloping ground of the right bank of the Molendinar burn The dripping aisle is so named from the constant dropping of water from the roof St Mungo's Well in the south-eastern corner was considered to possess therapeutic virtues, and in the crypt a recumbent effigy, headless and handless, is faithfully accepted as the tomb of Kentigern In 1115 an investigation was ordered by David, prince of Cumbria, into the lands and churches belonging to the bishopric, and from the deed then drawn up it is clear that at that date a cathedral had already been endowed When David ascended the throne in 1124 he gave to the see of Glasgow the lands of Partick besides restoring many possessions of which it had been deprived Jocelin (d. 1199), made bishop in 1174, was the first great bishop, and is memorable for his efforts to replace the cathedral built in 1136 by Bishop John Achaius, which had been destroyed by fire The crypt is his work, and he began the choir, Lady chapel, and central tower The new structure was sufficiently advanced to be dedicated in 1197 James Beaton or Bethune (1517–1603), the last Roman Catholic archbishop, fled to France at the Reformation in 1560, and took with him the treasures and records of the see, including the Red Book of Glasgow dating from the reign of Robert III The documents were deposited in the Scots College in Paris, were sent at the outbreak of the Revolution for safety to St Omer, and were never recovered. This loss explains the paucity of the earlier annals of the city The Reformers threatened to mutilate the cathedral, but the prompt defence of the craftsmen was the means of saving it

Excepting the cathedral, no Glasgow church possesses historical interest. This is due largely to the long survival of the severe sentiment of the Covenanters. There are several fine modern churches St. Enoch's (1780) has a good spire (the saint's name is said to be a corruption of Tanew, mother of Kentigern).

EDUCATION

University.—The university, founded in 1450 by Bishop Turnbull under a bull of Pope Nicholas V, survived in its old quarters till far in the 19th century The *paedagogium*, or college of arts, was at first housed in Rottenrow, but was moved in 1460 to a site in High Street, where Sir James Hamilton of Cadzow, first Lord Hamilton (d 1479), gave it four acres of land and some buildings Queen Mary bestowed upon it thirteen acres of contiguous ground, and her son granted it a new charter and enlarged the endowments Before the Revolution its fortunes fluctuated, but in the 18th century it became very famous By the middle of the 19th century, however, its surroundings had deteriorated, and in 1860 it was decided to rebuild it elsewhere The ground had enormously increased in value and a railway company purchased it for £100,000 In 1864 the university bought the Gilmore Hill estate and adjacent property and the new buildings (1879) were placed on the ridge of Gilmore Hill—the finest situation in Glasgow On the south the ground falls in a series of terraces towards Kelvingrove Park and the Kelvin On the west stand the houses of the principal and professors The third marquess of Bute (1847–1900) gave £40,000 to provide the Bute or common hall, divided by a screen from the Randolph hall, named after another benefactor, Charles Randolph (1809–1878) The library includes the collection of Sir William Hamilton, and the Hunterian museum, bequeathed by William Hunter, the anatomist, is particularly rich in coins, medals, black-letter books and anatomical preparations The observatory on Dowan Hill is attached to the chair of astronomy Exhibitions were founded by John Snell (1629–1679), a native of Colmonell in Ayrshire, for the purpose of enabling students of distinction to continue their career at Balliol College, Oxford The governing body includes the chancellor, elected for life by the general council, the principal, also elected for life, and the lord rector elected triennially by the students voting in "nations" according to their birthplace (*Glottiana*, natives of Lanarkshire, *Transforthana*, of Scotland north of the Forth, *Rothseiana*, of the shires of Bute, Renfrew and Ayr, and *Loudoniа*, all others) There are 50 professors and some 4,500 students The universities of St Andrews, Glasgow, Aberdeen and Edinburgh unite to return three members to parliament Queen Margaret College for women, which occupies a handsome building close to the botanic gardens, was incorporated with the university in 1893 Muirhead College is another institution for the education of women

A number of new chairs have been founded and lectureships instituted in branches of medicine, chemistry, physics, literature and history Extensions have been built, including a zoology building and a west wing with a War Memorial chapel, which cost about £122,000 The students' welfare scheme has been assisted by grants from the Government and the Carnegie Trust, and some £12,000 has been spent on the erection of a pavilion on the athletic ground at Westerlands

There are two educational endowments boards which apply a revenue of about £10,000 a year mainly to the foundation of bursaries The Royal Technical College in George Street originated in the foundation by John Anderson (1726–1796), professor of natural philosophy in the university, who opened a class in physics for working men, provided for the instruction of artisans and others unable to attend the university In 1799 Dr George Birkbeck (1776–1841) succeeded Garnett and began those lectures on mechanics and applied science which, continued elsewhere, ultimately led to the foundation of mechanics' institutes in many towns In later years the college was further endowed and its curriculum enlarged by the inclusion of literature and languages, but the scope of its work is now limited to medicine (physics, chemistry and botany also) The medical school is housed in Anderson's Medical College, in Dumbarton Road The Glasgow and West of Scotland Technical College, formed in 1886 out of a

combination of the arts side of Anderson College with three other colleges, is subsidized by the corporation and the endowments board, and is especially concerned with students desirous of following an industrial career St Mungo's College, which has developed from an extra-mural school in connection with the Royal Infirmary, was incorporated in 1889, with faculties of medicine and law. The United Free Church College, finely situated near Kelvingrove Park, the School of Art and Design, and the normal schools for the training of teachers, are institutions with distinctly specialized objects

The High school in Elmbank is the successor of the grammar school (long housed in John Street) which was founded in the 14th century as an appanage of the cathedral. Other secondary schools include Glasgow Academy, Kelvinside Academy and the girls' and boys' schools endowed by the Hutcheson and other educational trusts

Art Galleries, Libraries and Museums.—Glasgow merchants and manufacturers have been constant patrons of art, and their liberality may have had some influence on the younger painters who towards the close of the 19th century, broke away from tradition and, stimulated by training in the studios of Paris, became known as the "Glasgow school." The art gallery and museum is in Kelvingrove Park Opposite it is the huge Kelvin Hall, burnt down in 1926, but rebuilt in the following year The Institute of Fine Arts, in Sauchiehall Street, is mostly devoted to periodical exhibitions of modern art There are also pictures on exhibition in the People's Palace on Glasgow Green, and in the museum at Camphill The faculty of procurators possess a valuable library which is housed in their hall in West George Street In Bath Street there are the Mechanics' and the Philosophical Society's libraries, and the Physicians' is in St. Vincent Street The Mitchell library, was moved to North Street in 1911. It is governed by the city council. Another building in this street accommodates both the Stirling and Baillie libraries, the Stirling is particularly rich in tracts of the 16th and 17th centuries The Athenaeum in St George's Place, largely concerned with evening classes contains a library and reading-room

Charities.—The old Royal Infirmary, designed by Robert Adam and opened in 1794, adjoining the cathedral, occupied the site of the archiepiscopal palace, the last portion of which was removed towards the close of the 18th century. It was rebuilt in 1912, and recent extensions have demolished the block containing the ward in which Lord Lister first applied his discovery of antisepsis On the northern side are the buildings of the medical school attached to the institution. Hutcheson's Hospital, founded by George and Thomas Hutcheson in the 17th century for poor old men and orphan boys, and adorned with statues of the founders, is situated in Ingram Street, and by the increase in the value of its lands has become a very wealthy body, it is able to subsidize schools apart from the charity

ADMINISTRATION AND FINANCE

Parks and Open Spaces.—The oldest open space is the Green (140 acres), on the right bank of the river, adjoining a densely-populated district It once extended farther west, but a portion was built over at a time when public rights were not vigilantly guarded It is a favourite area for popular demonstrations The Kelvin burn flows through Kelvingrove Park, in the west end, and the ground is naturally terraced, while the situation is beautified by the adjoining Gilmore Hill with the university on its summit The park contains the Stewart fountain erected to commemorate the labours of Lord Provost Stewart and his colleagues in the promotion of the Loch Katrine water scheme, statues of Lord Lister, Lord Roberts and Carlyle, and a war memorial The other parks on the right bank are, in the north, Ruchill, acquired in 1891, and Springburn, acquired in 1892, and, in the east, Alexandra Park, in which is laid down a nine-hole golf-course, and Tollcross, acquired in 1897. On the left bank Queen's Park, occupying a commanding site, was considerably enlarged in 1894 by the enclosure of the grounds of Camphill. The other southern parks are Richmond, acquired in 1898, Maxwell, which was taken over on the annexation of Pollokshields in 1891; Bellahouston, acquired in 1895; and Cathkin Braes, presented to the city in 1886 by James Dick, a manufacturer, containing "Queen Mary's stone," a point which commands a view of the lower valley of the Clyde. In the north-western district of the town 40 acres between Great Western Road and the Kelvin are devoted to the Royal Botanic Gardens. More recent acquisitions include 200 ac. of the Balloch Castle estate (Loch Lomond park); the Rouken Glen, Linn, Newlands, Glenconner, Dawsholm, Ruchill and Frankfield parks.

Communications.—The L N.E R terminus is situated in Queen Street, and consists of a high-level station (main line) and a low-level station for Balloch, etc., used in connection with the City and District line, largely underground, serving the northern side of the town. The Central terminus of the L.M S R for Carlisle, Edinburgh, etc , in Gordon Street, comprises a high-level station and a low-level station for Balloch and the Cathcart District railway, and also for the connection between Maryhill and Rutherglen, which is mostly underground Both the underground lines communicate with certain branches of the main line, either directly or by change of carriage The older terminus of the L M.S R in Buchanan Street now takes the northern and eastern traffic and the station in St. Enoch Square serves the south-west of Scotland and Carlisle The Glasgow Subway—an underground cable passenger line, 6½ m. long, worked in two tunnels and passing below the Clyde twice—was opened in 1896 There are at certain points free steam ferry boats or floating bridges for conveying vehicles across the harbour, and there are three tunnels under the river Steamers, carrying both goods and passengers, constantly leave the Broomielaw quay for the piers and ports on the river and firth, and the islands and sea lochs of Argyllshire.

Trade.—Natural causes, such as proximity to the richest field of coal and ironstone in Scotland and the vicinity of hill streams of pure water, account for much of the great development of trade in Glasgow It was in textiles that the city showed its earliest predominance, which, however, has not been maintained, though several cotton mills are still worked The leading feature in the trade has always been the manufacture of light textures. Thread is made on a considerable scale, but jute and silk are of comparatively little importance Carpets are woven and some factories are exclusively devoted to the making of lace curtains The allied industries of bleaching, printing and dyeing have prospered. The use of chlorine in bleaching was first introduced in Great Britain at Glasgow in 1787, on the suggestion of James Watt, whose father-in-law was a bleacher, and it was a Glasgow bleacher, Charles Tennant, who first discovered and made bleaching powder (chloride of lime). Turkey-red dyeing was begun at Glasgow by David Dale and George M'Intosh, and the colour was long known locally as Dale's red A large quantity of grey cloth continues to be sent from Lancashire and other mills to be bleached and printed in Scottish works. These industries gave a powerful impetus to the manufacture of chemicals, and the works at St Rollox developed rapidly. Various chemical industries are prominent Glass-making and paper-making are carried on, and there are several breweries and distilleries Many miscellaneous industries are carried on such as clothing, confectionery, cabinet-making, biscuit making, boot and shoe making, saw mills, pottery and rubber goods. Since the days of the brothers Robert Foulis (1705–1776) and Andrew Foulis (1712–1775), printing, both letterpress and colour, has been identified with Glasgow, though less than with Edinburgh The discovery of the value of blackband ironstone, till then regarded as useless "wild coal," by David Mushet (1772–1847), and Neilson's invention of the hot-air blast threw the control of the Scottish iron trade into the hands of Glasgow ironmasters, although the furnaces themselves were mostly erected in Lanarkshire and Ayrshire The expansion of the industry was such that, in 1859, one-third of the total output in the United Kingdom was Scottish. Mild steel is manufactured and some crucible cast steel is made. In addition to brass foundries there are works for extraction of copper and smelting of lead and zinc Locomotive engines are built, all kinds of builder's ironwork is forged, and the sewing-machine factories in the neighbourhood are important. Boiler-making and marine engine works, in many cases in direct connection

with the shipbuilding yards, are numerous. Shipbuilding, indeed, is the greatest of the industries of Glasgow Excepting a trifling proportion of wooden ships, the Clyde-built vessels are made of steel, the trade having owed its immense expansion to prompt adoption of this material. Every variety of craft is turned out, from battleships and great liners to dredging-plant and hopper barges

The Port.—The Clyde Navigation trustees are responsible for 18 m. of the river Clyde, from Port Glasgow to Glasgow. The harbour occupies 206 acres. For the most part it is lined by quays and wharves, which have a total length of 8¼ m, and from the harbour to the sea vessels drawing 26 ft. can go up or down on one tide In the middle of the 18th century the river was fordable on foot at Dumbuck, 12 m. below Glasgow and 1½ m S E. of Dumbarton. The earliest shipping-port of Glasgow was Irvine in Ayrshire, but lighterage was tedious and land carriage costly, and in 1658 the civic authorities endeavoured to purchase a site for a spacious harbour at Dumbarton. Being thwarted by the magistrates of that burgh, however, in 1662 they secured 13 acres on the southern bank at a spot some 2 m. above Greenock, which became known as Port Glasgow, where they built harbours and the first graving dock in Scotland Sixteen years later the Broomielaw quay was built, but it was not until the tobacco merchants appreciated the necessity of bringing their wares into the heart of the city that serious consideration was paid to schemes for deepening the waterway. In 1768 John Golborne advised the narrowing of the river and the increasing of the scour By the building of numerous jetties, the constant use of steam dredgers, and the blasting of rock, the channel was gradually deepened, and much land reclaimed By 1900 it had a minimum depth of 22 ft., and, as already indicated, the largest vessels make the open sea in one tide, whereas in 1840 it took ships drawing only 15 ft. two and even three tides to reach the sea From 1812 to 1820 Henry Bell's "Comet," 30 tons, driven by an engine of 3 horse-power, plied between Glasgow and Greenock, until she was wrecked, being the first steamer to run regularly on any river in the Old World. When the quays and wharves ceased to be able to accommodate the growing traffic, the construction of docks became imperative In 1867 Kingston Dock on the south side, of 5½ acres, was opened, but soon proved inadequate, and in 1880 Queen's Dock (two basins) at Stobcross, on the north side, of 30 acres, was completed. In 1897 Prince's Dock (three basins) on the opposite side, of 72 acres, was opened, fully equipped with hydraulic and steam cranes and all the other latest appliances. The Rothesay dock (20 ac) at Clydebank, opened in 1907, and the warf at Renfrew, are included in the harbour. The L.M S R. has access to the harbour for goods and minerals at Terminus Quay to the west of Kingston Dock, and a mineral dock has been constructed by the Trust at Clydebank, about 3½ m. below the harbour. In 1924 the provision of further dock accommodation on land acquired by the Trust between Shieldhall and Renfrew was begun. It is connected by railway lines and a road joining the new trunk road of the Glasgow corporation scheme. The shipping attains to colossal proportions The imports consist chiefly of grain and flour, leather, tobacco, timber, oil, iron-ore, bacon and other foodstuffs, and the exports principally of cotton, jute and linen goods, yarn, coal, machinery and spirits.

Government.—By the Local Government (Scotland) Act 1889, the city was placed entirely in the county of Lanark, the districts then transferred having previously belonged to the shires of Dumbarton and Renfrew In 1891 the boundaries were enlarged to include six suburban burghs and a number of suburban districts, the area being increased from 6,111 acres to 11,861 acres In 1912 Govan, Partick, Pollokshaws and several suburban districts were included in the city, making the total area 19,183 acres and giving Glasgow again its position as 2nd city of Great Britain in point of size In 1925 the burgh was further enlarged by the acquisition of parts of Renfrewshire, Dumbartonshire and Lanarkshire, including the Yoker district. In 1893 the municipal burgh was constituted a county. Glasgow is governed by a corporation consisting of 113 members, including 14 bailies and the lord provost. As a county Glasgow has a lieutenancy (successive lords provost holding the office) and a court of quarter sessions, which is the appeal court from the magistrates sitting as licensing authority. Under the corporation municipal ownership has reached a remarkable development, the corporation owning the supplies of water, gas and electric power, tramways and municipal lodging-houses. In 1859 water was conveyed by aqueducts and tunnels from Loch Katrine to the reservoir at Mugdock, a distance of 27 m, whence after filtration it was distributed by pipes to Glasgow. In 1914 works were completed to raise Loch Katrine 5 ft and to connect with it by tunnel Loch Arklet (455 ft above the sea), with storage for 2,050,000,000 gallons. The two lochs together possess a capacity of twelve thousand million gallons. The entire works between the loch and the city were duplicated over a distance of 23½ m., and an additional reservoir, holding 694,000,000 gallons, was constructed and a dam built 1¼ m. west of the lower end of Loch Arklet, designed to create a sheet of water 2½ m long and to increase the water-supply of the city by ten million gallons a day. The water committee supplies hydraulic power to manufacturers and merchants. Huge gas works were opened at Govan in 1921, and a large electric generating station at Dalmarnock Bridge in 1920 By lapse of time and congestion of population, certain quarters of the city, in old Glasgow especially, were slums and rookeries of the worst description. The municipality obtained parliamentary powers in 1866 to condemn for purchase over-crowded districts, to borrow money and levy rates. The work was carried out, and when the act expired in 1881 whole localities had been recreated. Under the amending act of 1881 the corporation began in 1888 to build tenement houses and lodging-houses The powers of the improvement trustees were practically exhausted in 1896, when it appeared that the funds showed a deficiency of £423,050 Assessment of ratepayers for the purposes of the trust had yielded £593,000, and it was estimated that these operations had cost the citizens £24,000 a year In 1897 an act was obtained for dealing in similar fashion with insanitary and congested areas in the centre of the city, and on the south side of the river. The drainage system was entirely remodelled, the area being divided into three sections, each distinct, with separate works for the disposal of its own sewage Housing conditions and unemployment were again very bad after the World War, and led to a "rent strike." The position became very difficult in 1925 and a Rent Commission was appointed Among other works in which the Corporation has interests there may be mentioned its representation on the board of the Clyde Navigation Trust and the governing body of the West of Scotland Technical College Since 1918 Glasgow has returned 15 members to Parliament.

Throughout the 19th century the population grew prodigiously. Only 77,385 in 1801, it was nearly doubled in twenty years, being 147,043 in 1821, already outstripping Edinburgh In 1901 it stood at 761,709 and in 1921 at 1,034,174

HISTORY

Some historians hold that the name of Glasgow comes from Gaelic words meaning "dark glen," descriptive of the narrow ravine through which the Molendinar flowed to the Clyde But the more generally accepted version is that the word is the Celtic *Cleschu,* afterwards written Glesco or Glasghu, meaning "dear green spot" (*glas,* green; *cu* or *ghu,* dear), supposed to have been the name of the settlement that Kentigern found here when he came to convert the Britons of Strathclyde Kentigern or Mungo ("dear one") became the patron-saint of Glasgow, and the motto and arms of the city are identified with him—"Let Glasgow Flourish by the Preaching of the Word," usually shortened to "Let Glasgow Flourish" It is not till the 12th century, however, that the history of the city becomes clear. About 1178 William the Lion made the town by charter a burgh of barony, and gave it a market with freedom and customs At the battle of the Bell o' the Brae, on the site of High Street, Wallace routed the English under Percy in 1300; he was betrayed to the English in 1305 in Robroyston Plague ravaged the burgh in 1350 and thirty years later, the regent Arran, in 1544, besieged the bishop's castle, and there was a subsequent fight at the Butts (now the Gallowgate).

Most of the inhabitants were opposed to Queen Mary and many actively supported Murray in the battle of Langside—the site now occupied by the Queen's Park—on May 13, 1568, in which she lost crown and kingdom Under James VI. the town became a royal burgh in 1636, with freedom of the river from the Broomielaw to the Cloch. The people made common cause with the Covenanters to the end of their long struggle Montrose mulcted the citizens heavily after the battle of Kilsyth in 1645, and three years later the provost and bailies were deposed for contumacy to their sovereign lord Plague and famine devastated the town in 1649, and in 1652 a conflagration laid a third of the burgh in ashes. Even after the restoration its sufferings were acute. It was the headquarters of the Whiggamores of the west and its prisons were constantly filled with rebels for conscience' sake The government scourged the townsfolk with an army of Highlanders, whose brutality only served to strengthen the resistance at the battles of Drumclog and Bothwell Brig. The Union was hotly resented, but marked the dawn of almost unbroken prosperity By the treaty of Union Scottish ports were placed, in respect of trade, on the same footing as English ports, and the situation of Glasgow enabled it to acquire a full share of the ever-increasing Atlantic trade. Its commerce was already considerable and in population it was now the second town in Scotland It enjoyed a practical monopoly of the sale of raw and refined sugars, had the right to distil spirits from molasses free of duty, dealt largely in cured herring and salmon, sent hides to English tanners and manufactured soap and linen It challenged the supremacy of Bristol in the tobacco trade—fetching cargoes from Virginia, Maryland and Carolina in its own fleet—so that by 1772 its importations of tobacco amounted to more than half of the whole quantity brought into the United Kingdom. The tobacco merchants built handsome mansions and the town rapidly extended westwards. With the surplus profits new industries were created, which helped the city through the period of the American War Most, though not all, of the manufactures in which Glasgow has always held a foremost place date from this period It was in 1764 that James Watt succeeded in repairing a hitherto unworkable model of Newcomen's fire (steam) engine in his small workshop within the college precincts Shipbuilding on a colossal scale and the enormous developments in the iron industries and engineering were practically the growth of the 19th century

See *The Scottish Geographical Magazine* (Jan. 1921)

GLASITES, a Christian sect, founded in Scotland by John Glas (*q v*). It spread into England and America, but is now practically extinct The name Glasites or Glassites was generally used in Scotland, in England and America the name Sandemanians was more common Glas dissented from the Westminster Confession only in his views as to the spiritual nature of the church and the functions of the civil magistrate But his son-in-law Robert Sandeman added a distinctive doctrine as to the nature of faith which is thus stated on his tombstone "That the bare death of Jesus Christ without a thought or deed on the part of man is sufficient to present the chief of sinners spotless before God" In their practice the Glasite churches aimed at a strict conformity with the primitive type of Christianity as understood by them. Each congregation had a plurality of elders, pastors or bishops, who were chosen according to what were believed to be the instructions of Paul, without regard to previous education or present occupation, and who enjoy a perfect equality in office In all the action of the church unanimity was considered to be necessary; if any member differed in opinion from the rest, he must either surrender his judgment to that of the church, or be shut out from its communion The Lord's Supper was observed weekly; and between forenoon and afternoon service every Sunday a love feast was held at which every member was required to be present. Mutual exhortation was practised at all the meetings for divine service, when any member who had the gift of speech (χάρισμα) was allowed to speak The practice of washing one another's feet was at one time observed; and it was for a long time customary for each brother and sister to receive new members, on admission, with a holy kiss. The lot was regarded as sacred, the accumulation of wealth they held to be unscriptural and improper, and each member considered his property as liable to be called upon at any time to meet the wants of the poor and the necessities of the church. Churches of this order were founded in Paisley, Glasgow, Edinburgh, Leith, Arbroath, Montrose, Aberdeen, Dunkeld, Cupar, Galashiels, Liverpool and London, where Michael Faraday was long an elder Their exclusiveness in practice, neglect of education for the ministry, and the antinomian tendency of their doctrine contributed to their dissolution Many Glasites joined the general body of Scottish Congregationalists, and the sect may now be considered extinct The last of the Sandemanian churches in America ceased to exist in 1890

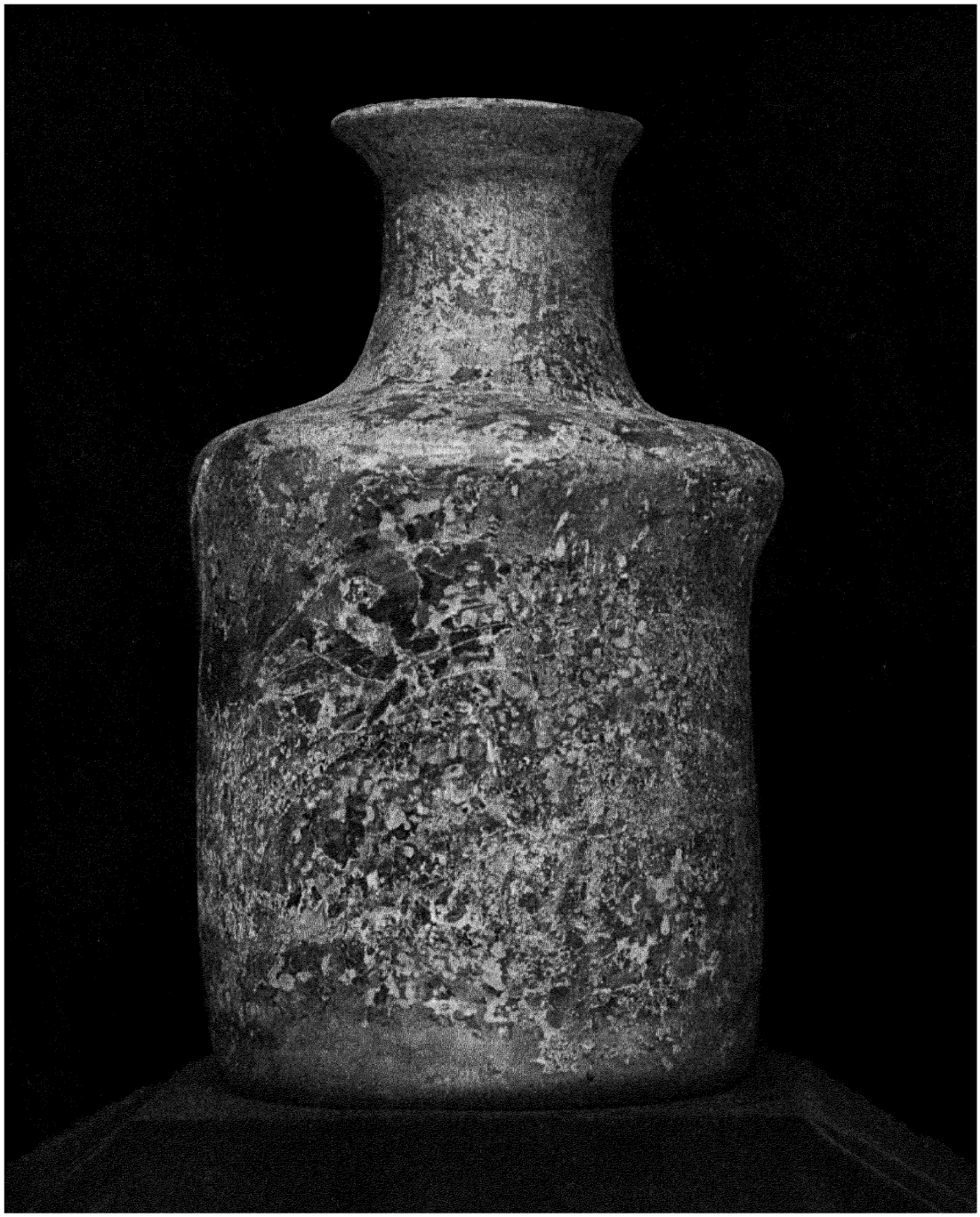
See James Ross, *History of Congregational Independency in Scotland* (Glasgow, 1900). (D. M.)

GLASS, CARTER (1858–), American politician, was born at Lynchburg, Va , on Jan 4, 1858 He received his education in the Lynchburg schools and learned the printer's trade, which he followed for several years, eventually becoming proprietor of the Lynchburg *Daily News* and *Daily Advance* He was elected to the Virginia State senate for two terms (1899–1903) and was a member of the Constitutional Convention in 1901 He was elected in 1902 to the national House of Representatives, and thereafter was continuously re-elected until his resignation in 1918. As chairman of the House banking committee he was active in framing and passing the Federal Reserve Bank law In 1918 he entered President Wilson's cabinet as secretary of the Treasury Under his guidance the fifth Liberty Loan was floated in April, 1919 In Nov 1919 he resigned after his appointment to the United States Senate In 1924 he was elected for the term 1925–31

GLASS, a hard substance, usually transparent or translucent, which from a fluid condition at a high temperature has passed to a solid condition with sufficient rapidity to prevent the formation of visible crystals Glass consists primarily of a combination of silicic acid with an alkali (potassium or sodium) The combination of the raw materials was from the earliest times subject to considerable variations As a general rule the silicic acid was prepared from sand, as pure as possible and free from iron; this sand was calcined and sprinkled with water until it became friable, and was then pulverized, in some places flint, in others quartz, was also used The potassium is in the form of potash, *i e*, charcoal washed in lye, beech charcoal was always preferred The sodium is obtained, under the name of soda ash, from seaweed ash Glass may be divided into two main classes according to which of these alkaline ingredients is used In well-wooded countries, particularly Germany, potassium glass has been made almost exclusively, while in coast-lands (Egypt, Syria, Spain, Venice) sodium glass was naturally preferred. As early as the middle ages, soda ash (*rocchetta, salicor*), as a costly product obtained by a secret process, was an export in great demand, particularly from Egypt and Spain (Alicante) Apart from certain admixtures—sometimes accidental, sometimes intentional—such as tartaric acid, saltpetre, etc , silicic acid and one of these two alkalis formed the chief ingredients of all the glass made up to the 17th century Not till then was *calcium,* particularly in the form of chalk, used to any great extent, it produced greater clarity and purity in the metal, the best examples being found in the Bohemian "crystal glass," which, owing to these properties, very quickly conquered the world market The addition of lead, an English discovery of the 17th century, further largely accentuates these superior qualities in the metal, and adds high refractive power, great lustre and a full ringing tone, but the weight is increased and the toughness diminished.

Great importance has always attached to decolorizing agents, known as glass-maker's soaps The necessary ingredients of glass are seldom found in a pure state; the iron particles commonly found in sand are particularly active in preventing complete absence of colour in the metal being obtained. For decolorizing, *i e*, for neutralizing such impurities, manganese and arsenic have proved the most satisfactory agents.

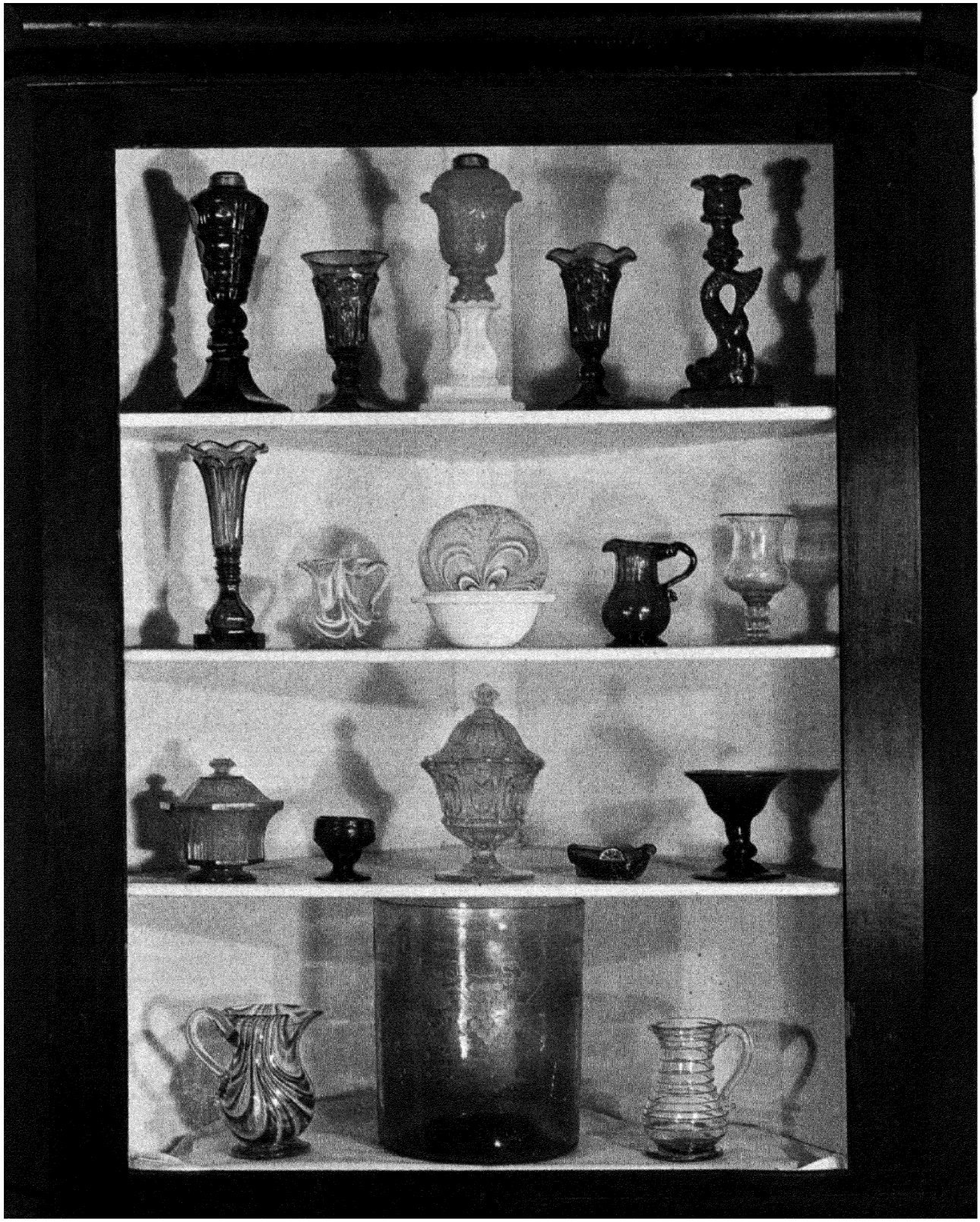
For producing coloured glass, metallic oxides are chiefly used Cobaltic oxide produces blue glass, cupric oxide green and red, chromic oxide yellow-green; stannic oxide makes opaque white glass; red ruby-glass is obtained by the addition of gold, and so



BY COURTESY OF THE METROPOLITAN MUSEUM OF ART, NEW YORK CITY

ROMAN VASE, TYPICAL OF BLOWN GLASS-WORK PRODUCED IN EUROPE BEFORE THE CHRISTIAN ERA

This vase was unearthed from a grave where it had lain for almost two thousand years. The disintegration of the glass, due to the action of the soil in which it was buried, produced an uneven surface, causing brilliant iridescence. This iridescence is not pigment, but refraction of light



EARLY AMERICAN COLOURED GLASS, SHOWING THE RANGE OF COLOUR AND DESIGN

Top row: Pressed Sandwich glass, *c.* 1830. 1 and 3, lamps; 2 and 4, vases; 5, candlestick
Second row: 1, vase of Sandwich glass; 2, pitcher of Wistarberg glass; 3, witch bowl holding witch ball supposed to keep witches away (blown New Hampshire glass); 4, pitcher; 5, South Jersey table glass
Third row: 1 and 3, sugar bowls; 2, salt bowl of Stiegel glass; 4, steamboat salt bowl; 5, Saratoga glass bowl
Bottom row: 1 and 3, pitchers; 2, wine jar with superposed decoration, a piece from Lancaster County, Pa.

on. The colouring varies with the quantities of the oxides used, the method of admixture, the temperature, and the time during which they are heated, so that several tints can be produced with the same metal. All the treatises on glass-making written up to the 18th century consist mainly of recipes of this kind for colouring glass; great importance was attached to this process, because endeavours were constantly directed towards the production of first-rate imitation gems.



FROM GEORGE AGRICOLA, "DE RE METALLICA" (PUB BY FROBEN IN 1556)

A LATE 16TH CENTURY GERMAN GLASS FURNACE, REPRODUCED AFTER A CONTEMPORARY DRAWING

In the centre is the main oven, where glass was melted in pots behind each working hole. In the right foreground is a large wooden case packed with vessels of various shapes, and in the rear one of the workmen is shown "blowing" hot glass into the desired shape, after its removal from the oven

In addition to these raw materials, to produce a good, easily-fusible metal a large percentage of old broken glass (cullet) is required Even in the middle ages, fragments of antique glass were much in demand among glass-workers; as early as the 13th century there was a treaty between Venice and Antioch dealing with the importation of cullet, and its acquisition has played an important part in the history of many glass-works.

METHODS AND PROCESSES

Glass-blowing.—In the manufacture of hollow-glass the most important process is blowing For this an iron tube about 5 ft long, called the blowing-iron or pipe, is used One end, which is knob-shaped, is dipped into the viscous mass of glass, a portion of which remains hanging from it. If the blower now blows through the tube from the other end into the pendent mass, a hollow bulb forms in it, and expands as more air is blown in During this process, of course, the wall of the bulb becomes continually thinner. By swinging, by putting on the "marver" (a flat marble slab) or on the arms of an armchair in which the blower sits and then by rolling and by manipulation with simple tools, the bulb can now be given any shape desired If a bottle is to be made, the bulb is drawn out lengthwise, and its lower end, which is to form the bottom, is "pricked," *i e*, the bottom is pushed in with a blunt iron. In the cavity thus formed the "punt" is fastened with a drop of molten glass. When the bottle is thus resting on the punt, a drop of water is applied, and with a slight tap it is detached from the blowing-iron; the neck is then shaped as desired by welding a thread of glass round it, or in some other way. Another slight tap suffices to detach the finished bottle from the punt To make a wine-glass, a quantity of glass is welded on to the lower end of a bulb, and by continued rotation of the blowing-iron the stem is wrought out of this mass with a pair of tongs Meanwhile another man has made a small bulb, which is now welded on to the lower end of the stem and knocked off from its own blowing-iron By the action of centrifugal force aided by the "pressing-iron" ("Auftreibeisen"), this small bulb, under continued rotation, spreads and straightens out into a more or less flat disc, the edge of which is smoothed off with scissors The punt is now again made fast to the underside of this foot, and the large bulb which forms the cup of the glass is knocked off from the blowing-iron. After this the bulb is broadened out with the pressing-iron, and the cup of the glass is shaped as desired with the "smoothing-iron" Finally the lip of the glass is cut with the scissors and fused all round The glass is then knocked off the punt During all these processes the material has to be frequently reheated

The glass can be moulded into any shape if the bulbs are blown into hollow moulds of stone, wood or metal, or, in the case of thick bowls, for example, if the glass-metal is pressed from within against the walls of such moulds

Coloured ornament in the metal is produced by pressing coloured glass threads into the still ductile surface of the vessel (*e g.*, Egyptian unguent jars), or by mixing glass of different colours on a definite plan or at random In many ancient mosaic-glasses, for instance, and in the Venetian jasper-glass, there is no plan, a colour-sequence, often very strictly followed, is to be seen principally in spun glass and "millefiori" glass The method of making "millefiori" glass is this glass threads of various colours are fused together into a bundle in such a manner that the cross-section shows a certain pattern—say a rosette, a geometrical ornament or a figure. This bundle is heated and drawn out longer, so that, while its diameter is reduced, the pattern in the cross-section remains unchanged, though diminished in size The bundle of threads is then cut up into small discs (*cf.* coloured plate No 1) They are worked into vessels by being placed side by side on an iron slab and having a bulb of colourless transparent glass rolled over them, they become embedded in this, and it then undergoes other processes like any ordinary glass bulb Any irregularities that may be left on the outer side are removed by gentle heating or by grinding

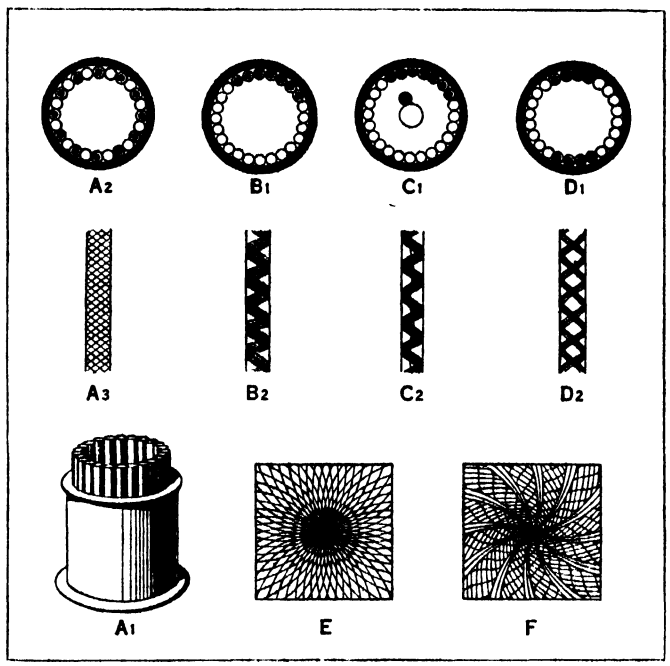
Spun Glass.—This is a Venetian invention and involves a highly complicated process The threads are made as follows. a certain quantity of coloured glass-metal, *e g.*, milk-glass (opal-glass) whitened with stannic oxide, is taken out of the crucible with an iron rod and rolled backwards and forwards on the "marver," or slab, until it adheres to the outside of the iron in the form of a thin tube. The iron is then dipped into colourless glass-metal, which now forms a coating round the tube of milk-glass The cylinder thus composed—white inside and colourless outside—is heated and pulled out until it becomes a long thread of about 3 to 6 mm diameter. From the threads thus prepared, bundles of a large number of threads are then made This is an exceedingly delicate operation Round the inside of a short earthenware cylinder, threads of milk-glass of the kind above described are arranged alternately with small rods of colourless glass in a definite symmetrical order (fig. *A*, 1 and 2) The hollow left in the centre is filled up with colourless glass-metal, so that the whole fuses together into a single compact rod of glass This rod, on the circumference of which there are of course parallel white threads at equal intervals, is pulled out until its diameter has shrunk to almost nothing; and simultaneously the rod is twisted in both directions. with the result that the threads of white glass, which had previously been parallel, are now twisted round one another

like the strands of a rope (fig. A_3).

Innumerable variations can be obtained by altering the arrangement of the white threads. If, for example, we put seven of them all together on the side of the earthenware cylinder (fig. B_1) and fill up all the remaining space with uncoloured glass, by pulling out and twisting we get a wide spiral consisting of seven parallel strands (fig. B_2); if we put four white threads on each of two opposite parts of the cylinder, in the finished rod we shall find two four-stranded spirals crossing (fig C_1 and 2) If we carry one thread into the middle of the cylinder, it will form a white central column with spirals twining round it; and if we shift it slightly out of the centre, the central thread itself will produce a corkscrew effect inside the spirals (fig D_1 and 2).

By other complicated arrangements of the white threads a great number of most attractive intricate patterns can be obtained Vessels made in this way are called *vasi a ritori.*

In making a *vaso a ritorti* a cylindrical mould is again employed. The rods are again arranged in any desired order, with or without uncoloured rods between them, on the inside of the cylinder. They are then gently heated, and into the hollow cylinder which they form a bulb of colourless glass is blown from above; they adhere to this bulb, and on further heating and expansion they fuse completely with its surface They are then pinched together just above the end of the bulb, so that they all meet at one point, while the intervals between them on the surface of the spherical bulb increase as it expands. As the bulb is blown out still more, its walls become thinner, and the rods are naturally pressed flat, so that the patterns inside them are squeezed out wide. The bulb is now subjected to the usual further processes. If it is not rotated, the rods run together like meridians on a globe; but if it is rotated while the other processes are going on, they form rhythmical spirals which cover the entire vase with their symmetrical whirling curves (figs. E and F)



FROM LABARTE, "HISTORIE DES ARTS INDUSTRIELS" (COPR BONNAIRE)

SPECIMENS OF GLASS WORK FOR PARTICULARS SEE TEXT

A simpler method of combining the rods with the bulb has obtained latterly at Murano The rods are laid in the desired order on a metal plate and are then heated, whereupon the hot glass bulb is rolled over them and they adhere to it.

A type of spun glass that differs from the others is reticulated glass (*vasi a reticelli*). It is made as follows: a considerable number of rods containing only one strand of milk-glass are welded on to the glass bulb at equal intervals, in such a way that the rods are not completely fused with the bulb, but take the form of ribs standing slightly out The bulb is elongated and rotated at the same time, so that the threads now run spirally round it. A second bulb is produced in the same manner, but is rotated in the opposite sense during the process of elongation, so that the spiral twists run in the opposite direction to those on the first bulb. Both bulbs are then cut open, fitted one inside the other in the form of open cylinders, and fused by heating The spiral threads now cross one another in a network, and as the separate raised rods leave small hollowed-out trough-shaped grooves between them, nothing remains inside the meshes of the network but little air-bubbles.

The same result can also be obtained by making only one bulb and denting it in, like an india-rubber ball, until the two poles, in which the threads meet, touch The kind of double-walled basin thus produced is then again shaped into a bulb and undergoes further processes. Thus reticulated glass shows an astonishing structure of interwoven spiral threads with small air-bubbles embedded between them.

Additional coloured superficial ornament is obtained by painting with cold colours, by burning-in enamel colours painted on, or by the process of gilding (*q v*), coloured plastic ornament by welding on threads, knobs, beads, etc

Grinding and Cutting.—The chief field for subsequent plastic decoration of the finished vessel lies in the grinding and cutting processes, with which may be counted the processes of scratching with a diamond and hammering small dents with a diamond-point—"dotting" or "stippling" Lastly, ornamentation can also be etched into the glass

Grinding and cutting both depend on the same fundamental process The glass is held against a rapidly-rotating metal disc (the "wheel"), which removes parts of the surface The rougher work—removing only good-sized pieces with a simple outline—is called "grinding" It is done on comparatively large iron discs The grinder's work consists principally in smoothing off unevennesses, *e g*, on the attachment to the blowing-iron or the punt (the "cap"), with the foot, and in facetting and incising spherical, olive-shaped, lancet-shaped and other ornaments—more or less coarse mechanical operations requiring no artistry. On the other hand, glass-cutting, a process based on the same technical principle, calls for a certain artistic capacity The glass-cutter or engraver has to cut into the sides of a glass vessel ornamental designs and figures, script, coats-of-arms, landscapes and the like His chief tool, the cutting-lathe, is simply a finer variety of the grinding-lathe, instead of the large iron disc a small copper disc, placed vertically, revolves and the glass is held against it For polishing, emery-powder is used. Discs of different sizes are employed according to the size of the piece to be cut, and it is in their correct application that the workman's technical skill is shown The execution of ornaments and other designs depends, of course, on his artistic talent Sometimes ground or cut glass is left with the dull, unpolished surface produced by the lathe; sometimes the piece is polished up with small discs of lead, tin or wood ("burnishing") The commoner and simpler method of glass-cutting is "intaglio cutting," the ornament being cut into the surface, in "relief cutting," which is more difficult, the ornament is left standing out and the surface of the glass is cut away round it (*e g*, the Portland vase, the Hedwig glasses, and Gundelach's work, *see* VASE)

ORIGIN AND EARLY MOVEMENTS

Antiquity and the Early Mediaeval Period.—We cannot state with any certainty when and where glass was invented Probably, however, it originated in Egypt (*see* EGYPT: *Ancient Art and Archaeology*) for the oldest examples of glass-work known to us come from Egyptian tombs of the 4th millennium B C. They are, however, merely pastes, generally of opaque coloured glass, which were worked into beads, amulets, and the like; and the first glass vessels to which any date can be ascribed belong to the 18th dynasty (*c* 1500 B.C) Even these vessels, however, most of which are very small vases or ointment-jars such as the balsam-pots shown in plate V., fig. 2 with particoloured enclosed threads on an opaque coloured ground, are made entirely by hand out of a viscous glass-paste The invention of glass-blowing, which



EARLY CONTINENTAL GLASS

1. Mosaic glass bowl (see text). In the Staatliche Museen, Berlin
2. L'dom'an relief glass, 1st century. Staatliche Museen
3. Net glass, so-called Diatreton, 3rd century. Staatliche Museen
4. Flask in the form of a negro's head (see text). Staatliche Museen
5. Bowl engraved with Poseidon (see text). Staatliche Museen
6. Flask with thread decoration (see text). Schloss Museen
7 & 8. Frankish glass, 5th–8th century. Staatliche Museen
9. Printed beaker, Frankish, 7th–8th century. Staatliche Museen

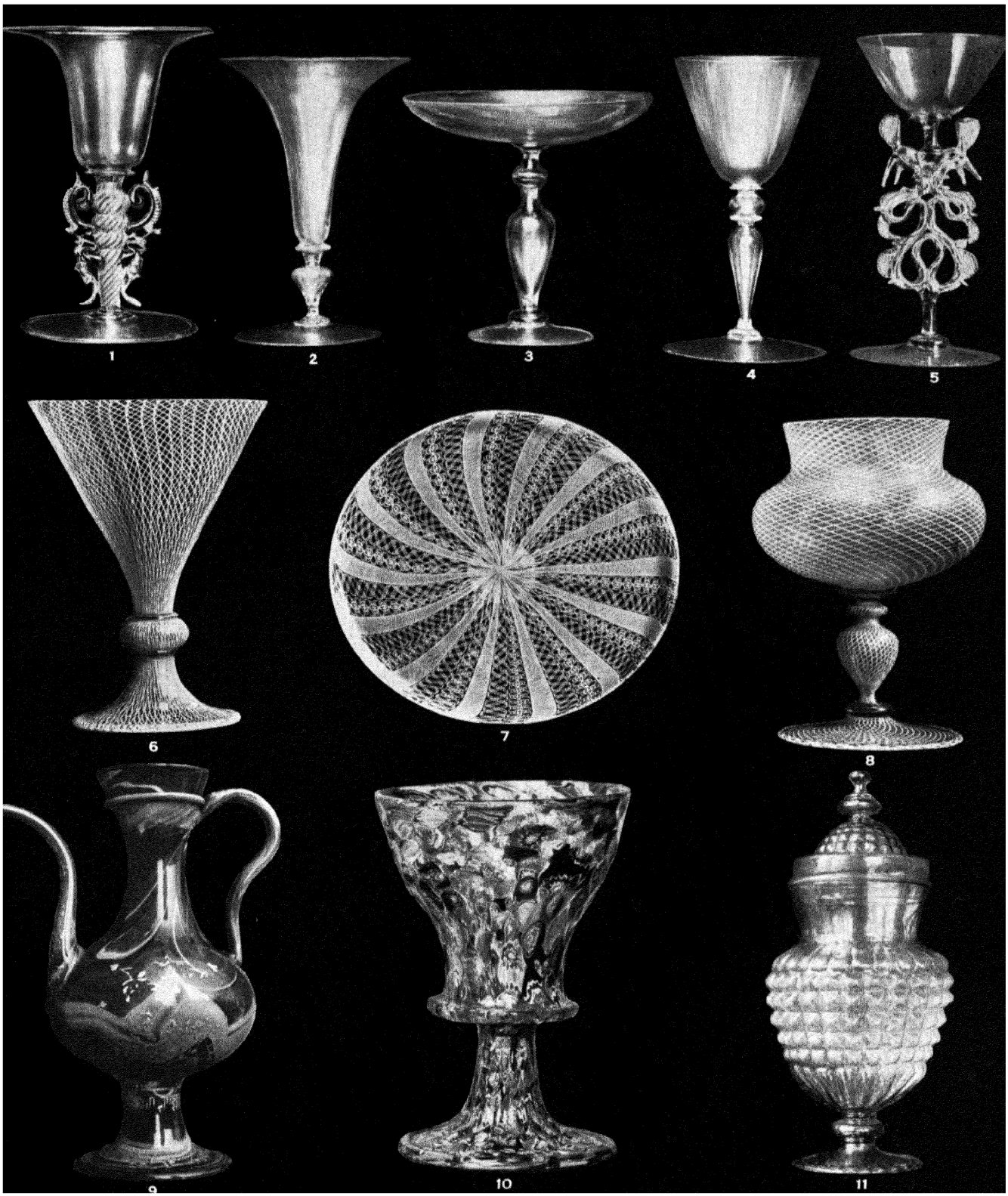
GLASS



BY COURTESY OF (1, 2, 3, 4, 5, 7, 8) THE STAATLICHE MUSEUM, BERLIN; (3) THE DIRECTOR OF THE RIJKSMUSEUM, AMSTERDAM; (3) THE DIRECTOR OF THE VICTORIA AND ALBERT MUSEUM

EASTERN AND CONTINENTAL GLASS OF THE VIII. TO THE XVIII. CENTURIES A.D.

1. Jug with decoration blown into mould; Egyptian, mediaeval. 2. Bowl with applied stamps; Eastern origin (Egyptian) 8th–9th centuries. 3. Beaker, cut in relief; an example of the so-called Hedwig glass, Egypt, 11th and 12th centuries. 4. South Spanish glass of the 17th–18th centuries. 5. Mosque lamp of glass, enamelled. Syrian, 14th century. 6. Blue Persian flask of the 16th–17th century. 7. Spanish (Catalonian) enamelled glass bowl of the 16th century. 8. Blue jug enamelled in colours. French, 16th century



VENETIAN GLASS OF THE XVI. AND XVII. CENTURIES

1. Glass with ornamented stem. Late 16th century
2, 3, 4. Wine glasses of the late 16th century
5. German glass in Venetian style. 17th century
6, 7. Venetian threaded glass. 16th century
8. Goblet of net glass. 16th century
9. Jug of jasper glass. 16th century
10. Goblet of "Millefiori" glass. About 1500
11. Vase with square stone ornament. 16th or 17th century

marked a turning-point in the history of glass, did not take place till about the beginning of the Christian era, in the time of the Emperor Augustus; and the place was the Phoenician city of Sidon. The early Sidonian relief-glass (Plate I., No. 2) is still blown into the mould, and still made out of coloured metal; decolorizing was soon learnt, however, at all events in Alexandria, whose glassware dominated the world market till late in the Roman imperial age While Greece produced no glass, we know of glass-works in Italy (Puteoli, Rome), Spain and Portugal (*e.g.*, Tarraco), France and Belgium (*e.g.*, Boulogne, Amiens, Rheims, Namur), and the Rhineland, where from the 2nd to the 4th century there were glass-works of high artistic quality in various places such as Treves, Andernach, Xanten, Worms, and above all Cologne. In Britain also glass-works were introduced from Gaul Nearly all the technical processes of any real importance in the manufacture and decoration of glass were already mastered in antiquity. Freehand blowing, blowing into the mould (relief-glass) (Plate I, No. 4), the working of glass while still plastic with tongs and various other implements to pull out studs or to produce bosses, the production of imitation coloured stones, gems and cameos, and even the making of window-panes, were practised in the glass-works of ancient times Mosaic-glass was treated in masterly fashion in the ancient workshops, particularly at Alexandria, both in the form of ornamental slabs (*see* plate No 1), which display highly complicated patterns and even figures, and in the form of vessels, bowls and vases, mostly in the flower-like "millefiori" patterns (*see* coloured plate fig. 3). (The name was not invented till later, in Venice) The finest ancient mosaic bowls with "millefiori" but also with ribbon patterns are the so-called *vasa murrina* (Plate I, No. 1), which must have been ground out of a solid block of glass. Painting (cold with mineral colours, and by the warm process with enamel colours) and gilding were already employed in ancient times for decorating the moulded glass after completion Gilding (*q v*) took the form of spreading gold-leaf on the surface and protecting it, as a rule, with an outer film of colourless transparent glass Ornaments, inscriptions and figures were etched out of the gold To the best-known types belong the so-called *fondi d'oro* (Plate I, No 7), which have been found chiefly in the catacombs at Rome and in Rhenish graves; they are bowls or beakers with gold etching under the flat bottom, often on a blue and green enamelled ground In the early days of this technique (2nd and 3rd centuries A D) they mostly depict mythological scenes and figures, and sometimes circus-combats or domestic scenes; in the 3rd and 4th centuries biblical scenes with pious toasts predominate. The ancient artists in glass obtained their plastic decoration by applying threads (Plate I, No. 6), or by welding on coloured projections in a wide variety of shapes; grinding and cutting also were already practised with great success Glass-cutting developed from simple lines and figure-engravings (Plate I, No. 5) to masterpieces of complicated technique such as the reticulated glasses (*diatreta*), with their freely-pierced network united only by frail bridges with the body of the vessel. These probably originated in the Rhineland Alexandria, however, was the home of what is artistically the most important ancient glass-work—the onyx glass, in which all kinds of exquisite designs are cut out in high relief with the cutting-wheel from layers of glass of various colours Gems cut out of semi-precious stones in several layers served as models The most celebrated example of this sumptuous genre is the Portland vase in the British Museum It was discovered at Rome at the end of the 16th century, in 1786 it was purchased by the Duke of Portland for 1,000 guineas; and in 1845, in the British Museum, it was smashed to fragments by a madman The scene represented (probably from the Peleus and Thetis legend) is cut out of a layer of white opaque glass, and stands out from a deep blue ground (*see* coloured plate No 4)

In the 5th century a powerful movement of artistic and technical decay set in in the glass-works of Gaul, Germany and Britain, which had till then remained wholly under the influence of the Roman provincial civilization The range of colours dwindled, the processes of decolourizing and refining the metal were forgotten, and the earlier immense wealth of forms was reduced to a few simple forms of beaker, with primitive ornamentation consisting of superimposed threads and prunts. The beakers are spherical; some have a narrow flat bottom, but most of them could only be set down bottom upwards, when completely drained (Plate I., Nos 8–10). The technical masterpieces of this Merovingian period are the "nose-beakers" (*Russelbecher*) (Plate I, No. 2). From the Carolingian age onward we lose all trace of the hollow-glass industry; it undoubtedly continued to exist, but not until the 15th century, at the close of the middle ages, does a new recognizable development begin For the absence of artistic hollow-glassware we have to compensate ourselves with the marvellous ecclesiastical stained glass (*q.v*) of the Romanesque and Gothic periods

The East.—In the East also, many of the ancient glass-works undoubtedly continued in activity throughout the middle ages, but we know little of them A few bowls ornamented with cut discs in relief, and a bowl with multi-coloured enamel-painting and gilding (most of these in the treasury of St Mark at Venice) can be ascribed with some certainty to Byzantine workshops Thick glasses (mugs, bottles, pots), generally of a marked greenish tint, with ornaments either stamped, impressed or blown in the mould, are early mediaeval Egyptian work (Plate II, Nos 1 and 2). In Egypt, as also in Syria and Persia, the superposition of threads continued to be practised Admirable examples of cut-glass were produced, in connection with cut rock-crystal work, in Egypt during the 11th and 12th centuries. These are the "Hedwig glasses," so called because it has been thought that some of them have a connection with St. Hedwig (d. 1243) They are thick glass beakers with conventionalized figures of animals and ornamental decoration in high relief (Plate II, No. 3) The 12 glasses of this group at present known undoubtedly came to Europe during the crusades; they have nearly all been in the possession of churches or noble families in Germany. The most beautiful and effective productions of oriental glass-making, however, are the enamelled glasses made from the 12th to the 14th century, a great many of which also came early into ecclesiastical hands in Europe The earlier products of the 12th and 13th centuries are magnificent, sumptuous domestic vessels (pots, bottles, vases and goblets); most of them were made in Mesopotamia and 'Iraq, while the mosque-lamps—the majority of which are preserved in Egypt —come chiefly from Syrian workshops of the 14th century On the non-ecclesiastical pieces we find purely Persian designs (hunters, polo-players, musicians), and rich Persian ornamentation in the form of magnificent multi-coloured enamels and gilding (*see* coloured plate fig 5); many Chinese motifs are also met with The 14th-century mosque-lamps (Plate II, No 5), made in Syria (Damascus), offer spirited decoration in the shape of arabesques and flower-motifs, medallions showing coats-of-arms or inscriptions (Koran texts and dedications) In the 15th century the Syrian manufacture of enamel-glass, which had also early begun to work for Europe, died out completely Persia, from the 16th to the 18th century, produced peculiarly-shaped pots and bottles, usually of blue or green glass (Plate II, No 6), and these also influenced the glass-makers of southern Spain

GLASSWORK IN EUROPE

Venice.—Although our earliest knowledge of the Venetian glass industry dates from as far back as the 11th century, no sign of artistic form is met with in Venetian glass until the beginning of the Renaissance—about the middle of the 15th century—and then there is not a trace of oriental influence As early as 1291 the glass-ovens were removed *en bloc* to the neighbouring island of Murano, owing to the danger of fire, and draconian penalties were provided for glass-workers taking the secret of the process abroad The 16th century was the great period of Venetian glass, which, in its technical and artistic perfection, had no equal in the whole world Apart from the almost crystalline clarity of the glass, really artistic forms do not appear at Venice till the latter half of the 15th century, and then often in the form of late Gothic silver-work—in a strong, close superstructure on relatively thick walls (*see* coloured plate No 6) In the 16th century the Venetians found the proper expression for the sense of form that marked the Renaissance at its height, and also acquired the

true style in glass-work, which arises solely out of the technique of glass-making. It was this period that gave birth to those spirited, graceful, airy forms of vessel which are due purely to the glassblower's labour (Plate III., Nos. 2–4). The contour of these glasses—bowl-shaped, calyx-shaped or bell-shaped—is of unprecedented elegance, and the baluster-stem, tapering down to a simple flat foot, varies widely in formation The stem is often adorned with masks, lions' heads or pinched-out "wing" appendages (Plate III., No. 1). In the 17th century glass was not spared by the prevalent baroque spirit; its forms become eccentric, complicated, and too rich in ornament In the 18th century the predominance of Venetian glass was at last destroyed by the Bohemian and Silesian cut-glass Besides the colourless soda-glass, Venice produced throughout her best period a wide range of coloured glassware. In the early days a great favourite was the marbled "agate" or "jasper" glass (Plate III , No. 9). "Millefiori" glass (Plate III., No 10) was inspired by discovered antiquities, and the astonishing skill of the Muranesi is witnessed by the invention of spun-glass (Plate III , Nos 6 and 7) and its by-form, reticulated glass (Plate III , No 8), in the first half of the 16th century. To the same period belongs decoration in the forms of painting behind glass and diamond-engraving, while the wonderfully artistic kind of Venetian glass which is ornamented with enamel-painting dates from the early period (*c.* 1460–1530). Goblets, beakers, bowls, jugs, flasks (*see* DRINKING VESSELS) and other vessels were painted in multi-coloured enamel; in the early period the body of the glass was almost always coloured (blue, green or violet). Milk-glass was also often used for this purpose; but from 1490 onwards colourless transparent glass predominates. Triumphal processions and love-scenes, biblical and mythological scenes, half-length portraits (*see* coloured plate No. 6) and coats-of-arms, and in the later period complicated grotesques, were favourite forms of decoration In the 16th century many aristocratic German families had their coats-of-arms and portraits painted on glasses and goblets by Venetian enamellers

"Venetian glass" became a generic name; but much so-called Venetian glass was made not at Venice, but in other Italian glass-works (Treviso, Mantua, Padua, Ferrara, Ravenna, Bologna, Florence, etc), to which the technique was generally brought by renegade Venetians The most serious competition however, that Venice had to meet came from Altare, near Genoa; the glass-makers there, who formed a close corporation, went abroad (to France, Flanders, etc) year after year, but always returned to their homes and families. Glass-works on Venetian lines, *à la façon de Venise*, were founded all over Europe, mainly in the 16th and 17th centuries, by renegade Venetian glass-blowers and men from Altare In 1550 one was founded at Antwerp, in 1662 at Brussels, and others at Liège, Amsterdam (1597), Haarlem, The Hague, Vienna (as early as 1428), Hall, in Tirol (1534), where distinguished work, easily recognizable by its peculiar characteristics, was produced, Nuremberg, Munich, Cassel, Cologne, Kiel, Dessau, Copenhagen, Stockholm, Lyons, Argentières, Nantes, Nevers, Orleans, Paris, and in London as early as the middle of the 16th century and also later. Many of the productions of these foreign daughter-establishments of Venice—only a few examples of which are shown here—cannot be distinguished, or only with difficulty, from the genuine Venetian ware, at the same time, however, a number of these glass-works *a la veneziana* developed forms of their own, often of considerable artistic charm (Plate III , No. 5).

Spain, France, the Netherlands.—In the middle ages the ancient Roman glass-works in Spain received the imprint of two different influences in the south, the oriental influence, transmitted through the Moorish domination, in the east (Catalonia), the influence of Venice The principal centre in the south was Almería, famous for its artistic glassware as early as the 13th century. Here we find a mingling of indigenous and oriental motifs and ornament Eccentric, fantastically-shaped vessels covered with handles, threads, rosettes, etc , are characteristic of southern Spanish glass (Plate II , No. 4) In and around Barcelona, on the other hand, we find, in addition to native forms (undoubtedly, however, originating in the East), a marked Venetian influence. The shapes of the 16th-century enamelled glasses show a strong Venetian tendency, while their typical painting—generally pale green tendrils with multicoloured beasts and birds—point rather to the East; on the other hand, many forms revealing oriental influence (*e g.*, decanters with long spouts) bear the thread-ornament derived from Venice. Work *à la façon de Venise* was also done in various inland Spanish factories, as at Cadalso (Castille) and Toledo; at Villanueva de Alcorcon, and later at La Granja de San Ildefonso, there were glass-works from 1712 onwards—royal property from 1734—which produced ground and cut, gilt and painted articles, and also lustres and mirrors They were influenced by French and German work. At the same time Spain and Portugal formed a considerable market for the Bohemian glass-works in the 18th century.

In France the immigration of Italian glass-workers from Venice and Altare began as early as the 15th century; but there were also many native glass-works, especially in Normandy and Lorraine. Apart, however, from a small body of 16th-century enamelled glass, to which a French origin can be definitely assigned (Plate II , No 8), and some graceful small glass figures from the Nevers works, France never produced glass of any artistic value. Greater attention was paid to glass for purely utilitarian purposes, such as window-panes, mirror-glass (*see* INTERIOR DECORATION), and other products of a more industrial kind A *manufacture des verres à la façon de Venise* founded by Colbert in 1665 at Paris (Faubourg St Antoine) grew later into the immense St Gobain works Whereas in the 18th century France was still wholly subordinate to other countries in the matter of fancy glassware, in the 19th century there was a strong upward movement, the result of which has been that France now leads in many branches of the fancy-glass industry.

In the Netherlands, where in the 16th and 17th centuries there were many glass-factories working both on Venetian lines and after German patterns, the new English lead-glass began to exercise a strong influence about the end of the 17th century A large number of new works were established by Englishmen or operated with English hands, as at Haarlem, Middelburg, Ghent, and 's Hertogenbosch In Holland glass-cutting was practised in the 18th century; the best master, Jacob Sang, lived at Amsterdam The pride of Dutch glass-decoration, however, consisted in scratching and dotting with the diamond Throughout the 17th century scratching with the diamond was a popular method, dilettante artists, like the three sisters Roemers and Willem J van Heermskerk, adorned glasses and bottles with beautiful sinuous calligraphy (*q v*) In the 18th century scratching was superseded by dotting or "stippling," in which process the entire design is composed of small dots hammered into the surface of the glass with a diamond-point (Plate IV , No 2) The greatest masters of this airy and delicate decoration, to the success of which the clear, faultless English flint-glass was essential, are Frans Greenwood of Dordrecht (d 1761 or 1762) and D. Wolff of The Hague (d. 1809).

THE GERMAN GLASSES

Germany.—Germany is undoubtedly the European country in which the art of glass-making has received its widest application, and in which the decoration employed has covered the most varied and artistic range. From the Rhine, where ancient Roman traditions were never wholly extinguished, glass-making spread quickly eastward in the later middle ages to many well-wooded hilly districts which favoured the industry. It was carried on most actively in Hesse and the surrounding forest regions, and in Bohemia and the neighbouring territories of Bavaria, Thuringia, Saxony and Silesia As early as about 1400 all the glass-workers in the Hessian factories formed a close corporation.

The late mediaeval German glasses are almost all made of the green "forest" glass; the principal forms are simple cup-shaped beakers with bosses or spiral fluting on the sides (*Maigelein*) (Plate IV., No. 1), and beakers about the size of the fist, with knobs or prunts, which were called "cabbage-stalks" (*Krautstrunk*) because they resembled a cabbage-head with the leaves



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ANTIQUE AND MEDIAEVAL GLASS OF EUROPE AND THE EAST

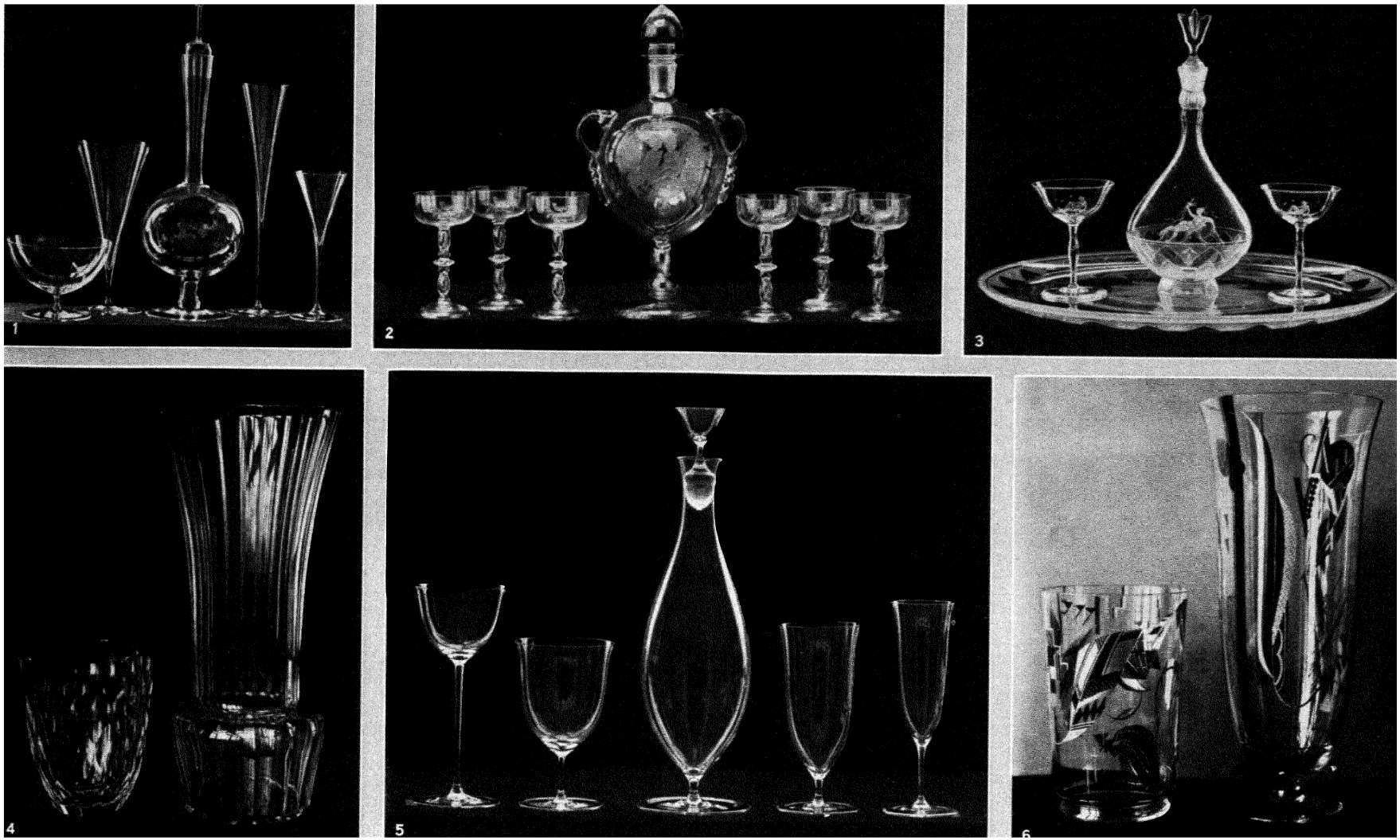
1. Slab of glass with flower pattern. Antique. 2. Graeco-Egyptian wine-jug. Palm pattern formed by double drag on dark blue, nearly opaque ground. 3. Enamelled "Humpen" with representation of the coopers' trade. Bohemian, 1616. 4. Bowl of *millefiori* Roman glass, 1st century A.D. 5. The Portland vase, blue and white carved glass, 1st century B.C. 6. Enamelled cup of green glass. Venetian, 15th century. 7. Saracenic glass Pilgrim bottle, brownish amber-coloured, thick glass, with gold and enamel; on the flattened back a wheel design. About 8 in. high. Probably from Mesopotamia, *c.* 1300 A.D.



BY COURTESY OF (7, 9, 10) THE STAATLICHE MUSEUM, BERLIN; (4, 5) SCHMIDT, "DIE GLÄSER DER SAMMLUNG MÜHSAM" (ERNST WASMUTH); (11, 12) SCHMIDT, "DIE GLÄSER DER SAMMLUNG MÜHSAM" (VERLAG FÜR KUNSTWISSENSCHAFT), (6, 8) SCHMIDT, "BRADENBURGISCHE GLÄSER" (VERLAG FÜR KUNSTWISSENSCHAFT)

GERMAN AND DUTCH GLASS OF THE XV. TO THE XVIII. CENTURIES

1. Beaker (*Maigelein*), 15th c. 2. "Kuttrolf," German, 17th c. 3. Beaker with fired painting in black by J. Schaper, Nüremberg, 17th c. 4. Roemer, 16th c. 5. "Cabbage-stalk" beaker; *c.* 1500. 6. Goblet, engraved by F. Gundelach, Cassel; *c.* 1700. 7. Goblet, engraved by H. Schwinger, Nüremberg; *c.* 1675. 8. Glass cut in relief by Spiller, Berlin, 18th century. 9. Engraved glass, Silesia; *c.* 1750. 10. Engraved chalice, Bohemia; *c.* 1720. 11. Diamond stippled glass by D. Wolff, The Hague. Late 18th c. 12. Beaker with engraved gold leaf decoration, Bohemia, 1730



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CONTEMPORARY EUROPEAN TABLE GLASS

1. Table set of muslin glass executed at the Lobmeyr factory, Vienna, after designs by Oswald Haerdtl
2. Table set from the State technical school at Haida; Czechoslovakian
3. Decanter, glasses and tray engraved at the Orrefors factory after designs by Simon Gate; Swedish
4. Pieces designed by B. Mauder, executed at the State technical school at Zwiesel, Eastern Bavaria
5. Table set of muslin glass, after designs of Josef Hoffmann; Viennese
6. Painted glass, designed by B. Mander, executed at the State technical school at Zwiesel

stripped off (Plate IV., No. 5). By the side of these there developed taller and larger glasses, with or without prunt decoration, almost always green, but in an extraordinarily wide range of shades. Slender wine-glasses were given a squared pattern or decorated with glass threads welded around the sides Out of the knobbed beaker there developed in the first half of the 16th century the "rummer" (*Römer*) (Plate IV, No. 4), the beautiful classic form of the German green wine-glass, which has maintained its popularity to the present day. In the 16th and 17th centuries there was a great demand for the *Kuttrolf* or *Angster*—a comic shape consisting of a bulbous vessel with from two to five thin tubes like windpipes intertwined and uniting in an enlarged bowl like a mouth (Plate IV., No 2) Other comic glasses are in the shapes of animals (bears, pigs, birds, etc), boots, pistols and so forth. The principal drinking-vessel of these centuries, however, was the cylindrical tankard, often of huge dimensions, which is also called the "welcome" (*Willkomm*). The second half of the 16th century saw the introduction into Germany of painting with opaque enamels on hollow-glass, and for about 100 years this remained the most favoured type of glass-decoration. The idea came from Venice (*q v*), but soon spread to all the German glass-works, and ware of this kind was produced in vast quantities The most beautiful enamelled glasses, from the point of view of colour, come from the Bohemian works (*see* coloured plate No 7). Multicoloured dotted borders on a ground of gold leaf close the design below the lip of the glass; the design itself may be of many different types—coats-of-arms, the imperial eagle with the electors, dukes, counts, cities, farmers, etc , according to the "quaternion" system on the wings, the electors with the emperor, political allegories, apostles, biblical scenes, allegories of the virtues, ages of life, hunting scenes, *genre* pictures, playing-cards, views of churches, cities and many other pictures, often full of figures The Schaper glasses, named after their inventor, Johann Schaper (d. 1670 at Nuremberg), were a particular specialty; they were small beakers and goblets painted generally with black lead, sometimes with other transparent enamels, in very charming designs (Plate IV, No 3) Lacquer-painting and scratching with the diamond were also used here and there (*e g*, in Nuremberg, Silesia and Saxony) for decorating glass with telling effect.

About 1600, Caspar Lehmann, court jewel-cutter to the Emperor Rudolf II at Prague, applied the process of cutting jewels and crystals to glass This was the decisive step towards the form of glass-decoration that has ever since held the first place —glass-cutting We know of only a few goblets and dishes cut by Lehmann himself (d 1622), his pupil and successor in office, Georg Schwanhardt, took the technique with him to Nuremberg, which kept the lead in fashion till towards the end of the 17th century The specialty of this town was the tall Nuremberg goblet, composed of hollow pillars, and adorned with distinguished landscapes and portraits by masters of the art (Georg Schwanhardt and his sons Heinrich and Georg the Younger, Hermann Schwinger, H. W. Schmidt, G. F Killinger and others) (Plate IV, No 7); similar work was done by one or two glass-cutters of the Hess family at Frankfort-on-the-Main About 1700, however, the Bohemian and Silesian glass-cutters came into the first rank In those districts cut-glass of unprecedented technical perfection and artistic delicacy was produced in numerous workshops, almost always in intaglio, but sometimes—especially on the Silesian side of the Riesengebirge—in brilliantly-handled relief. Every phase in the development of style, from the Baroque through the Regency (foliate and fillet patterns—Laub- und Bandelwerk) and the Rococo to the Louis XVI. style, can be followed in these gracefully-shaped glasses and goblets, which have also been blown since about 1675 in the faultless crystal-glass (chalk-glass) of Bohemia Of the countless variations of Silesian and Bohemian glass, a few examples are given in Plate IV., Nos. 9 and 10 Thuringia, Hesse, Saxony, Brunswick and other districts have produced special types of glass and special forms of decoration; next to Silesia and Bohemia, a distinguished place is taken by Brandenburg, where the celebrated alchemist and master glass-maker Johann Kunckel invented the magnificent gold ruby-glass about 1680 at the Potsdam works. These works, established by the Great Elector and removed to Zechlin about 1736, produced magnificent, and incidentally very large, goblets, mainly by command of the court The greatest glass-cutters were Martin Winter (d. 1702) and Gottfried Spiller (d. after 1721), both of whom worked in Berlin. The latter in particular exercised astonishing technical ingenuity and artistic power in producing veritable masterpieces in relief and intaglio (Plate IV., No 8). His only equal—artistically perhaps even his superior—was Franz Gundelach (*see* Plate IV, No 6), who worked in Cassel as glass-cutter to the Hessian court

A special technique, practised only in the 18th century in Bohemia, was that of the "gold sandwich" glasses (*Zwischengoldgläser*), in which two glass beakers are made to fit exactly together and one is slipped over the other, the outer glass thus serving as a cover and protection for a highly decorative gold etching design on the outer surface of the inner glass (Plate IV, No 12). This technique was practised in monastic workshops, and found a late imitator in J. J. Mildner of Guttenbrunn (Lower Austria), who, from about 1785 to 1808, produced delicate glasses on which "gold sandwich" medallions and fillets are frequently combined with diamond engraving

In the first half of the 19th century, German, and particularly Bohemian, glass-making enjoyed another considerable rise in importance. Besides cutting and engraving, painting with transparent enamel colours was in great favour (Samuel Mohn, d. 1815, Gottlob Samuel Mohn, d 1825, Anton Kothgasser, d 1851) Tinted glasses of all kinds, coloured in the metal, flashed and etched, were produced, as well as the popular lithyalin (an imitation of agate and other semi-precious stones), spun glass and "millefiori" in imitation of the old Venetian inventions, and many other types Technically, the *Biedermeier* period reached an absolutely amazing height; but artistically it could not equal the best productions of other ages, particularly the 18th century. Subsequently, about 1860, a new movement set in under the leadership of the Viennese glass-manufacturer Ludwig Lobmeyr (1829–1902), inspired by the cut crystal work of the Renaissance, it ushered in a new renaissance in the art of glass-cutting, the modern development of which is explained below

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MODERN EUROPEAN GLASS

Like every other branch of industrial art the production of glass suffered neglect during the 19th century The last ripples of the Empire period and the times of Biedermeyer occasionally produced a valuable specimen, but then the effort seemed completely spent When ornamental glass was mentioned, people thought of the heavy cut glass, of which the Bohemian factories and those of Baccarat in France and of Val-Saint-Lambert in Belgium had the monopoly It was not until the general revival after the middle of the 19th century that there came a renaissance in this sphere. The pioneer was the Frenchman Gallé, but his work aimed at a treatment of the glass-material altogether different from that followed in the course of the previous centuries He produced opaque-coloured glass About the same period the Viennese firm of Lobmeyr attempted to raise the standard of Bohemian glass by perfecting methods of cutting and engraving Old models, however, were closely followed and as a result a development in a modernist direction did not become noticeable until the 20th century, when, under the influence of young Austrian craftsmen like Hoffmann and those of the Wiener Werkstätte, new shapes and decorations gradually became more general and even spread to the German glass-industry This renaissance movement had an influence also on the Italian (*i e*, the Venetian) glass industry, but their excellent products remained too faithful to the shapes typical of the Venetian efflorescence But the 20th century saw a considerable general improvement Almost every centre of glass production has tried, in the course of recent years, to apply to the principles of modern industrial art Important progress in this direction was made by the Swedish factory at Orrefors, which produces cut and engraved blown glass The French movement

continued to be of importance, while in Holland the glass-factory of Leerdam made important experiments which are particularly significant because they make a modern use of all the technical possibilities of industrial glass-making. Before going into details about this development in various countries, a brief reference to certain technical details should be given.

Materials and Treatment.—In the first place it should be noted that glass can be grouped into three divisions according to the elements which are fused together to form it There is, first of all, glass made with soda and lime, which is utilized for ordinary household articles and for window panes. There is, furthermore, potash and lime glass, which provides the "metal" for fine glass work; and, finally, lead glass, which is the same as crystal, and is distinguished by a particular lustre and brilliancy of colour

Glass can be submitted to manipulations of different kinds in order to enhance the beauty of the object made from it To begin with, glass can be blown into a mould or into a series of moulds of gradually differing shapes To this class belongs the so-called "optic" glass, which is obtained by making vertical dents in the shape These dents may become the basis of an ornamental motif. Next, there is the ancient Venetian method which applies ornaments by means of threads, blobs and festoons of glass There is, furthermore, the colouring of the glass mass, which can be effected without impairing the translucency of the glass, and also the methods of covering the glass surface with ice-flowers, and of crackling the surface.

It is technically possible to blow two layers of glass one above the other The most striking form of this process is the so-called *Ueberfangglas* which super-imposes two layers of different colours. When both layers are of the same colour, ornaments can be applied in between the two It is a very subtle and difficult process, but it can be effected successfully where technical ability is allied to artistry Colour, as enamel, can also be burnt into the glass while it is in the annealing furnace, which makes it possible to apply all kinds of ornaments to the basic material.

There are two methods of cutting glass Diamonds or facets can be cut into the glass on smooth iron discs by means of sand or cutting-powder. The rough surface must then be polished on discs covered with leather, felt, or wood The other method is the cutting of figures by means of the "amaril" wheel In this process the object must be held in the hand and put into contact with the fixed rotating wheel, while damp sand or powder must be continually applied It is not possible to see precisely what one is doing and a steady hand and considerable ability are therefore required. When applied to *Ueberfangglas* the effect can be obtained by allowing the differently coloured under-layer to become visible through the top layer The modern practitioner of industrial art has found it difficult to adapt cutting and especially engraving to modern conceptions, but even this has in the end been done with success in Czechoslovakia and in Sweden—the cut glass of Hoffman is among the best glass that has ever been produced. The old method of glass engraving by means of a diamond is no longer used At present the glass, which has been covered with a layer of wax or lacquer, is etched with hydrofluoric acid A few French artists allow the process to go so far that they obtain differences of surface of as much as 10 millimetres A technique of an entirely different kind is that of the *pâte-de-verre*. Glass powder, which has been finely ground, is baked in moulds with or without the addition of various colour oxides This treatment is allied to that of the ceramist. Considerable care must be observed both in heating and in annealing Among the methods which are suitable for mechanical application there is also that which consists in pressing glass, mostly coloured glass, into moulds. It is applied by artists for the production of household articles. The effect of the smooth sides is not so pleasant as that obtained by cutting, but the method is so much cheaper that it enables many people to acquire products of excellent quality which would otherwise be beyond their means

DEVELOPMENT

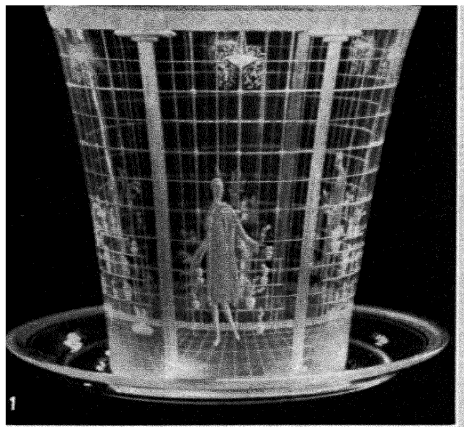
Belgium.—In the 17th century Liége was the centre of the glass industry, but it almost completely lost its importance in the course of the 18th century, and at the beginning of the 19th century Liége glass had no particular significance—at any rate from the artistic point of view. Like Liége, Namur had at that period but one glass furnace where fine glass was still made. It belonged to the Zoude family. In the course of the 19th century, crystal manufacture began to flourish in the neighbouring Val-Saint-Lambert The produce of this factory is scarcely distinguishable artistically from that of the ordinary crystal factories, although recently a few pieces of good shape and rational ornamentation have been produced. K. Graffart has executed some engraved work which is not without merit. In the industrial area of central Belgium the Verreries du Centre at Houdeng-Coegnies produce vases and household articles which can stand comparison with the products of Val-Saint-Lambert.

Holland.—During the last quarter of the 19th century the idea of making household articles which should be beautiful came into its own, and its protagonists turned their thoughts to glass. The architect H P. Berlage occupies a prominent place in this movement In 1900 he designed a set of table-glass which was executed in the French factory of Baccarat About the same period a member of an old firm of Amsterdam glass merchants, Gerard Muller, made his own designs for household glass. Since then numerous glass sets of his design, usually executed in the Josefinenhutte at Schreiberhau, have appeared, and they are noticeable by the purity of their shape and by their noble simplicity A drinking-service of his design, with hollow blown foot and large bowl, which he has christened "Cyrano," is very beautiful and has an entirely original shape Each object in this set has been specially constructed with a special view to the purpose for which it is intended There are also from him bowls and dishes with facet cutting which are striking by their simplicity and dignity

It is, however, at the big glass factory of Leerdam that the richest unfolding of the possibilities of artistic glass is found. This factory, formerly directed by Jeeckel-Mijnssen, is now under the control of P. M. Cochius. Its activity started when the architect K. P. C. de Bazel was commissioned to design a drinking service. De Bazel, whose delicate art is revealed not only in his architecture, but also in his furniture designs, felt particularly attracted by the brittle material which is glass, and until his death in 1923 his activity in this new sphere continually increased. He designed some ten different drinking-services, all of which excel by their delicate and slender shape Some of them are very simple; the later types are richer in shape, while minute but carefully considered cutting gives them real dignity. The services include not only glasses, goblets and carafes, but also finger-bowls, dishes and flower vases. De Bazel has also designed individual flower vases of a pleasant though particularly practical shape He has also produced four memorial cups in crystal (*jaarbekers*, dated 1918, 1919, 1920 and 1924), with engraved inscriptions. That of 1924 in particular, executed in cut crystal of dark purple hue, is a noble piece of work The inscription round the rim is dull gilt and reads *worstelend waakzaam* (wakeful and struggling). He also made designs for a complete service in pressed glass, entirely constructed upon a regular decagon, which is being brought into trade in blue, brown, purple and green

In 1923, Dr. H P Berlage designed a breakfast-service, severely constructed in yellow-coloured pressed glass, while he also designed a few of the dated annual cups, among which that of 1925 is distinguished by a shape which is at once monumental and slender.

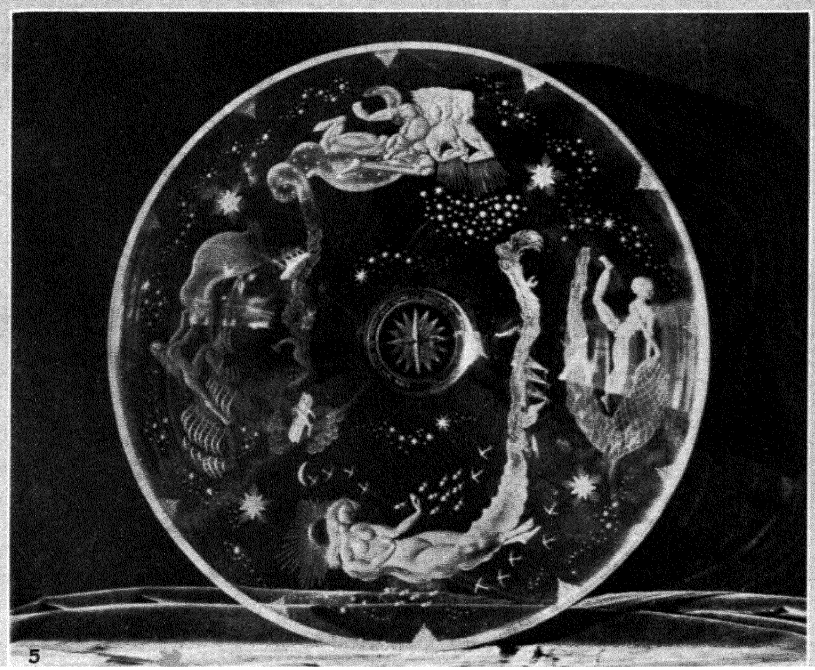
Since 1917 the decorative artist C deLorm has produced drinking-services and other table-glass His work is distinguished by the fullest attention to all the requirements of utility without impairing in the least the aesthetic value of the article The artist A. D Copier has been on the staff of the factory since 1923 He started with two drinking-services inspired by the shapes of flowers and fruit, and he extended his activity over the whole sphere of household glass. His work has resulted in the production of a large variety of bowls, vases and cups, executed in different colours, which have favourably influenced the general taste in Holland. Not less well shaped, and decidedly more striking and personal, are similar articles designed by the decorative artist













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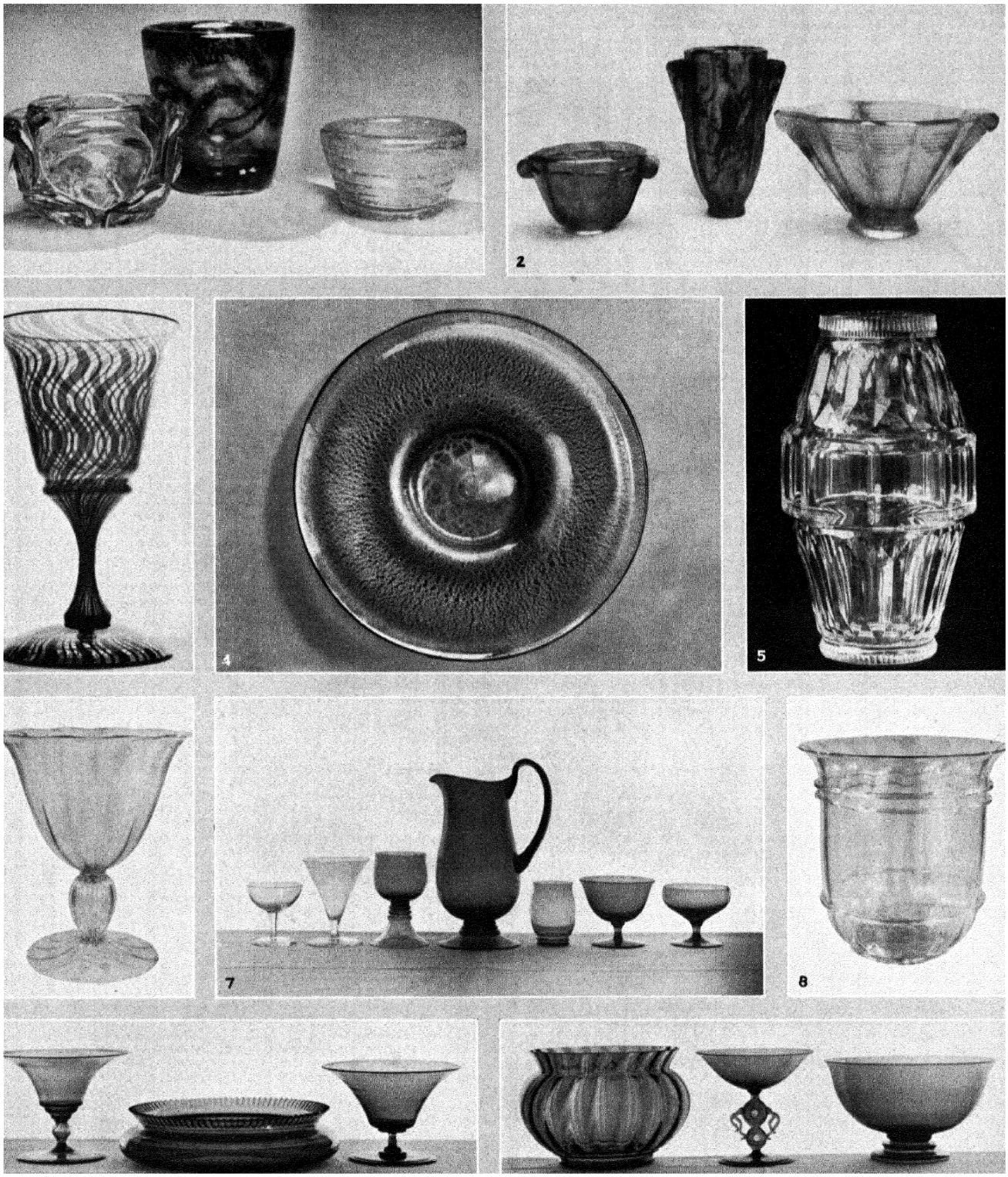
MODERN CUT AND ENGRAVED EUROPEAN GLASS

1. "Fashion" vase of engraved Orrefors glass designed by Edvard Hald; Swedish
2. Cut and engraved flower basin design by M. Powolny, executed at the Lobmeyr factory, Vienna
3. Vase with human figure ornamentation, by Simon Gate, executed at the Orrefors factory; Swedish
4. Vase, modelled in relief, by Emile Gallé; French
5. "The Wind Rose," engraved Orrefors crystal plate designed by Edvard Hald
6. Crystal goblet from the State technical school at Haida; Czechoslovakian

GLASS



BY COURTESY OF (1, 2) MAISON ROUARD, (3, 7, 9, 10) ORREFORS BRUKS AKTIEBOLAG, (4) J. F. OPPENHEIMER, (5) THE STAATSFACHSCHULE, HAIDA, (6, 8) THE VENINI GLASS FACTORY

CONTEMPORARY EUROPEAN DOMESTIC GLASS

1. Glass with coloured ornamentation applied inside the material, by Henri Navarre; a technique developed by this designer. French
2. Bowls and vase of *pâte de verre* by François Decorchemont. French
3. "Graal" glass in which the coloured design is burnt into the glass. Swedish
4. Dish by C. Lebeau. Dutch
5. Crystal vase from the State technical school at Haida. Czechoslovakian
6. Undecorated glass from the Paolo Venini factories, Murano. Italian
7. Undecorated domestic glass from the Orrefors factory. Swedish
8. Bowl from the Paolo Venini factories, Murano. Italian

9 & 10. Undecorated domestic glass from the Orrefors factory. Swedish

C. Lebeau, who has also worked at Leerdam. Followed by Copier, he started another line of activity by producing specimens of decorative art, as "Unica" Lebeau's work at Leerdam lasted only a time, and he then went to the Moser factory at Winterberg, while Copier continued to work at Leerdam. The activity of these two artists has produced a rich variety of all kinds of glass-work of a much higher quality than has been attained elsewhere. It has placed Dutch glass at the summit of artistic production. Every technical possibility has been exploited. "optic," "crackled," "iced-glass," *Ueberfang*, "irisation," "colouring," have all been applied singly or in combination. In this kind of work Lebeau has proved himself stronger and more personal than Copier. Copier has, however, sometimes displayed a very tender delicacy. In 1927 the ceramist C Lanooy and the decorative artist J. Gidding began to execute work for the same factory While they produce household articles and ornamental glass by means of the above mentioned technical processes, they have re-introduced the method of enamelling by applying colour evenly upon the glass. They use either a few delicate lines or else complete designs, such as fish motives Much good glass-work may still be expected from these two artists

Among other Dutch artists who do glass-work we may mention C. Agterberg, who designed glasses and vases which were made in Bohemia, and some very simple drinking- and breakfast-services, ornamented solely with a black enamelled line. J. Jongert and F van Alphen have turned their attention to the artistic execution of bottles and flagons and have proved that in this direction also innovation and improvement can be effected

Czechoslovakia, Austria and Germany.—The development of the art of glass-making in German-speaking countries must be considered mainly as one whole, because their glass factories, arts and crafts schools, glass-manufacturing centres and artists continually exchange both views and personnel one with another It is difficult therefore to separate Austria and Germany, while Czechoslovakia, which has so many glass factories within its borders and near its frontiers, cannot be entirely separated from the other two countries.

The application to glass of the new conceptions of industrial art took place in German-speaking countries only at a late period Originally it was limited to the designing of drinking-services, a matter to which numerous architects and decorative artists have given their attention Among the long list of names which can be found in Pazaurek's book we shall only mention Peter Behrens, K Koepping, Kolo Moser, T Schmuz-Bauditz and W. v. Wersin Little is observable of attempts to endow other glass products with a particular value resulting exclusively from shape One might at most reckon among such attempts the objects designed for the Deutsche Werkstatte in Munich by K Rehm and Else Vietor, by Wolfgang and Herte von Wersin, about the years 1910–14. This work was also partly executed at Murano However meritorious in many respects, it remained too solidly linked up with Venetian traditions It is for that reason that more importance attaches to a strongly developed movement in these countries whose aim was the improvement of cut and engraved glass—an aim which has naturally resulted in improvements of shape. Ludwig Lobmeyr was one of the pioneers of this movement. He was at the head of a Viennese glass factory which has been in existence for over a century As early as 1870 he secured the collaboration of good Viennese artists for the design of his more important pieces So far as shape was concerned, his products continued to be severely limited to the imitation of models from the Italian Renaissance. Yet even in the direction of shape a certain independence was manifest The main significance of the movement was that work was done in one definite direction It was possible for able engravers like A. Bohm and K. Pfohl, and more especially K. Pietsch, F. Ullmann and F. Knochel, who were entrusted with the execution of these designs, to practise upon good work, until a tradition was established which has greatly benefitted work of a more personal character We meet with this tradition in the glass factories of Haida, Schreiberhau and elsewhere, as a result of the work of the excellent technical schools of Steinschonau and Haida, in the region of Lausitz, while the school of Zwiesel in eastern Bavaria has a particular significance for the glass districts of Bavaria.

The technical school of Steinschonau dates from the year 1856. H. Zoff, who directed the school from 1899 to 1914, and A. Beckert who became director in 1918, have exercised a great influence on the glass produced in the area The latter especially is a very able designer of glass ornamentations, which are executed at the school. Among the good glass-engravers who have been trained there and have produced the best pieces for the factories of the surrounding area we may mention F Ullmann (1846–1921), who worked with Lobmeyr from 1887, A Helzel, and various members of the family Pietsch Frederic Pietsch works for the firm of Conrad and Liebsch, which executes numerous designs made by this school The same thing is done by the firm Lorenz Brothers, which furthermore executes work by Munich artists such as P. Emmerich and P. Susz The technical school of Haida is much younger. It was established in 1870, and became important under the direction of D Hartl in 1881, and still more so under that of H. Strehblow. This school, which has on its staff excellent men such as R. Cizek and J Schröder, is a source of inspiration to the numerous glass factories within its area; not only does it produce a number of well-trained and expert technicians, but it also provides good designs which are executed at, among others, the factories of J Oertel and, especially, C. Hosch K. Hosch made glasses designed by C J Pohl, coloured black with cut and engraved ornamentation J Oertel also executes designs for the Wiener Werkstatte

In other parts of Czechoslovakia, which is so rich in glass-making centres, attention is attracted by the artistic glass of the Klostermuhle factory, which belongs to the firm of Lötz, where good work was being done about 1900 under the management of von Spaun; and by the factories of L Moser at Meierhofen, near Karlsbad, and at Winterberg, where, especially in the latter, fine glass has been made recently by the Dutchman C Lebeau. Since the revolution Prague has acquired a considerable importance At its school for industrial art, the teacher Josef Drahonovski guides the development of the factories by his designs, among which there have been very beautiful ornamental cups, one being a present from the Sokol Gymnastics club to President Masaryk Other work of value is being done by Kotera and, especially, by J Horejc for the Viennese glass firm of J and L Lobmeyr. This firm of Lobmeyr has set the tone in Vienna for more than a century and has done very much for the revival of artistic glass, but until the beginning of the 20th century its productions were mainly commissions in imitation of famous models and motives, particularly those of the Italian Renaissance Since then a change has come. The development in a modern direction is due to the firms of Bakalowitz and of J Lotz Witwe These two houses collected the younger artists, among them Kolo Moser, the most important of them, who has since died The Arts and Crafts school, which received its impetus from Josef Hoffmann and to which belonged O Dietrich, U. Janke, H Jungnickel and D. Peche, had much influence on Viennese glass. The noted glass artist M Powolny belongs to this school He is the most important of them all. Hoffmann has designed coloured glass models of a strong and forceful character that are cut in square facets The glass of Peche on the other hand is full of airy playfulness Powolny combines strength of shape and of cut with extremely delicate engraving. Hoffmann and his school, as well as Powolny, have also designed glass for the Wiener Werkstatte. Among their pupils a few women artists of delicate taste deserve mention, viz M. Flogel, A. Schroder and V Wieselthier There are also artists like J. Zimpel and O. Haerdtl. At present most of them also work for Lobmeyr, while the Bimini-Werkstatte produces fine blown glass after designs by J Berger and F Lampl

The revolution having made connections with the glass factories of Czechoslovakia much more difficult, the Edelglaswerke of L Forstner, a pupil of Kolo Moser, founded in Stockerau, has acquired considerable importance, and has produced beautiful work in cut "copper-ruby" glass and in different kinds of *Ueberfang* glass

Finally, a brief word about Germany In the north-east of Bavaria, the Arts and Crafts school of Zwiesel, under the direc-

tion of B Mauder, is the principal centre. While cut and engraved white glass is the main glass product of Czechoslovakia, Bavaria concerns itself chiefly with painted coloured glass, although engraving is also carried on there, in particular, after designs by Mauder and A Pech In Silesia the school of Breslau, under S Haertl, is of importance, while in Stuttgart the very able teacher W. von Eiff, an extremely proficient glass-engraver, exercises considerable influence.

Italy.—Italian glass owes the prominent position which it occupied until the end of the 17th century to the workshops of the little island of Murano near Venice, where this industry was concentrated But after this period of efflorescence Venetian glass fell from the first rank and, notwithstanding attempts at revival, it has not reconquered its former position even in the 19th and 20th centuries This is because these efforts, especially those of Salviatti, aimed in the main at continuing the old manner of the glorious period A certain improvement, no doubt, was obtained, owing to the fact that over-elaborate ornamentation was abandoned and simpler and severer lines were adopted This is especially due to the factories of Paulo Veneni, where the designers Francesco Zecchin and Napoleone Martinuzzi are at work But up to the present they do not seem to have freed themselves from the domination of old models, as regards either colour or shape. Work of a really personal character is still rare, however able and technically perfect the products may be

France.—The revival in France came in the days of the World Exhibition at Paris in 1870, not from the old glass factories but from the fine handwork of enthusiastic artists The first of these is Th J Brocard, who set himself to imitate the old art of the followers of Islam, and succeeded in imitating them very closely. He made enamelled and coloured glasses, mosque-lamps, etc , as well as imitations of 16th century German goblets, in which he displayed a high technical aptitude At the same time, E. Rousseau and E Gallé were busy and soon created general admiration by their original work, shown at the exhibitions of applied arts in 1884. A third artist, E Léveillé, soon followed in practically the same direction

E Rousseau (b 1827), originally a ceramist, was seized, fairly late in life, by a passion for glass If his assiduous search did not always lead to new methods, his results were often most unexpected His system of applying opaque-coloured ornaments on clear and transparent glass was something very striking Equally novel was his way of producing a play of colour by introducing into the volume of the clear glass metal-oxides or glass dust In 1885 he started a collaboration with Léveillé, who after Rousseau's death in 1891, continued to work in his tradition Good samples of the work of both artists can be seen in the Museum of Decorative Arts in Paris In many respects they are the immediate predecessors of such very modern workers as Marinot At the outset, however, their fame was obscured by that of Emile Gallé, born at Nancy in 1846 After having learned his craft abroad, Gallé established a glass factory in his birthplace in 1874 His first attempts aimed at giving colour to his material without causing it to lose its transparency He first produced a blue colour by means of cobalt-oxides, which was the great success of the exhibition of 1878 Afterwards he succeeded in applying numerous other colours There is at the Museum of Decorative Arts a very beautiful vase, dating from 1884, with ornamentations in green and black in the clear glass, which is modelled in relief In 1889 he was able to announce that he could apply all colours from orange or lacquer-red to violet and purple He also practised glass-engraving Originally he disapproved of the use of acids, but gradually he gave up this attitude, and started researches into the production of coloured opaque glass with etched ornaments and of glass in double layers, with the ornamentation cut into the outer layer. About 1897 he was melting into his glass pieces of other glass or enamels of a different colour. Finally he devoted his efforts to the search for the so-called *pâte de verre,* in which others were to follow him with more success His contributions were novel in many respects as regards the material used, but in shaping his form he was not always equally happy—whenever his shapes are not extremely simple they become disagreeable, over-burdened with flower-ornamentations or even altogether in the form of flowers The leading place left open by Gallé was taken over by René Lalique, originally a designer of small ornaments, who soon after the exhibition of 1900 devoted himself to the making of glass Although Gallé had also designed household glass, he aimed mainly at the production of unique pieces by the application of diverse and difficult technical methods Lalique, on the other hand, applied to his work all the resources of modern mechanical production The application of enamels and engraving by means of the wheel have become exceptional The usual process now is that of moulding or blowing into set matrices This is considerably more expensive and therefore necessitates mass production

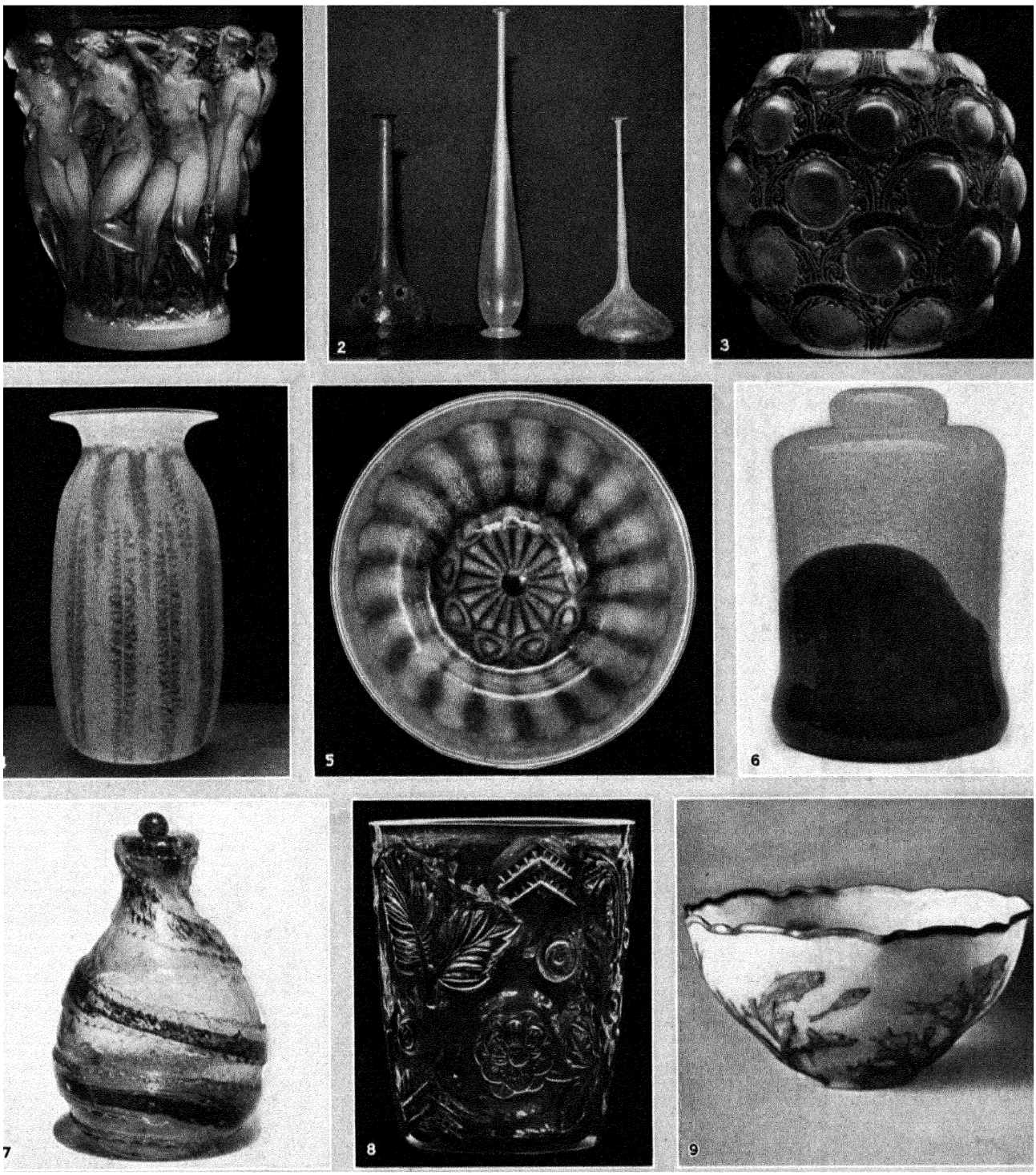
The system of moulding allows three main combinations. (*a*) The decoration can be applied completely or partly in relief to the object; it can then be enamelled (*i e* , coloured) or rendered mat by cutting (*b*) The decoration can be pressed into the object in bas-relief, thereby heightening the illusion owing to its greater transparency (*c*) The whole object is covered with a decoration which is enamelled and cut either mat or polished.

The colour of the glass can also be modified. Lalique usually borrows his decorations from nature (fish, deer, flowers, sometimes human figures). His work aims at pleasant elegance rather than at profundity For this reason he has given much attention to articles of general utility (perfume flasks, table glass), though he has also executed large decorative works in glass, such as the not very successful fountain of the Esplanade des Invalides, during the exhibition of 1925 in Paris, and also a mural decoration ornamented with fountains in the steamer "Paris "

Meanwhile, further work had been devoted to the other glass technique, that of *pâte de verre* The real initiator of this process is Henri Cros, whose efforts went much further than those of Gallé He was not always equally successful in this difficult work, but his large reliefs, such as those which are now at the Luxembourg museum, the Victor Hugo museum and the Museum of Decorative Arts in Paris, dating from approximately 1892, display a decided skill An artist who made even more interesting experiments was A Dammouse, who in 1898 began work on this process, which is based on a more or less ceramic treatment of glass-powder He manufactured vases and goblets, usually of small size, shaped like the calyxes of flowers, softly coloured (blue, purple and yellow-brown), which are notable for their refined delicacy In 1900 his example was followed by G Despret, who had been at the head of the glass manufacture of Jeumont since 1884 In collaboration with G Nicolet, Despret made little statues and what-not ornaments Of more artistic value, however, is the work of F Décorchemont, who also began as a ceramist and in 1900 followed the example of Dammouse He made considerable technical progress in obtaining a certain measure of translucency His vases and cups, coloured dark blue and heavy green, brown or lilac, picturesquely varied by touches of less translucent colour, nearly always bear a geometrical ornamentation on the outside

For the sake of completeness we may further mention the names of Argy-Rousseau, Walter, and Joachim and Jean Sala (father and son) who also worked in *pâte de verre* Although frequently not without a certain roughness, their products, as can be seen for instance in their fruit-bowls, possess a picturesqueness which would be more effective if the material were more satisfactory

It is not among the artists of the *pâte de verre* that we must look for the continuation of the glass-tradition of Rousseau, Léveillé and Gallé, but rather among those who have maintained the process of glass-blowing Of these the foremost is Maurice Marinot His followers include P. and A Daum and Henry Navarre, who works on more original lines Maurice Marinot started his career as a painter, but a visit to the glass factory of Bar-sur-Seine gave him a predilection for glass-work He exhibited his first attempts at the Salon des Indépendants of 1912 Marinot practises the craft in all its stages and handles the blowing-tube himself He adorned his first glasses with small coloured opaque enamels His motifs were birds, heads of women, flowers or festoons, with no other significance than a vivid colouring which enhances the transparency of the clear glass. Without altogether



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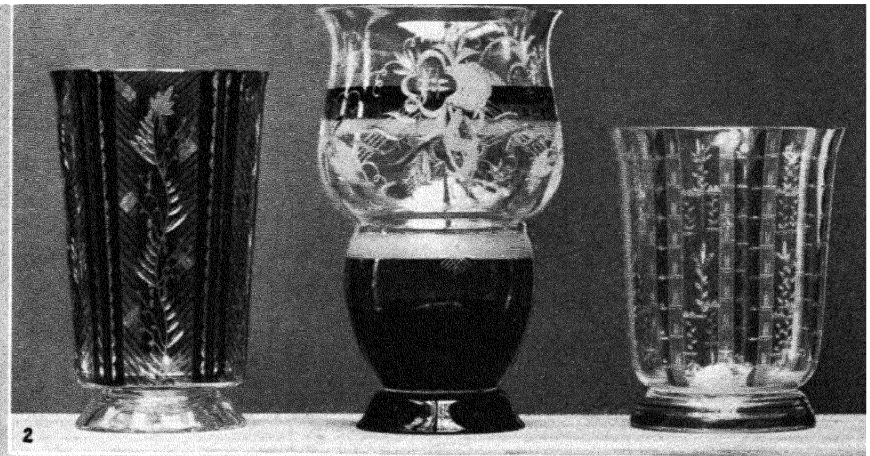
CONTEMPORARY EUROPEAN DECORATIVE GLASS

1. Vase by René Lalique, one of the leading French designers of ornamental glass. Lalique uses human figures as well as animals and flowers for effects of sculptured relief with subtle and delicate colour
2. Vases of coloured glass by C. Lebeau, a Dutch glass artist who has been a leader in developing various kinds of decorative technique
3. Vase by René Lalique
4. Vase by C. Lebeau
5. Plate by C. Lebeau
6. Vase, violet and manganese, by Henri Ed. Navarre, a French designer. Navarre has specialized in thick-walled vases in which ornamental colour or design is indicated inside the material
7. Glass flask by Maurice Marinot. French
8. Vase of cut glass designed by Michael Powolny, a glass artist of the Arts and Crafts school of Vienna
9. Bowl in *pâte de verre* by A. Dammouse, a French artist who experiments especially in the *pâte-de-verre* technique

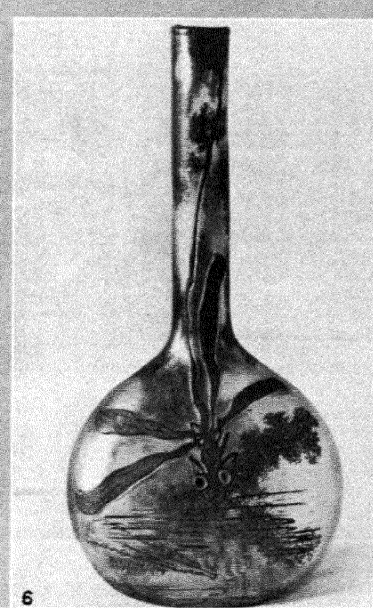












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FRENCH AND CZECHOSLOVAKIAN GLASS

1. Enamelled glass by Marcel Goupil, a contemporary French designer
2. Cut and engraved vases from the State technical school at Haida, Czechoslovakia
3. Vase by E. Leveillé, who with Rousseau and Gallé in the 19th century started in France a revival of interest in the designing and manufacture of fine glass
4. Bowl of etched glass by Maurice Marinot, a contemporary French glass artist
5. Vase by E. Rousseau (1827–91), French; an example of this artist's method of applying ornaments in opaque colour to clear glass
6. Vase by Émile Gallé (1846–1904), a French designer

abandoning his original methods he afterwards started to shape vases and bottles with very thick walls, in which, round the ornamentation that was usually composed of sharp angular lines, he made fairly deep indentations by treating the glass with acids. The result was to give more unity to the glass and the ornamentation. Marinot proceeded further in this direction by producing smooth glass without any exterior ornament, but very thick and ornamented by air bubbles inside the material The air bubble usually counted as a fault in the old glass-craft, but Marinot made it into an ornament by rhythmic repetition. A further step in this direction is the use of colour-oxides inside the material, by which the glass sometimes is made almost opaque. A factory directed by P. and A. Daum at Nancy started by following Gallé's example and produced decidedly satisfactory work. This factory now uses its own designs, shapes and colours, but applies the process of strong indentations obtained by acids which was initiated by Marinot. This work has enough originality and shows enough artistic ability to deserve special mention. Such is equally the case with the work of Henry Navarre, which was represented, for the first time at the exhibition of 1925, by thick-walled vases where inside the material a vaguely indicated, but regular ornamentation in blue, brown or black had been applied. This work was done anonymously for a factory indicated by the letters Umab. When this factory failed, Navarre started independent work in the Verrerie de la Plaine Saint Denis, near Paris His ornamentation is still applied in the same manner but has acquired more strength

Another and very able artist in the technique of glass enamelling, who also designs articles of general utility in earthenware and porcelain, is Marcel Goupy, who represents the genuine French taste, which never strays from delicacy He is undeniably the most gifted among a group of artists in decoration, of whom, in order to be complete, we mention also Maurice Dufrêne, Manzana Pissarro, Henri Farge, Simonet and Jean Luce. All these artists also produce household and table-glass which is generally very elegantly shaped Although the ancient factory of Baccarat has remained on the whole outside modern artistic development, it has entered upon new ways with the production of table-glass designed by G Chevalier and A. Bullet The Verrerie de la Compagnie des Cristalleries de Saint Louis produces work designed by Maurice Dufrêne.

Sweden.—Modern glass production in Sweden is an interesting development which caused general admiration at the Paris exhibition of 1925, where it became clear that for decorative as well as for household glass, Sweden had a right to a prominent place among European countries This is all the more remarkable because the development of Swedish glass maufacture has been so extraordinarily rapid Formerly Sweden played no important part in glass production There was an old factory established in 1741 at Kosta, near Karlskrona, which mainly produced plain household glass and only in the course of the last 25 years, after its amalgamation with the Reymyre factory, began to produce cut glass also Among others, Gunnar Gunnarson Wennerberg did work in the manner of the Frenchman Gallé But good glass cutters had to come from the Bohemian technical school of Steinschonau The ablest among them is Richard Bayer A factory established in Dec. 1917, the Svenska Krystallglasbruker, under the direction of Edvin O Ollers, showed promise, but had only a brief existence On the other hand, the Orrefors Bruck established at Orrefors in 1898, which is now directed by Edvard Stromberg (b 1872), is still flourishing Stromberg learned the craft at Kosta, and established his own factory at Sandwik in 1905 In 1918 it was amalgamated with that of Orrefors, which thereupon acquired considerable importance. The factory of Orrefors is mainly concerned with the production of household glass, which has a pretty shape and outline, is slender and delicate and is characterized especially by the topaz, amber or brown colouring of the material. Ornamental glass is also produced with designs in colour, burnt into the glass This is known as Grail glass This work, which is very varied, is designed by Edvard Hald and Simon Gate, two Swedish artists who do not limit themselves to the design of shaped and coloured glass but also design engraved and polished ornamental glass with remarkable artistic talent. There are numerous engraved ornamental goblets Without definitely following old models, Gate in his designs mainly applies the ornamental methods of the old art of glass-engraving. On the other hand, Hald appears to be endowed with a richer and more original ornamental gift It is not impossible that his international training has pointed the road to him in a happy manner There is no doubt that in his work the somewhat playful ornament of the Viennese has given its peculiar charm to the Scandinavian background, without in the least impairing its individuality He is particularly happy in representing the human figure, a remark which equally applies to Gate The cutting done by these two artists has considerable merit The engravers who worked under them, such as the Swedes G. W P. Abels and B. E Ryd, and the German W. H. Eisert, have been trained to forceful work displaying no hesitation and characterized by a perfect and exquisite finish. (*See* STAINED GLASS; MOSAIC)

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ENGLISH GLASS

The British people have contributed much to the well-being of the world by their manufacture of glass Crystal glass, plate glass, window glass and bottles are all produced in large quantity by British factories, but of these, crystal or flint-glass, is best known. Flint-glass is really a glass of lead, a heavy brilliant crystal-like glass, composed of lead potash and sand; as powdered flints happened to be used at first, instead of sand, the name flint-glass remained It is essentially a useful glass, and from its very nature is incapable of the artistic development seen in the fragile and easily worked glass of Venice The British glass-makers did however make the most of a beautiful but intractable material and their work is marked at most periods by seemliness and good taste; simple useful shapes were chosen for glass vessels of all kinds, and decorated in ways most appropriate to the nature of flint-glass, with cutting as the most obvious means, many other experiments in decoration were tried, but all were abandoned in favour of cutting and engraving, which have been practised in England for over 200 years and still retain their popularity.

The 16th and 17th Centuries.—Flint-glass was introduced about 1675. Before that time glass for table service had been made in England on a small scale, but it was really Venetian, light in weight and of fragile material, and in form mere copies of simple Venice examples, made by Italian glass-makers, or their English pupils Few of them have come down to us intact, but fragments, excavated in London and elsewhere, have revealed their actual shape and quality. Edward VI. induced a few wandering Venetian glass-makers to settle for a while in London, and again in 1570 Italian glass-makers appeared Elizabeth procured the services of a Venetian, Jacob Verzellini, and in 1575 granted him a patent or monopoly for making Venetian specimens (Plate II., fig 1) In 1592 the glass monopoly was transferred to Sir Jerome Bowes, and in 1615 to Sir Robert Mansell, who had good results with the help of Italian glass-workers (figs 1 and 2) The Protectorate put an end to glassmaking by monopoly, and for some time John Greene and other London glass-sellers imported their wares from Venice, which were generally made according to English designs (fig 3). One good result came from these early experiments in glass-making In 1615, owing to the demands of the navy, the glass-makers were forbidden to burn wood as fuel, and in consequence they had to use coal furnaces and closed glass pots giving intense heat, an essential to flint-glass making. Again, about 1660, Italian glass-makers were brought over to London, and with the help of one of them (Seignior De Costa) George Ravenscroft evolved the famous flint-glass about the year 1675, marking his glass with a glass seal, bearing the device of a raven's head (fig 4); his rivals followed suit, so that five different glass trademarks of this period are now known This custom of marking glass was

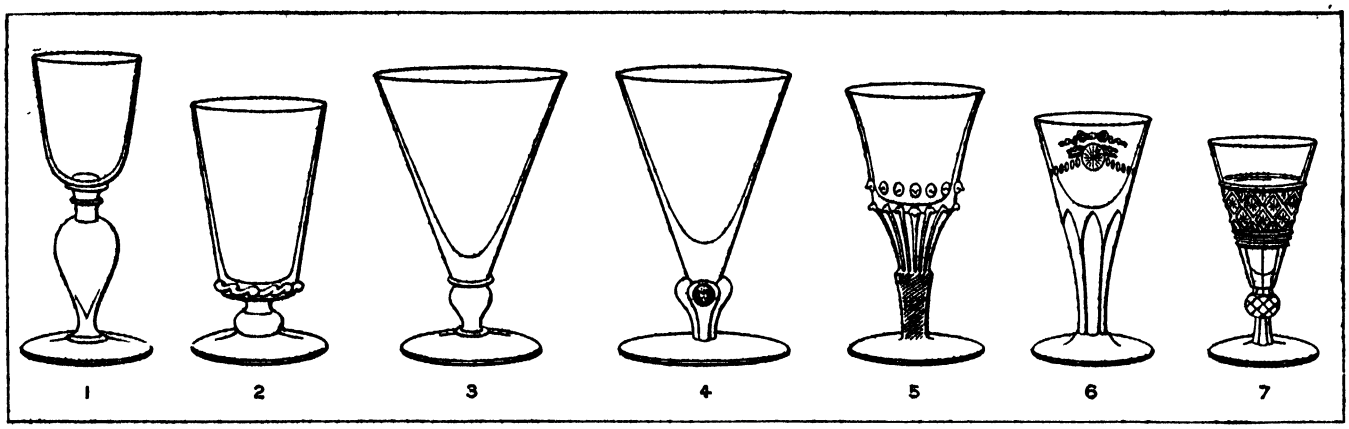


FIG. 1.—MANSELL EARLIER GLASS. A CUP-SHAPED BOWL ON LONG URN-SHAPED STEM FIG 2.—MANSELL LATER GLASS. LARGE STRAIGHT-SIDED BOWL ON COLLAR AND SMALL PEAR-SHAPED STEM FIG 3.—JOHN GREENE'S FORM. LARGE FUNNEL-SHAPED BOWL ON INVERTED PEAR-SHAPED STEM. COLLAR AT NECK AND FOOT. FIG 4.—RAVENSCROFT'S SEALED GLASS, IDENTIFIED BY SEAL BEARING DEVICE OF RAVEN'S HEAD FIG 5.—ORNATE GLASS WITH PRICKLY BOWL AND TWISTED STEM FIG. 6.—FUNNEL-SHAPED GLASS WITH STEM CUT IN LONG FLUTES AND ENGRAVING ON BOWL FIG. 7.—HIGHLY CUT GLASS WITH KNOPPED STEM AND DIAMOND CUT BOWL

dropped about 1690, when flint-glass had become generally known Ornate drinking-glasses made about this time (fig 5), were due to the prevailing taste for highly ornamented table service, for which the silversmiths were mainly responsible, but just before 1700 this fashion changed, and there followed a period of simple tableware, lasting nearly 25 years

The 18th Century.—In the 18th century the decoration of drinking-glasses was mainly stem decoration, and there were five different kinds of stem in fashion during this period without counting minor variations (Plate I) These are known to collectors today as the baluster stem, the plain stem, the air-twisted stem, the opaque-twisted stem, and the cut stem From 1747 to 1760 all kinds were being made simultaneously, but out of this welter of competing fashions, only two styles survived. the cut stem for fashionable glasses and the plain stem for those of ordinary use The taste for elaborate stem decoration arose first of all from the national craving for intricate artistic ornament of all kinds, which started about 1720. Stem decoration of glasses was encouraged in 1746 when the Government laid a tax upon glass according to its weight rather than its value, so that it became most profitable to make and sell elaborately decorated glass.

Venetian glasses of the 17th century, whether made abroad or in England, had generally hollow stems blown into various shapely mouldings, known as baluster stems; this name is still given to all stems with one or more distinct mouldings or swellings The difficulty of making an entirely hollow stem in flint-glass soon led British glass-workers to make a solid baluster stem, or one with only a small hollow core, like a large teardrop (Plate I, fig. 1). These drinking glasses were heavy and had at first large bowls and short stems. Gradually the stem was lengthened out and more elaborately modelled, and the bowl was reduced in size (Plate I., fig. 2).

After the Glass Excise Act (1745) heavy glass was no longer profitable to make, but more slender versions of the baluster stem survived till 1768, having simple "olive buttons" in the stem, and often engraved (Plate I, fig 3)

Tall goblets with plain stems were made in the 17th century as suitable for special beverages. Until 1746 they were generally of substantial size, of good quality and still used for special kinds of wine (Plate I, fig. 11), but the excise duty made these simple types unpopular, and thenceforward wine glasses with plain stems were generally made smaller and lighter, to be used in the tavern and household (Plate I., fig 12).

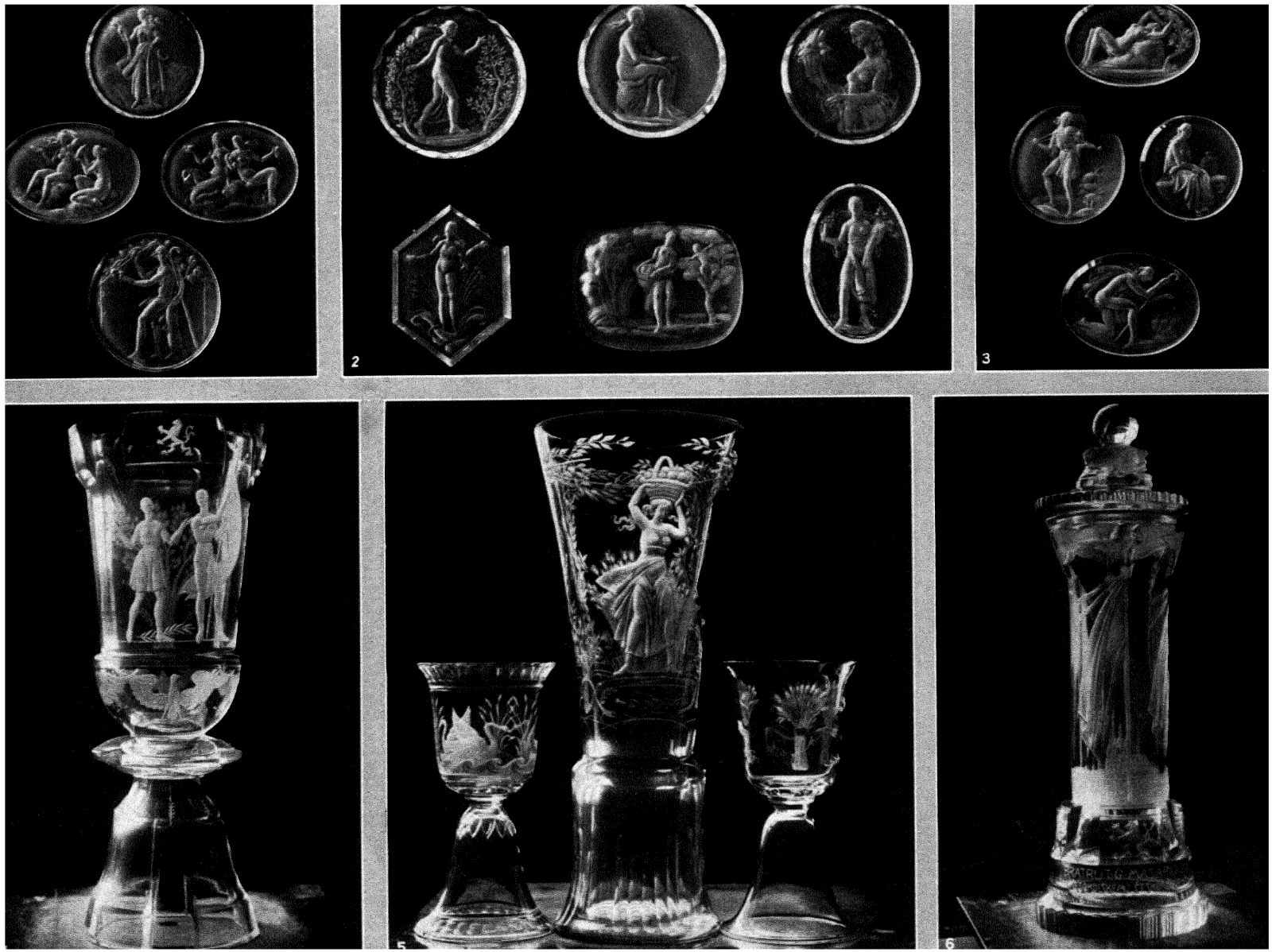
Drinking-glasses with the air-twisted stem were in fashion in England from about 1735 to 1760, and in Ireland till somewhat later. An air-twist in the stem was made originally by inserting a number of large air bubbles in the thickened base of a partly formed bowl and then drawing down the bowl into a stem and at the same time twisting the stem; the air bubbles were thus contracted and formed into corkscrew air-lines within the stem. At first the result was a coarse, irregular spiral (Plate I., fig. 4), but with practice the regularity and symmetry of the air spiral were improved Air-twisted stems were sometimes made separately, and were then welded to the bowl as well as to the foot of the glass (Plate I, fig. 5); such stems are remarkable for their extraordinary intricacy (Plate I, fig 6) An almost national type of decoration, the air-twisted stem could only be made well with the best flint-glass The glasses cost at the time 7d each

Drinking-glasses with the opaque-twisted stem originated in Bohemia, they came into fashion in England about 1746 as a means of evading the glass tax, which omitted the taxation of the enamelled kind The stem was here formed of opaque enamel glass threads, encased within clear glass This result was obtained with the aid of a cylindrical mould first lined with clear glass, and the centre then filled with one or more canes of enamel glass; it was then heated in order to weld the contents together Next the large lump of striped glass was withdrawn from the mould, reheated, twisted and drawn out like a long rod, to be cut up later into short lengths, which formed the stems of a set of glasses. At first, while the process was in an experimental stage, the glasses had a single broad band of enamel glass, like a twisted tape, within the stem (Plate I, fig. 7) Later kinds have spirals of many fine enamel threads most ingeniously arranged (Plate I, fig 8) As many as 56 fine threads have been counted in a single stem White and coloured enamel glass was used to form the opaque spiral In 1777 the Second Glass Excise Act taxed enamel glass, and the glasses soon went out of use

Glasses with cut stems had the surface of the stem cut into small grooves, or facets, which formed a regular and continuous diamond pattern round the stem The glass was cut by being held firmly against a revolving iron wheel called the "scalloper's mill"; the cut facets were then smoothed with a stone wheel and finally polished with a wood and brush wheel The decoration of glass by cutting and engraving came from Bohemia and was introduced into London shortly before 1720 After 1745 cut wineglasses grew in popularity, until by 1777 they were almost the only fashionable kind produced Furthermore, they were made shorter and the style of cutting began to change Stems were often cut with long upright grooves like the flutings on a pillar (fig 6) Just before 1800 further changes were made, both in shape and style of cutting, the bowls being more heavily cut than the stems (fig 7) Since then there has been little change in the style of cutting, although after 1845, when the glass excise was abolished, taller goblets were again made.

Cut glass has never been cheap; in 1755 simple types cost 7d each (Plate I., fig. 9) and more elaborate pieces as much as 2s (Plate I., fig. 10).

Glass vessels were also decorated by having various designs scratched or cut upon the bowl. The earliest method was simply to scratch the design on the bowl with a diamond point (Plate II., fig. 1), but after 1720 engraving was generally done in the Bohemian manner, by cutting the glass with small copper and stone



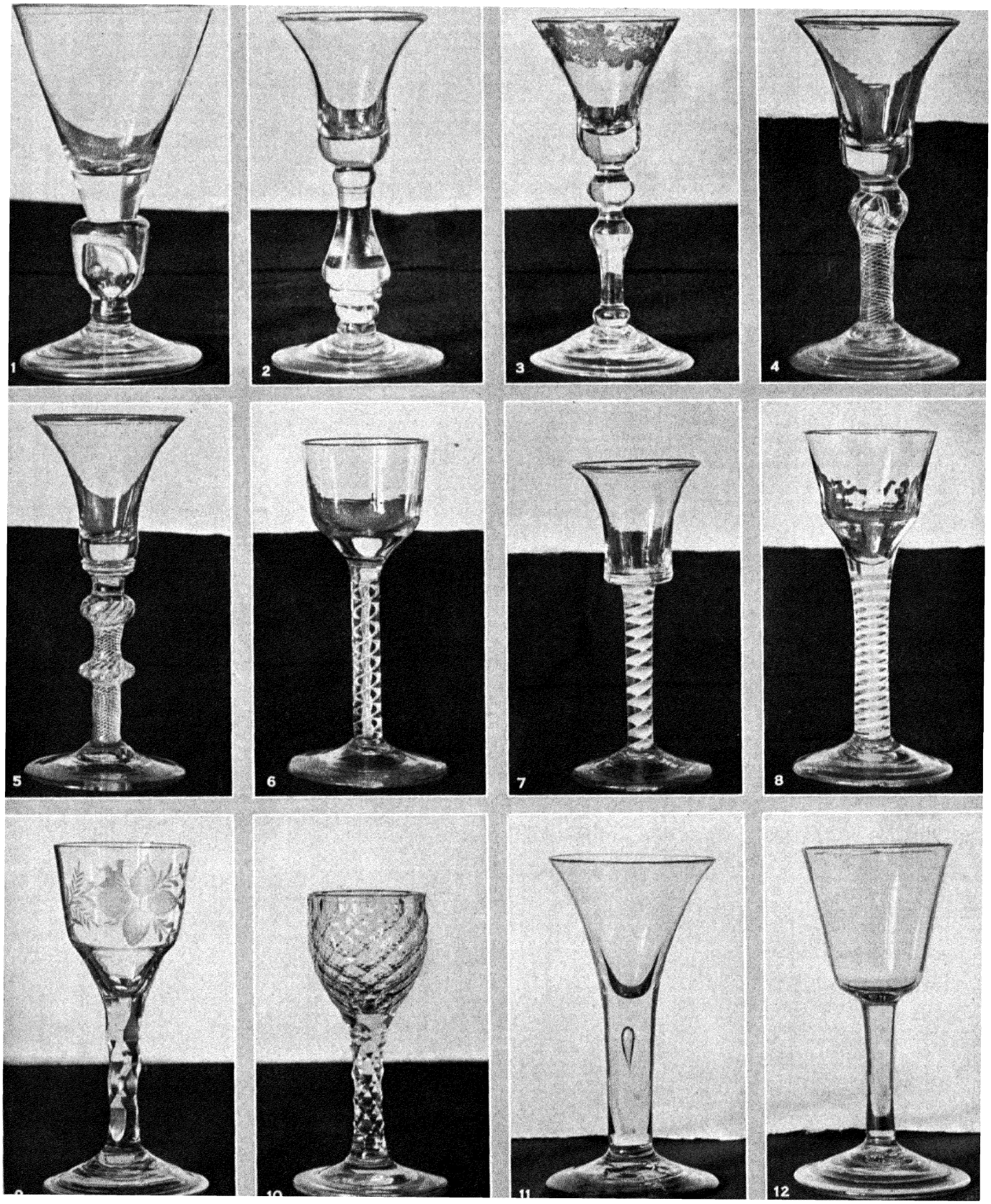
BY COURTESY OF JOSEF DRAHOŇOVSKY

CRYSTAL GEMS AND ENGRAVED GLASS FROM PRAGUE

1, 2, 3. Gems in transparent rock crystal designed by Josef Drahoňovsky; Prague

4, 5, 6. Ornamental cups and glasses engraved after designs by Josef Drahoňovsky

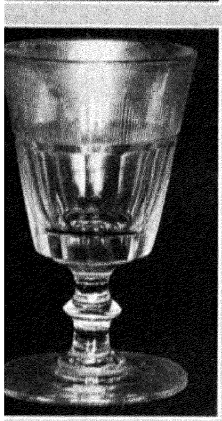
GLASS

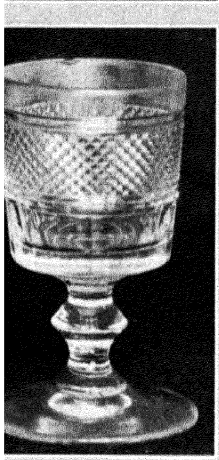


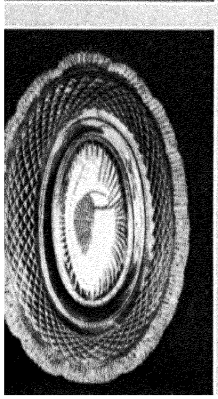
THE DEVELOPMENT OF THE WINE GLASS IN THE 18TH CENTURY

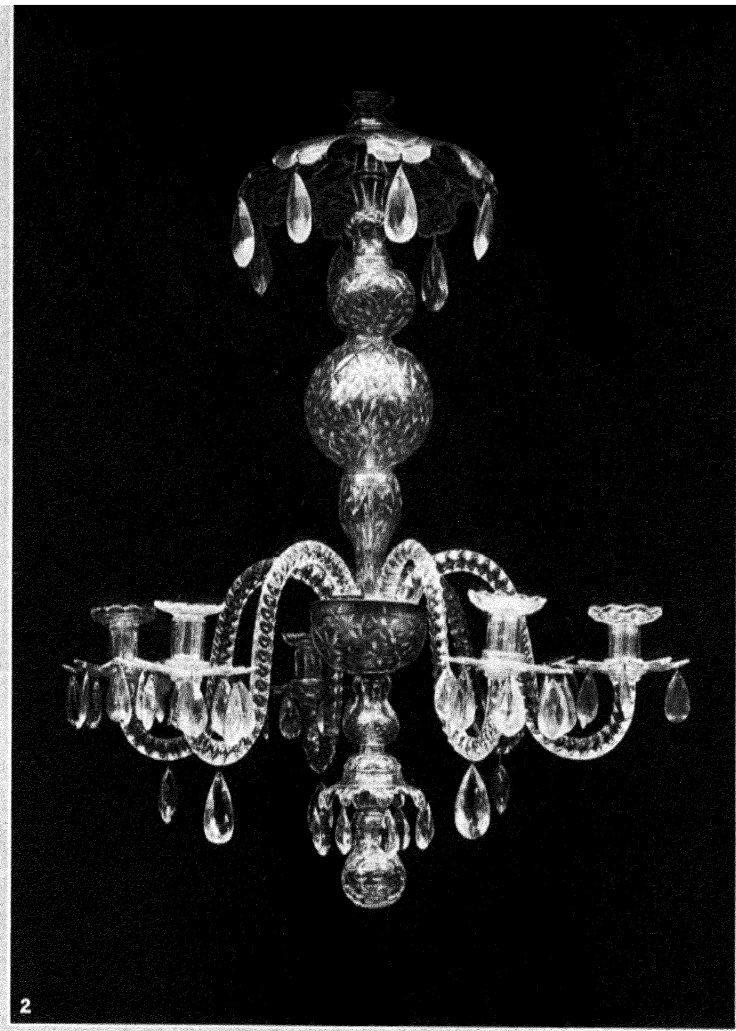
The five main kinds of wine-glass stem are shown, illustrating, in each group except the last, a transition from simple to elaborate decoration. 1–3. Baluster stems. 4–6. Air-twisted stems. 7–8. Opaque twisted stems. 9–10. Cut stems. 11–12. Plain stems



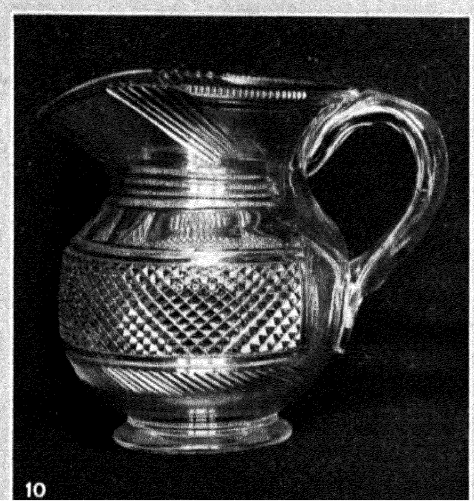


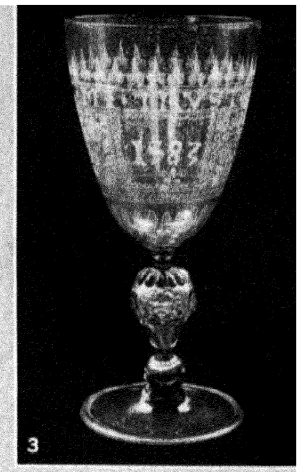


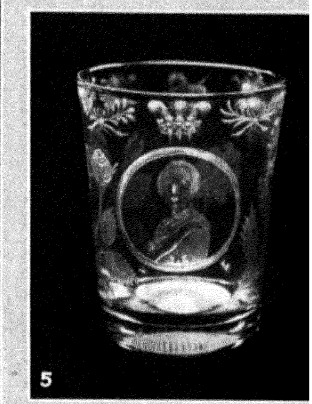


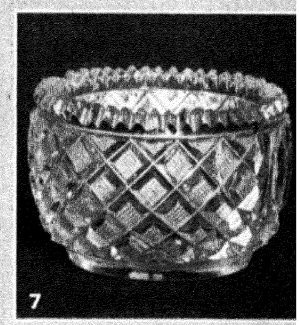


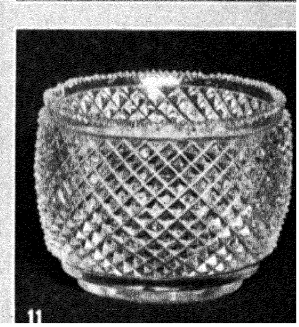












BY COURTESY OF (1, 3, 5) THE HAMILTON CLEMENTS COLLECTION, (2) CECIL DAVIS, (4, 6, 7, 8, 9, 10, 11) M. S. DUDLEY WESTROPP AND THE IRISH NATIONAL MUSEUM COLLECTIONS

ENGLISH AND IRISH GLASS OF THE XVIII. AND XIX. CENTURIES

1. Early cut dessert glass, middle 18th century
2. Fine lustred chandelier
3. Goblet by Verzellini, dated 1583
4. Wine glass of Irish cut glass, early 19th century
5. Tumbler engraved with portrait of the Young Pretender
6. Wine glass of Irish cut glass, early 19th century
7 & 11. Salt cellars with diamond cutting, Irish
8. Dish with plain diamond cutting, Irish
9. Decanter marked "Waterloo Co. Cork" c. 1820
10. Water jug with diamond cutting and flanged base

GLASS



BY COURTESY OF (1, 2, 3, 7) THE METROPOLITAN MUSEUM OF ART, NEW YORK, (4) EARL J KNITTLE, (5, 8, 9, 13, 14, 15) ARTHUR SUSSEL, (6) GEORGE S. MCKEARIN, (10, 11) FREDERICK K. GASTON, (12, 16) KNITTLE, "EARLY AMERICAN GLASS" (THE CENTURY CO.)

AMERICAN BLOWN GLASS; 1790–1860

1–2. Early examples made of inferior grade silica

3–4. Rigaree decorated vase and gimmal flask made in New Jersey, showing Spanish influence; 1790–1860

5. Heavy "off-hand" pitcher blown for home use from bottle or window-glass; 1800–30

6–7. Footed, reamed edged, superimposed and tooled bowls from New Jersey and New York State; 1820–40

8. Crimped or indented base and handle, common to works employing Dutch and German artisans; 1780–1860

9. Pitcher showing plastically applied threads about neck and superimposed and tooled body; 1820–40

10. Tri-coloured striated or whorled technique used mainly in New Jersey, Pennsylvania and Massachusetts works; 1830–60

11–12. Types giving evidence of a variety of Continental influences; 1820–40

13. Early "chymical" or apothecary ware made at various bottle and window glass works

14. Wine glass attributed to Pennsylvania, showing both English and German influence; 1770–1830

15. Jar blown from window glass at Columbia glass works, New Jersey; 1820–40

16. Dense amber vase and ball cover made at Saratoga, N.Y.: 1845–60

wheels (Plate I., figs. 3 and 9), which is a more difficult and delicate method of cutting glass. Etching on the glass with acids was not much practised in England until more recent times. The most interesting engraved glasses, from a sentimental point of view, are those relating to the fallen house of Stuart, and no other country in the world possesses such a series of interesting political glasses (Plate II, fig. 2).

Cut Glass.—The introduction of glass-cutting was commercially an event of supreme importance to the welfare of glass-making in Great Britain and Ireland. At first Bohemian glass-cutters were employed by a few of the more enterprising London glass sellers; John Akerman, employing a man named Haedy, advertised "diamond-cut flint glasses" in 1719. Haedy eventually acquired a business of his own, which prospered for three generations. Benjamin Payne, another London glass seller, advertised "diamond-cut flint glass" many times from 1735 onwards; he too must have employed a Bohemian glass-cutter. Thomas Betts, a London glass-cutter (1738–67) at first employed a Bohemian, Andrew Pawl, but afterwards instructed pupils himself Jerom Johnson (1739–61), a self-taught London glass-cutter, became successful and is found selling cut-glass for exportation in 1749. These men laid the foundation of the cut-glass trade in London, where it was "greatly in vogue" in 1747 Bohemian glass-cutters continued to come over and assist in the production of fine cut-glass, *e g*, Tresler, Laurikus, Ayckbowm, Gerner and Benedict, whose work in London between 1750 and 1800 is now well known After 1750 the art of glass-cutting spread gradually to other parts of the country. And by the middle of the 18th century London cut-glass had displaced the Bohemian cut glass in European markets

Originally, the most popular articles in cut-glass were lustres (Plate II, fig 4) and sets of dessert glasses (Plate II, fig. 3); but by 1742 all manner of cut-glass articles were being advertised At first cutting was confined to hollow diamond patterns until 1770, when the fluted patterns came into fashion; finally, convex or raised diamond patterns and prismatic cutting were introduced (*c.* 1800) These last were quite British in type, and are the styles of cutting most in favour today Specimens of Irish cut-glass, which began to be made on a large scale in 1780, sufficiently illustrate this stage of the national glass-cutting (Plate II., fig. 5); in design no very great advance was made after 1825. From 1835 onwards there was a return to the simple fluted style of cutting for wine-glasses, but they were then of a shape unsuitable for this decoration.

The present cut-glass designs are more or less copied from those of the period 1800–30, popularly called Waterford The use of steam engines to drive the cutting machines led the glass-cutters to sacrifice the natural blown forms of glass for the sake of a masterly display of deep and accurate cutting, and glasses became too deeply and profusely cut, emitting a blaze of prismatic light, but having an unpleasantly rough surface The worst types produced were early Victorian; John Ruskin, impressed with the vulgarity of these glasses, wrote a sweeping condemnation of all cut-glass, which for a time brought the craft into discredit and undoubtedly injured the national glass trade. Decoration by cutting almost disappeared for a time. Latterly, however, cut-glass has recovered much of its former popularity The distinguishing features of modern flint-glass are its purity and its cold perfection Glass-making is now treated scientifically for, with world wide competition to face, economy and efficiency are essential to the prosperity of the trade, which owes not a little to the foundation of a Society of Glass Technology at Sheffield university, and to the researches and experiments carried on there under the supervision of Prof. W. E. S. Turner.

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(F BUC)

AMERICAN GLASS

The development of American glass-making from both commercial and aesthetic standpoints is unlike that of ancient, oriental or European endeavours in the same field From the semi-mythical period to the present day, the industry has encountered almost insurmountable handicaps and has had to solve problems in respect to glass manufacture different from those of other lands. Stringent migration laws from Old World glass houses, regarding their workers, resulted in a great scarcity of operatives for early American furnaces; the assistance and patronage of guilds and trades societies enjoyed by European artisans was non-existent in the United States, poor pot-clay and silica bed ingredients, the constant recurrence of conflagrations, an apathetic attitude on the part of the general public during the 17th and 18th centuries, and the tendency of the workmen to turn agriculturists, doomed nearly every attempt to failure almost before it had started.

THE 17TH CENTURY

As it happened, the 17th century was almost a glassless age in the American Colonies. Men lived and died in the more isolated sections without ever having seen the substance called glass It is not definitely known what furnaces made the first window-panes, 1629 being the earliest record of glass for this purpose brought from England by the settlers Many 17th century households were equipped with durable pewter, wooden and iron utensils, crude glass bottles, bowls, pans and pitchers were more of a luxury than a necessity

America was so busily engaged in the matter of expansion, civilization and upbuilding, in the preservation of life itself, that the cultural aspects of many of the arts and crafts were neglected In time, the more well-to-do sent to Europe for their drinking-glasses and decanters, and the tide of imports gradually increased Native sporadic endeavours could not compete in quality or quantity with foreign production.

The earliest glass furnaces were situated along the Atlantic seaboard, the first attempt at glass-making being in the spring of 1609 The previous autumn, the London company sent eight Dutch and Polish glass-blowers to Jamestown, Va, who began the manufacture of crude articles for the settlers and for exportation purposes, Robert Mansell not having yet received his patent for sea-coal as a fuel for glass furnaces in England Extant records state that this production was the first made-in-America article to be exported. The operations were short-lived The next attempt was promoted by the same company in 1621 when Venetian workmen were sent over from London for the purpose of fabricating beads used for barter with the Indians in return for large tracts of their land. After several years the undertaking collapsed A few remains of these round and cylindrical coloured beads have survived This may be called America's first mint Salem, Mass, was the seat of the third brief experiment In 1641 Obadiah Holmes and Lawrence Southwick built a primitive plant wherein, it is thought, window-panes and roundels, coarse bowls, bottles, pitchers and lamps were blown intermittently for two or three years

The first centralized industry was in the Dutch settlement of New Amsterdam on Manhattan island, where glass was probably manufactured continuously from 1645 to 1767 The earliest furnaces were built on Glass Makers street (now William street), the later ones several miles further northward, at the Glass House Farm situated on the Hudson river Johannes Smedes, Cornelis Dirkson, members of the Jansen and Melyn families, and other Dutch artisans also practised the art of glass-blowing in New York Evert Duycking and his son Gerrit made America's first coloured art glass for the windows of the Dutch Reformed and other churches in the vicinity between 1654 and 1674

THE 18TH CENTURY

The majority of the glass-house proprietors before 1825 were foreign-born—English, Dutch, Germans and Bohemians; few of them, however, had received technical training or had been connected with glass manufacture in Europe. Glass-making in America was entered into for the primary purpose of assisting in the industrial growth and independence of the country. With the predominance of trained foreign-born workmen, the production took on the methods of mixing and manipulation which were practised by the

gaffers, teazers and blowers in their former English, Dutch, German and Bohemian houses Thus it is not surprising to find a European prototype for nearly every piece of glass made in America during the first 200 years of her activities in this field In structural forms and decorative motifs America imitated and assimilated It was not until the coming of mechanical inventions that American types originated To make attribution of 18th century glass more precarious, no designs, pattern books, moulds or mould models have survived

Caspar Wistar, who emigrated to Philadelphia from Germany, sent to Belgium for four glass workers in 1739. He erected a small furnace in South Jersey where window and bottle glass and chemical apparatus were blown Upon Caspar's death in 1752 his son Richard took over the plant, enlarged its capacity, and carried on the work until 1781 The majority of the surviving authenticated examples are termed "off-hand" blown glass, *i e*, pieces which the workmen fashioned for their friends or families apart from the regular production The blowers often added a bit of colouring matter to the last run of glass in the pot, then exercised their greatest skill in fashioning these useful and ornamental objects This off-hand blown glass forms the preponderance of examples in the American collections until the advent of the historical blown and moulded flask and the invention of the mechanical pressing-machine

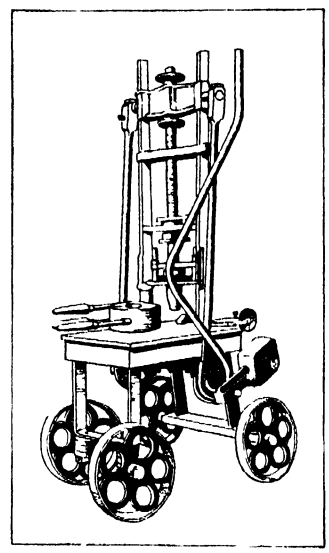
Contemporary with the Wistar works, the Bamper-Bayard undertaking in New York and at New Windsor, up the Hudson, doubtless made the same kinds of glass and employed similar styles in the fashioning of the hand-manipulated household commodities What we term the "South Jersey technique" was probably practised in a limited way by all of these blowers It was not until the beginning of the 19th century that it flowered forth in several separate sections of the expanding country

South Jersey types of glass are sturdy, substantial, capacious, bold of execution, yet well-balanced and graceful There is a delicacy of curve in the handle and an artistry in the crimping of foot Although a piece may combine plastically applied threads about the neck, superimposed decoration around the body, crimped handle and foot, it does not appear top-heavy, or over-elaborated The principal methods of decoration are as follows:—(1) Superimposed decoration After the piece had been fashioned, the lower portion of it was dipped into molten metal of the same colour, and while still plastic, the upper part of this second layer was tooled, or drawn out by pincers into wave-like, lily-pad or similar flowing ornamentation Bowls, pitchers and vases were frequently thus treated (2) Plastically applied threads of molten glass were wound around the necks of pieces, about the dome of a sugar-bowl, and occasionally around the body of a pitcher These threads were often of contrasting colour to the piece itself. (3) Crimpings or indentations were applied to the still plastic finials, handle ends and feet of many examples A little revolving wheel attached to a wooden handle was probably used for this purpose (4) Blobs, prunts or seals of plastic glass were applied to the formed articles. Such ornamentation is frequently found in bi-colour and tri-colour effects This type is rare (5) Striated or whorled bi-colour and tri-colour combinations both in transparent colourings and in transparent and opaque glass were used by the latter-day houses These alternating colour loopings, like their Venetian prototypes, produced a bizarre but beautiful effect

The province of Massachusetts witnessed an undertaking from 1748 to 1757 which was fostered by Joseph Crellins from Franconia and taken over by Joseph Palmer from Devonshire, England Situated near Quincy-Braintree, the place was called Germantown, the operatives being Palatinates This glass works, in combination with other industrial endeavours, was one of the first localized general manufacturing attempts in the Colonies The buildings were struck by lightning and burned down, and almost nothing is known about the production

The Pitkin glass works, Connecticut, built 1783, was probably the first native plant to utilize "half-post" or double-dipped German method of bottle blowing These perpendicularly, closely ribbed and fluted flasks, later copied by the Keene works (N H), have become one of the outstanding types in the collectors' catalogue The quality of the metal, and the green and amber colourings found in the Pitkins are above the average. A limited number of clear white glass flasks blown in the same manner were made at some of the later mid-western houses The bottle, embodying every method of manipulation, and every technique practised in America, is the outstanding glass product, holding the same relative position in America as that of the drinking-glass in England

The most beautiful glass ever blown in America was made in Mannheim, Lancaster county, Pa., by Henry William Stiegel who was born in Germany in 1729 and emigrated to the New World in 1750. Although he is frequently called "Baron" Stiegel, this title is erroneous, for he held no patent to nobility He needed none After small initial efforts at Elizabeth Furnace, Stiegel believed that the time was economically ripe for a pretentious glass-making undertaking in the provinces, that the tide of imports might be checked, taxation reduced and home industries developed Taking the advice of patriotic Americans, he purchased a one-third interest in a tract of land near Elizabeth Furnace, calling it Mannheim, and then proceeded to erect a good-sized glass-house and other appurtenances Stiegel then departed for Europe where he learned some of the finer points of glass-making and hired trained operatives from Bristol, Venetian and Bavarian houses—glass-cutters, engravers, etchers, gilders, workers in vitrifiable enamels and in the pattern-mould expanded technique The lead flint metal mixers and the colour compounders brought their formulae with them and the workmen brought their tools and probably some of their moulds. The first run of glass occurred at Mannheim in 1765



AN EARLY TYPE OF PRESS, SHOWING THE MOLD WITH ITS HANDLES ON THE TABLE OF THE PRESS

This was probably the beginning of lead-flint glass-making in America Everything augured success, but in two years the general depression preceding the Revolution, coupled with the increasing personal extravagances of Stiegel, gradually led to complete financial failure Unmindful of the signs of the times, he erected a larger furnace in 1769 The last firing occurred in 1774 The name Stiegel, as applied to American glass, has unfortunately, like that of Wistarburg and Sandwich, become almost generic Quantities of glass, old and new, native and foreign, good and bad, are thoughtlessly or deliberately called by these names Fine old blown coloured glass from Bristol, English-Irish cut-glass wines and decanters, Spanish, Dutch and German etched and engraved tumblers, flips and other articles, Rhenish enamelled cannisters and jugs, Venetian bottles, and the somewhat later American mid-western specimens are unhesitatingly called Stiegel Modern imitations add to the confusion Attribution and authentication of surviving pieces requires time, patience and caution

The most outstanding types of glass made by Stiegel are as follows: (1) Plain surfaced blown and hand-manipulated ware. (2) Expanded types blown into part-sized pattern-moulds (3) Panelled or fluted types, blown into full sized moulds (The above groups are found in remarkably beautiful colourings, such as cobalt, emerald, amethyst and yellow) (4) The use of vitrifiable enamels upon a clear white or a blue surface (5) Cut, etched or engraved methods of ornamentation (6) Gilded ornamentation(usually in combination with No 5.

The greatest exodus of glass-workers from Europe to America occurred in 1784 when 82 operatives left the Bremen manufactory, Germany, and under the leadership of John Frederick Amelung established a communal industry near the town of Frederick, Md Although exceptionally well financed, the enterprise soon collapsed

Amelung made window, bottle and flint glass, yet few authenticated pieces have been identified The Metropolitan Museum of Art owns the most remarkable example, a marked and engraved covered presentation goblet on a bulbous baluster stem After the abandonment of the New Bremen glass works, the blowers either established or found employment in the plants at Baltimore, Md , or in trans-Alleghany houses such as the New Geneva and the Pittsburgh, Pa , plants, the Wellsburg, Va (now W Va), and the early Ohio furnaces In 1797 Major Isaac Craig discovered coal in a hill-side along the Monongahela river at Pittsburgh This marked the beginning of glass-making across the Appalachian range of mountains. Anthracite and bituminous coal gradually supplanted wood as fuel for the glass-house furnaces The erection by Craig and James O'Hara of an eight-pot window and bottle-glass house adjacent to this first coal bank was the beginning of the great Pittsburgh glass industry

THE 19TH CENTURY

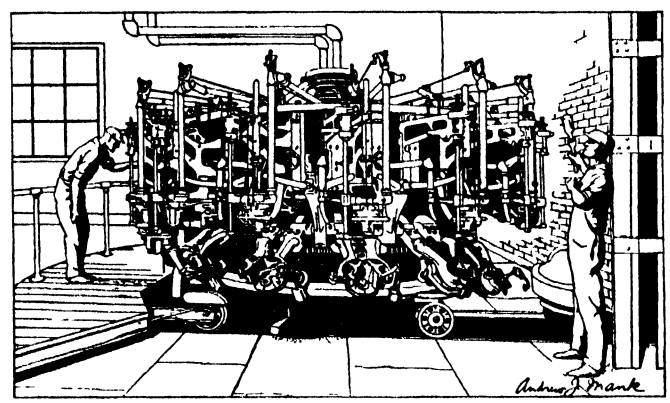
In the years following the Declaration of Independence until 1825, local and national troubles, sporadic wars, political agitations, land-bubbles, panics, high transportation rates, and inebriate and nomadic tendencies of the workmen handicapped the progress of native glass-making Long credits and poor collections affected economic stability, yet a constantly increasing population demanded glass for many purposes The glass pressing-machine was invented in 1827, and in this momentous decade occurred the imprint of national heroes and historical objects upon whiskey flasks and cup-plates The first historical flask was probably designed by Thomas Stebbins of Coventry, Conn , or by Frederick Lorenz, who purchased the O'Hara works in 1819

Numerous attempts at window and bottle-glass manufacture were made in upper New York State, New Hampshire, Vermont, Massachusetts and New Jersey from 1800 to 1840, the off-hand blown examples from the Redwood, Redford, Salisbury, Saratoga, Stoddard, Glassboro and other houses generally manifesting the South Jersey technique There were at least 250 glass-houses in America prior to 1870

Two Englishmen, Robert Towars and James Leacock, built a small bottle-glass furnace in Philadelphia in the Kensington district After passing through various ownerships, it was purchased and enlarged by the picturesque, self-styled "Dr " Dyott who established the patent medicine business upon a firm foundation in the United States Dyott manufactured the containers at this furnace, and concocted the contents elsewhere That he impressed his name, or that of Kensington, on so many of the bottles is a boon to the present-day collector The two leading table-ware and flint-glass manufactories in Massachusetts were the New England Glass Company, of Cambridge, established in 1815, and the Boston and Sandwich Glass Company incorporated in 1825 Prior to 1818 none of the manufacturers could solve the secret of compounding red-lead or litharge, which prevented America from making crystal glass or lead flint which could be cut in the English manner Deming Jarves, then an owner of the Cambridge works, built a set of furnaces for experimentation in the compounding of litharge, his first attempt meeting with success For years Jarves held the monopoly of the red-lead business in America. In 1827 Enoch Robinson, of the Cambridge industry, invented the first crude pressing machine, which was almost immediately improved by Jarves, now a part owner of the Sandwich plant By 1838 the invention was perfected and pressed-glass became popularized, although it did not become a household commodity until about 1845 America was now sending these machines to all the glass centres of the world Both these firms made lovely blown glass before and after the installation of the mechanical pressers, their insufflated types evidencing an infinite variety of geometrical, arched and baroque patterns English and French designs were copied by the mould model designers in the making of this contact mould ware, the mould itself always being full sized, and generally three sectional, although it was occasionally of four parts No comprehensive name for this kind of glass has yet been devised The metal is usually very thin, and the glass is frequently iridescent. It has been found in many colours. Other houses, such as Pitkin, Stoddard, Amelung, Zanesville, Kent and Greensboro, also manufactured this type of glass

The Cambridge and Sandwich industries manufactured large quantities of glass for over 50 years, the former attaining fame for their cut flint ware in the Waterford manner, for their pressed glass and their fine opalescent examples Many foreign designers were engaged by both houses, the Sandwich works making fine lace-like patterns on their pressed ware, the metal of which was of a superior quality. Every shade and range of colouring known to glass-making was employed, the coloured opaque glass becoming as deservingly famous as the blown and pressed candlesticks and lamps and their overlay manipulation Sandwich also made a great variety of salts and cup-plates In Pittsburgh two contemporary flint-glass works, Bakewell, Page and Bakewell, and James B Lyon, turned out both blown and pressed ware of fine quality Bakewell's probably produced more meritorious cut, etched, engraved and gilded glass than any American factory Lyon, acknowledged by his contemporaries as the finest glass-maker of his day, was the first manufacturer to adopt pressed-glass as a main line instead of blown glass He was awarded many honours and medals in his field of endeavour Fisher and Gillerland of New York city, the McKees and James Bryce of Pittsburgh and several other mid-western houses made an enormous amount of very good glass which has been incorrectly attributed to Sandwich Patterns could not be protected, mould-makers were migratory, and popular designs such as the bell-flower were turned out by all these manufacturers

The leading Zanesville, O , glass-works was granted an operating privilege in 1815 This bottle-house is credited with the introduction of the long-necked, bulbous-bodied, swirled and expanded bottles found in a variety of colours What is now called the mid-western technique, an adaptation and a frequent combination of the Stiegel and the South Jersey methods, emanated from Zanesville and other glass-works in this territory Many splendid specimens of off-hand blown glass have come from these houses The scroll and violin types of bottles probably originated at Wellsburg, W Va , the Louisville, Ky , plant adopting the violin shape as a main line of production These bottles are found in a greater variety of sizes and colourings than any others made in America The invention of the snap-case, used for holding the bottom of the bottle while in the making, occurred in 1857 This eliminated the rough mark of the pontil rod In 1858 the discovery of petroleum created a thriving business in glass lamps and chimneys, the later introduction of artificial gas as an illuminant ruining many glass-works



BY COURTESY OF OWENS BOTTLE CO

THE MODERN FIFTEEN ARM BOTTLE MACHINE WEIGHT 100 000 LB , WITH AN INCREASE OF 202% IN CAPACITY OVER THE FIRST COMMERCIAL BOTTLE MACHINE

At the close of the Civil War, glass-making in America became modernized Many of the older workers were crippled or killed, causing the hand-manipulated methods to cease The Barns-Hobbs-Brockunier flint glass works at Martins Ferry, O , gave the industry three important innovations (1) the Leighton process—the use of soda-lime in the batch to supplant litharge, which greatly reduced the cost of production, but robbed such pressed glass of its resonant quality, (2) the use of benzine in the glory-hole or polishing furnace, (3) the mechanical application of cold

air to the moulds for the purpose of chilling them. The discovery of natural gas in mid-western districts led to increased glass production and ultimately to an enormous mass-tonnage in Pennsylvania, Ohio, West Virginia, Indiana and Oklahoma

American forms and ornamentations of glass-ware became decadent in the era of poor taste in all the arts and crafts between 1860 and 1890. Much glass was manufactured in that period which is not worth preservation. In 1870 America was making: (1) plate-glass, including rough, ribbed or polished plate and rolled cathedral plate; (2) window-glass, including cylinder and sheet; (3) table-glass, including flint, lead or lime glass, both blown and pressed, lamp chimneys and flint druggists' and chemists' ware; (4) green glass, including green, black, amber and other bottle glass, fruit-jars, carboys, demijohns and other hollow ware and green druggists' ware.

Cut glass attained a high degree of excellence and a great vogue in America around 1890, the Libbey firm of Toledo, O., becoming world renowned for their output John LaFarge about this time did more than any one man "to replace glass painting in the sphere of art." The leading art glass manufactured in the United States was evolved in this period and is known as the Tiffany favrile.

THE 20TH CENTURY

Modern Tendencies.—The present tendencies (1928) among table glass and art glass manufacturers favour reproductions of early American blown and pressed glass, the earlier Venetian blown glass, the Waterford cut-glass, engraved Spanish glass, Bohemian overlay glass, pressed patterns from Nancy and Baccarat, recent copies of Lalique and European modernistic forms. Intricate machinery in connection with the industry has been constantly invented or improved upon since 1895, including the bottle machine, an automatic instead of a semi-automatic piece of mechanism Its first conception occurred in 1899, the inventor being Michael J. Owens Beds of better grade silica for glass-making were discovered about 1900, causing an increase in the resistance of glass to corrosion and decay, but also an increase in its resistance to melting and fusion. American manufacturers achieved the art of red signal glass-making in the solid, replacing the plating, casting or flashing process

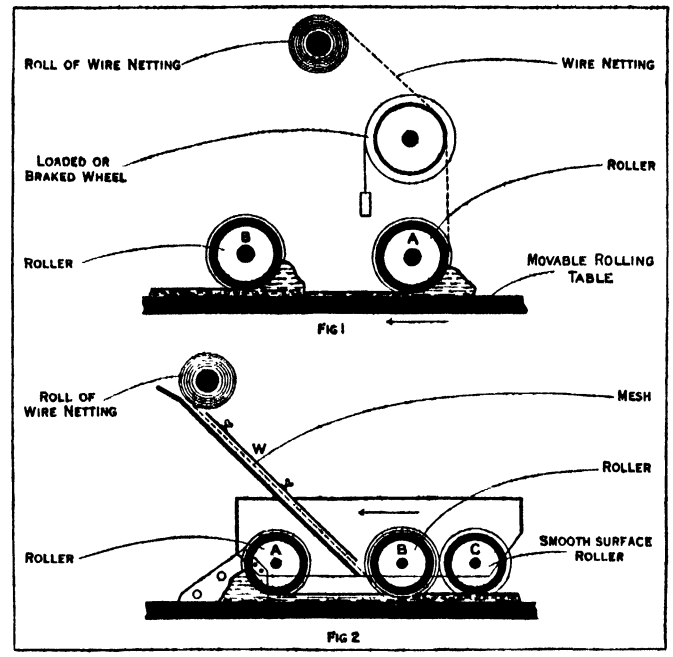
In 1927 the United States had 54 manufacturers making tableware and home products, 44 manufacturers making blown or pressed tumblers or stem-ware, 39 manufacturers making coloured glass-ware, 23 manufacturers making opal ware, 69 manufacturers making novelties and specialties, 101 manufacturers making decorated glass (cutting, etching, enamelling, gilding), 87 manufacturers making bottles and similar containers

The difficulties encountered in glass-making for nearly three centuries are gradually being eliminated. The industry has grown up. It has now standardized materials, processes, quality, sizes, colour and trade practices. It has been a long, rough road from the Jamestown, Va., venture to Triplex, from Stiegel to the Steuben industry at Corning, N Y, yet by determination both the pioneer Stiegel and the present-day Steuben have achieved aesthetic beauty (*See* INTERIOR DECORATION; STAINED GLASS, DRINKING VESSELS)

BIBLIOGRAPHY—F. W Hunter, *Stiegel Glass* (1914), S Van Rensselaer, *Early American Bottles and Flasks* (1926); W S Walbridge, *American Bottles, Old and New* (1920); Rhea Mansfield Knittle, *Early American Glass* (1927) (R. M KN.)

GLASS: SAFETY. The problem of overcoming the danger of "flying" and splintering when glass is broken has, in the case of sheet glass, been overcome in two ways The first consists in embedding a mesh of wire in the glass; the second by preparing what may be described as a sandwich of two glass sheets with one of celluloid between.

Experiments on the preparation of wired glass were made as far back as 1855 by Newton in England, but the first successful commercial manufacture appears to have been by Siemens in Dresden in 1891 based on Tenner's process. The Shumann process was developed between 1892 and 1903 in America and is known as the "solid process" Mild steel wire mesh (wire 0·5–0 6 mm. diameter), free from dust, grease, rust or other impurity such as would develop bubbles is normally employed, although, with the view to an approximation between the thermal expansion of the wire and the glass, a nickel (34%) steel has been tried in France. The glass sheet must be sufficiently thick to have strength to withstand the internal stresses set up between glass and metal because of the difference in contraction and expansion The diagrams 1 and 2 illustrate two methods employed for making



wired glass In (1) (Appert system) two rollers are arranged at different fixed levels over a table travelling right to left Molten glass cast before A is rolled out so that its upper surface adheres to the wire mesh previously placed at the desired height above the table A second casting in front of B is rolled out by that roller to cover the mesh. In process (2) (Shumann), the roller A rolls out the glass on the iron table, it is followed by B which has deep corrugations or rings penetrating the glass so that the mesh, W, fed from a slide, is pressed into the glass and the process is completed by a smooth-surface roller C which follows B.

Wired glass is used largely for building construction. In case of the glass being broken either by a blow or by fire the fragments are held together by the mesh

Laminated Glass.—Several processes of preparing non-shatterable glass (also termed composite glass) by the use of a layer of transparent cellulose product are used but a description of the best known and established, the Triplex process, the original invention of which is due to Benedictus in France, will sufficiently indicate the principle on which these compound glasses are formed The sheets of glass to be reinforced must be smooth and flat; and although by some companies drawn sheet glass is now being employed, the best type is prepared from thin, well polished plate, the thickness of sheet normally employed being slightly less than $\frac{1}{8}$ in so that the composite sheet is about $\frac{1}{4}$ in thick, or similar to ordinary plate glass. After thorough cleaning and drying, one surface is spread with a uniform layer of gelatinous adhesive material which, when dried (in dust-free air) is from 0·016 in to 0 02 in thick. A very thin coating of collodion is then given to the gelatinous layer, when dried, being only about $\frac{1}{10}$ that of the first layer Two glass sheets so treated are then paired, cut to size and shape (for motor windshields, goggles, etc.) and a sheet of transparent celluloid 0·5 mm thick is also cut a little less in area than the sheets between which it is to lie. The prepared film is cut back about $\frac{1}{8}$ in from the edges of the sheets so as to leave a covered area equal to the cellulose sheet. The latter is dipped in a softening bath which renders the outer surfaces slightly plastic and immediately then laid between the prepared surfaces of the glass sheets The sandwich is placed in a hot water heated hydraulic press operating at a total pressure up to 100 tons



BY COURTESY OF (1, 2, 4) THE METROPOLITAN MUSEUM OF ART, NEW YORK, (3) FREDERICK K. GASTON, (5, 8) J. HERBERT WEST, (6, 14) EARL J. KNITTLE, (7) THE TOLEDO MUSEUM OF ART, (9, 11) GEORGE S. MCKEARIN, (10) ARTHUR SUSSEL, (12, 13) KNITTLE, "EARLY AMERICAN GLASS" (THE CENTURY CO.), (15) FRANCES M. NICHOLS, (16) MRS. E. E. STEINHART

AMERICAN BLOWN, MOULDED AND PRESSED GLASS; 1765–1865

1–4. Attributed to Stiegel; prototypes Continental: 1. Engraved and panelled flint lip glass. 2. Vitreous enamelled flint cannister. 3–4. Flint sugar bowl and pitcher showing Venetian diamond technique

5. Swirled, expanded, double-domed Ohio type sugar bowl, 1820–40

6. Swirled and fluted, expanded, reamed edged amber bowl, Pennsylvania-Maryland-Ohio type; 1784–1840

7. Paper-weight made by Wm. T. Gillinder, Philadelphia; 1850–60

8. Amber flower "off-hand" blown by Zanesville, Ohio, artisan; 1840–50

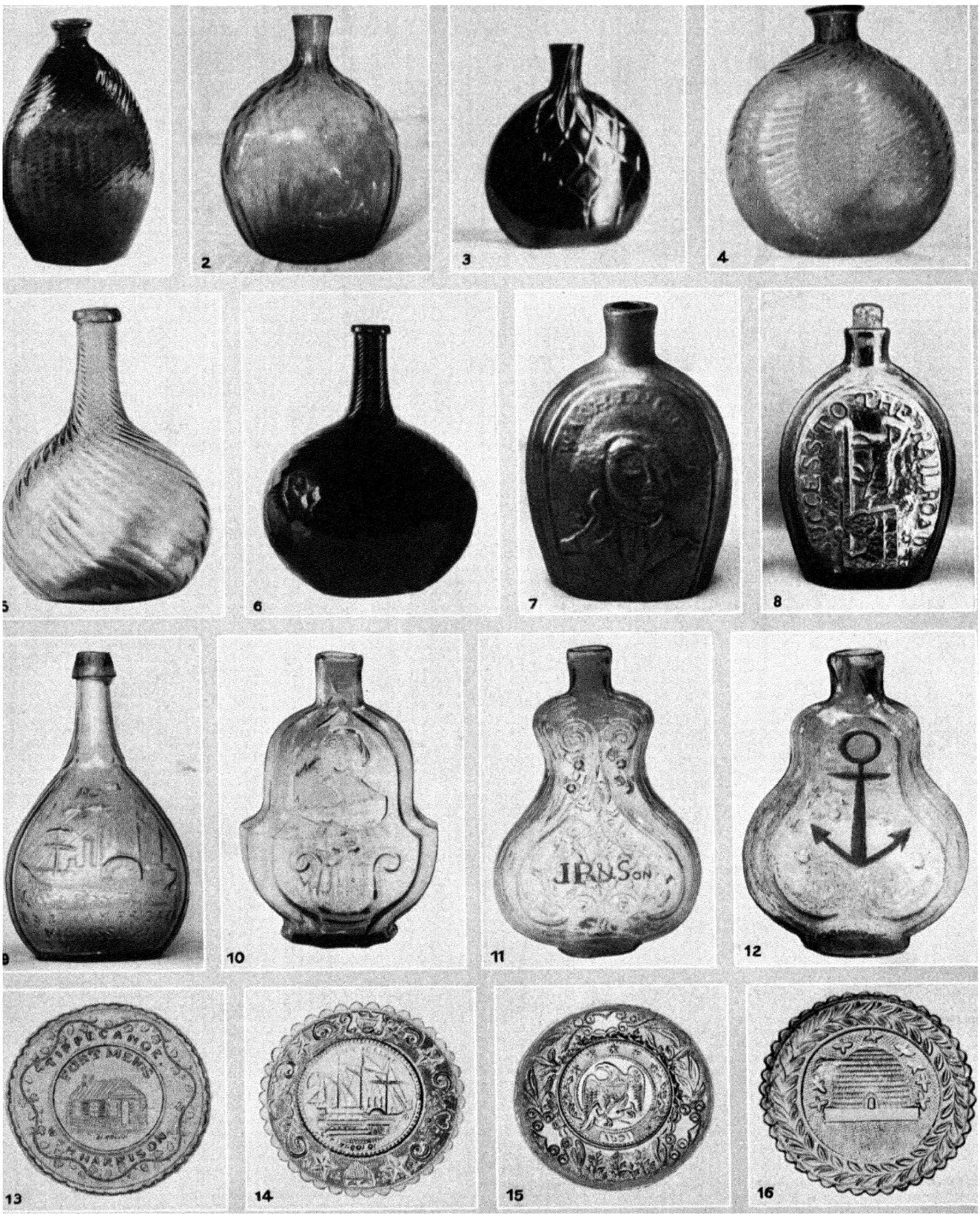
9–13. Insufflated or contact blown-mould technique, 1790–1864: 9. Four-mould pitcher. 10. Three-mould celery holder. 11. Three-mould baroque patterned decanter. 12. Three-mould vase. 13. Three-mould opalescent pitcher

14. Swirled and fluted expanded Ohio pitcher; 1816–26

15. Lacy pressed glass, New England Glass Co., Cambridge, Mass.; 1840–50

16. Crude early pressed glass, Boston and Sandwich Glass Co., Mass., and Providence, R.I.; 1828–38

GLASS



BY COURTESY OF (1, 5, 6) KNITTLE, "EARLY AMERICAN GLASS" (THE CENTURY CO.), (2) HENRY V. WEIL, (3, 13, 14, 15, 16) EARL J. KNITTLE, (4) ARTHUR SUSSEL, (7) JAMES H. ROSE, (8) THE METROPOLITAN MUSEUM OF ART, NEW YORK, (9, 10, 11, 12) J. HERBERT WEST

AMERICAN BOTTLES, FLASKS, COMMEMORATIVE AND SYMBOLIC CUP-PLATES; 1765–1870

1–6. EXPANDED: 1. Pitkin type; 1783–1830. 2. Stiegel type; "Diamond-daisy"; 1765–74. 3. Ohio type; "Diapered-hip"; 1815–48. 4. Mid-western type; 1815–60. 5. Pittsburgh type; 1820–70. 6. Zanesville type; 1840–60. 7–12. BLOWN IN MOULD: 7. Monongahela type; 1815–35. 8. The advent of the railroad; 1832–38. 9. Calabash type; Kensington, "Frigate Mississippi," reverse, "Kossuth"; 1851–53. 10. West Virginia, Jenny Lind, "Violin" type; 1851–53. 11. J. R. & Son "Corseted violin" type; 1832–38. 12. "Anchor violin" type, for Ohio River trade; 1820–40. 13–16. CUP-PLATES: 13. Harrison campaign; 1841. 14. Chancellor Livingston; 1830–36. 15. 1831 Eagle. 16. Bee-hive (Industry); 1834

as the result of which the three sheets, two of glass and one of cellulose become firmly united. The gap between the edges of the glass sheets is finally filled with a preparation of bitumen to seal in and preserve the celluloid layer. Other successful commercial processes for the manufacture of laminated glass require no edge protecting seal.

When such compound glass is struck a heavy blow, the cracks radiate from the centre of attack but the "splinters" remain firmly adhering to the intermediate celluloid layer It is, therefore, finding popular use in automobiles, particularly for windshields, the breaking of which is responsible for many accidental injuries. It is also retardent but not proof against rifle and revolver shots and has been used in Armoured Car (*q v*) service in America

(W E. S T)

GLASS, ULTRA VIOLET RAY TRANSMITTING. Glasses having the property of transmitting radiations of shorter wave-length than occur in the visible spectrum, that is, shorter than 400$\mu\mu$ (the sign $\mu\mu$ representing $\frac{1}{10,000,000}$ cm.) have been known for many years Fused silica or quartz provides a glass transmitting rays down to 190$\mu\mu$ while in 1907, E Zschimmer prepared in small quantities a number of glasses having transmissions varying from 186$\mu\mu$ to 280$\mu\mu$. As the most active rays which affect a photographic plate are those of short wave-length lenses which transmit well in the ultra-violet are advantageous in camera work, and Schott, at Jena, on the basis of Zschimmer's work, introduced such a glass under the name of Uviol, although only made in small quantities Especially is good transmission of importance for stellar photography and W D Haigh showed, at the Optical Convention in London in 1926, that British optical glasses in this respect could claim some advantage

The great stimulus to the development of glass transmitting the shorter ultra-violet rays has been given in recent years as the result of the study by Bernard at Samaden and Rollier at Leysin of the beneficial effect of high Alpine sunlight on tuberculosis patients and of the subsequent employment for combating diseases of undernourishment, such as rickets, of electric-arc lamps emitting short ultra-violet radiations The rays of therapeutic value have a wave-length about 300$\mu\mu$. Owing to absorption by the atmosphere, the shortest solar rays available, even in the Alps, are 295$\mu\mu$, but ordinary window glass seldom transmits the rays shorter than 310$\mu\mu$. The question naturally arose as to the possibility of preparing a window glass to transmit the therapeutic rays F E Lamplough in England first successfully did so in 1925, the glass, known as Vita-glass, being now made in large quantities Fused boric oxide is, like quartz, transparent even to very short rays and Vita-glass resembles ordinary window glass except that it contains about 2% boric oxide in addition and is of low iron oxide and titanium oxide content The presence in glass of iron oxide in the ferric condition greatly diminishes transparency to the shorter ultra-violet rays and success in manufacture depends largely on their exclusion. Lead glasses absorb the ultra-violet rays and are, therefore, unsuitable. Several glasses have now been put on the market of which the most remarkable is the American glass known as Corex, although it is insufficiently weather-resisting to be of general use

The following measurements made in the Department of Glass Technology, Sheffield, on samples 2 mm. thick, indicate the transmission in the region of therapeutic value of a number of specimens of the glasses now available:

Glass	Limit of transmission	Transmission between 315$\mu\mu$–295$\mu\mu$
Corex	214 $\mu\mu$	89
Helio	261 ,,	52
Holvi	256 ,,	61
Quartzlite	299 ,,	4
Sanalux	245–255 ,,	73–59
Sun Ray ..	250 ,,	62–63
Vita	252–249 ,,	54–60

After short service the transmission of most such glasses diminishes somewhat and then remains constant. (W. E. S T)

See also SUNLIGHT TREATMENT

GLASSBRENNER, ADOLF (1810–1876), German humorist and satirist, was born at Berlin on March 27, 1810 In 1831 he began to edit *Don Quixote*, a periodical which was suppressed in 1833 for its outspokenness. He published, under the pseudonym *Adolf Brennglas*, a series of pictures of Berlin life, *Berlin wie es ist und—trinkt* (30 parts, with illustrations, 1833–49), and *Buntes Berlin* (14 parts, with illustrations, Berlin, 1837–58) Glassbrenner founded the popular satirical literature of modern Berlin He said many things in jest which the censor would not have permitted in "serious" journalism In 1840 he married the actress Adele Peroni (1813–95) and later, in Mecklenburg-Strelitz, became leader of the democratic party Expelled in 1850, he became editor of the *Montagszeitung* in Berlin, where he died on Sept 25, 1876

Among Glassbrenner's humorous and satirical writings may be mentioned *Leben und Treiben der feinen Welt* (1834), *Bilder und Traume aus Wien* (2 vols, 1836); *Gedichte* (1851, 5th ed 1870), the comic epics, *Neuer Reineke Fuchs* (1846, 4th ed 1870) and *Die verkehrte Welt* (1857, 6th ed 1873), also *Berliner Volksleben* (3 vols, illustrated, Leipzig, 1847–51). Glassbrenner published some charming books for children, notably *Lachende Kinder* (14th ed, 1884), and *Sprechende Tiere* (20th ed, Hamburg, 1899) *See* R Schmidt-Cabanis, "Adolf Glassbrenner," in *Unsere Zeit* (1881)

GLASS CLOTH, a textile material, the name of which indicates the use for which it was originally intended The cloths are in general woven with the plain weave, and the fabric may be all white, striped or checked with red, blue or other coloured threads; the checked cloths are the most common The real article should be all linen, but a large quantity is made with cotton warp and tow weft, and in some cases they are composed entirely of cotton The short fibres of the cheaper kind are easily detached from the cloth, and hence the material is not so satisfactory

GLASS MANUFACTURE. The term "glass" has two meanings, one used in science only, the other generally To the chemist and physicist the word glass signifies the special state of matter assumed when a liquid substance is cooled continuously, and, becoming more and more viscous, finally hardens without, at any stage, crystallizing Glycerine at low temperature, resins, pitch, sealing wax exhibit such characteristics, although the term glass is often confined to transparent materials Substances in this "under-cooled" state are spoken of as having assumed the glassy or vitreous condition; they have in general, properties like common glass

Common glass, which fulfils all the requirements of the scientific term "glass," is readily recognizable but much less easy to define briefly It is usual to describe glass (that is, mineral or inorganic as contrasted with organic glasses) as a hard, brittle, amorphous substance, breaking with a conchoidal (or shell-like) fracture, usually transparent, but in some cases translucent or opaque, and either colourless or coloured; produced by the fusion of acidic oxides, or, most frequently, of acidic and basic oxides together, the fused mass being subsequently cooled sufficiently quickly as to present the deposition from it of crystalline material in solution The definition, long as it is, is not perfectly watertight, because opal glasses are produced by inducing deposition of small particles, usually crystalline, in the glass on cooling As an amorphous substance, glass has properties which, unlike those of a crystal, are the same in whatever direction we measure them For example, glass is equally refractive of light throughout its mass The definition says that glass is produced by the fusion of some acidic oxide either alone, or usually with some basic oxide. It is, therefore, not one but many substances, the term being employed like the word "metal" in a collective sense The acidic oxides which find use in glassmaking are silica (sand), boric oxide, oxides of arsenic, oxides of antimony, and phosphoric oxide The only one which of itself is valuable for producing a commercial glass is silica.

Of basic oxides, those occurring in common use are soda, potash, lime, magnesia, lead oxide, barium oxide, zinc oxide, alumina These may be described as fundamental constituents and give no colour to the glass Commonly employed for imparting colour are the oxides of iron (bright green, bluish-green, dark green,

PERCENTAGE COMPOSITION OF DIFFERENT TYPES OF GLASS

	English crystal	Electric light bulbs (lead glass)		Window glass: Hand made	Window glass: Cylinder machine	Window glass: Fourcault	Window glass: Libbey-Owens	Plate glass	Common pressed glass and common tumblers	Electric bulbs (lime-magnesia glass)
Silica	53–55·5	58–59	Silica	71–72	73–74	70–73	72	72–73	72–74	71 5 73·5
Iron oxide	0·02–0·03	0 04–0·06	Iron oxide	0·15–0·3	0·1–0·2	0·15–0·2	0 15–0 2	0·08–0 1	0·04–0 07	0·06–0·1
Alumina	0 2–0 4	0 2–0·4	Alumina	1–1·5	1–2	1–1 5	1–1·5	0 6–1 0	0 5–1 0	1–2
Lead oxide	31–35	28–30	Lime	14–15	12·5–14	9·5–11	11	12·5–15·5	7–8 5	5–6
Potash	11–13	4–5	Magnesia				2 5–3			3 5–4·5
Soda		7 8	Soda	11–12·5	12 6–13·5	15–18	12·5–13	12–13	17–18	14–17
			Potash							0–1·5

	Optical glasses: A hard crown	Optical glasses: A medium flint		Chemical and heat resisting: Monax (British)	Pyrex (American)	Jena (1920) (German)	Kavalier's combustion tubing	Sunbrand lamp glass (Czechoslovakia)	Miners' lamp glass (Jena)	Thermometer glasses: English clinical	Jena 59III	Jena 16III
Silica	71	46	Silica	75 3	80 6	74 5	79·6	76·8	73·1	Similar	72 9	66 6
Iron oxide	0 3	0 02	Iron oxide	0 1	0 1	0 1	0 4	0·06	0 15	to	0 15	0 1
Alumina	0 33	0 15	Alumina	3 0	2 0	8 5	0 4	0 6	2 0	English	6·1	3 8
Lime	10		Lime	0 5	0 2	0 8	7 8	6 5		crystal	0 3	7 2
Lead oxide		44 5	Magnesia		0 2	0 1	0 1	0 2		glass	0 2	0 2
Soda	4 5	0 5	Zinc oxide	2 8								6 2
Potash	13	8 5	Baryta			3 9						
Arsenious oxide	0·8	0 3	Soda	6 3	3·8	7 7	0 6	11 1	7 6		9·8	14 8
			Potash	1·2	0 6		11·6	4 7			0 1	
			Boric oxide	11 3	11·9	4·6			17 2		10 4	0 9

brown and even red according to conditions), oxides of copper (blues and reds), cobalt oxide (blue); nickel oxide (purple to brown), manganese dioxide (purple to brown); chromium oxide (yellowish green), uranium oxide (fluorescent green or yellow); titanium dioxide (yellow to brown) Tin oxide and zirconia have been used in opal glasses The actual colour obtained depends on the amount of the colouring oxide, the general composition of the glass and frequently also the temperatures, time of melting, and the furnace atmosphere Nickel oxide and manganese dioxide both tend, for example, to produce a purple colour in potash glasses, but brown in soda glasses Combinations of colouring oxides can be used to produce intermediate shades Substances other than oxides may be added to produce colours, such as cadmium sulphide (yellow), selenium (red), finely divided gold (ruby), silver salts (yellow), carbon (yellow-brown), sulphur (yellow), whilst fluorspar, cryolite and bone ash (calcium phosphate) are much more commonly used for making opal glasses than tin oxide or zirconia

Types of Glass and Glassware.—With such a variety of constituents to draw upon for glassmaking, it will be understood that the number of glasses available is very great In practice, the composition chosen depends on (1) the cost (2) the properties of the glass The properties which have to be considered by the manufacturer include general properties, namely, the ease of melting, since furnaces have their limits of operation, the rate of setting of the glass, which influences the mode of converting it into articles, and the general stability or durability The special properties aimed at are selected according to the service the glass must give It may be required for optical purposes, or to be of a special tint; it may need to be heat resisting, to be electrically insulating or to withstand chemical action, it may be needed to be of special hardness, resistant to scratching, to fulfil certain conditions of mechanical strength or density Although much remains to be done, modern investigations have done much to determine the influence which each constituent oxide exercises on the properties of the glass as a whole Thus, the oxides which make glass specially resistant to the action of water, whether liquid or steam, are silica, zirconia, alumina, zinc oxide, titania, and, under certain conditions, boric oxide, whilst those which render the glass particularly liable to attack are soda and potash. Again, lead oxide increases the refractive index, extends the temperature range over which the molten or plastic glass can be worked and the glass which contains it is soft for cutting

Some physical properties are related to the chemical composition so simply that for many (but not all) glasses a linear or additive relationship holds good In other words, it is possible within limits to state what contribution each 1% of each of the constituents of the glass makes to the numerical value of the property In a general way this is true of thermal expansion, specific volume (and density), refractive index, specific heat and various mechanical properties

Other physical properties, such as viscosity, annealing temperature, electrical conductivity are not so simply related to the composition, but general relationships have been established. Armed with tables of the specific effects of each oxide, or, in the case of less well-defined relationship, with graphical representations, the manufacturer can do much to design a glass composition to meet a given specification Illustrations of such compositions are provided in the above table

Raw Materials and Preparation of the Glass-making Mixture.—The chemical oxides present in the glass are not necessarily introduced in this form in the raw material Silica, however, is introduced as such, almost invariably as sand The chief requirements of a sand for glassmaking are high silica content and very low iron oxide For optical glass, best crystal table glass and special illuminating glasses, the iron oxide should be less than 0 02%, for common domestic ware and colourless glass bottles, up to 0·05–0·06% is permissible; for common window glass 0·1% Sands fulfilling the first named requirement are derived from Fontainebleau (France), Hohenbocka and Dörentruper (Germany), Ottawa (Illinois), Berkeley Springs (West Virginia) and near Lewistown (Pennsylvania), their silica content is usually not less than 99·6% Belgian sand, containing 0 03–0 06% of iron oxide is exported to various countries including Canada (Montreal) and some of the U S A factories on the Atlantic and Pacific sea coasts King's Lynn sand of iron oxide content 0 05% is in considerable use in England, together with large importations of Belgian, Fontainebleau and (rather less) Hohenbocka

Soda is added to the glassmaking mixture in the form of soda ash (sodium carbonate) and also, in smaller proportions, according to the type of glass to be made, as sodium nitrate, sodium sulphate and borax; potash is added almost always as potassium carbonate and in smaller proportions as potassium nitrate. Lime

is added mainly as calcium carbonate (limestone, marble, calc-spar, precipitated lime and, rarely, chalk), in America fairly frequently as burnt lime or slaked lime, either calcium or dolomitic lime Lead oxide is added usually as red lead, sometimes as litharge

The mixture (or "batch") from which the glass is made contains (a) and (b), and, according to circumstances, one or more

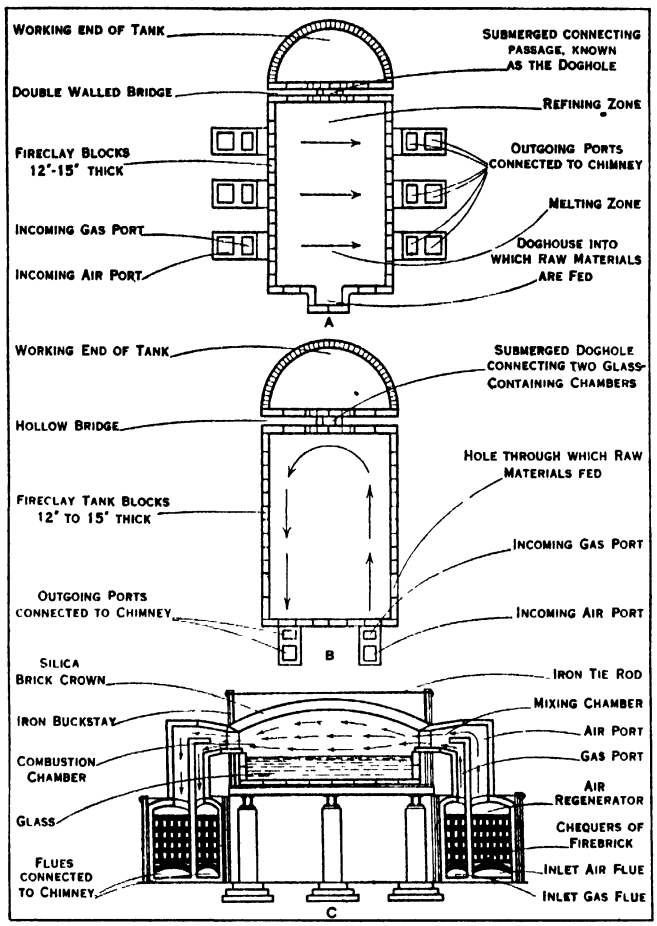


FIG 1.—PLANS OF TWO TYPES OF TANK FURNACES FOR MELTING GLASS
A. Plan of cross flame furnace B Plan of horseshoe flame furnace C. Cross-section of cross flame furnace

of (c), (d) and (e), namely (*a*) fundamental materials (sand, soda ash, red lead, lime, etc), (*b*) waste glass from a previous melting known as cullet, (*c*) oxidizing agents such as sodium or potassium nitrate, or reducing agents such as carbon, (*d*) decolourizing materials, (*e*) colouring or opacifying materials

Waste glass or cullet is invariably added, first for economy secondly because it assists in the melting Oxidizing agents are employed under certain special conditions, as, for example, in glasses containing lead oxide in order to prevent reduction of this material to metallic lead by the action of furnace gases, whilst reducing materials are added such as for the purpose of decomposing more rapidly sodium sulphate or saltcake when this forms part of the mixture Decolourizing agents are employed to produce the appearance of colourless glass in cases where otherwise the glass would have a faint green tint due to the presence of iron oxide The decolourizing agents commonly used in glassmaking are manganese dioxide and nickel oxide (for glass melted in pots) and selenium (for glass melted in tank furnaces), arsenious oxide, in itself a mild decolourizing agent, being an almost invariable accompaniment of one of the foregoing decolourizers Arsenious oxide produces no colour, but each of the others when present in a glass containing no iron oxide, or, in any case, when present in excess, produces a shade of colour, a purple or pink, which within limits covers the green or yellow-green due to iron oxide The amount of iron oxide which can satisfactorily be so covered is not greater than 0 09%

The raw materials are weighed out; the decolourizing or colouring materials being small in quantity are weighed out separately The chief materials may be mixed either by hand, or mechanically The waste glass or cullet, in different branches of manufacture, constitutes from 20 to as much as 80% of the total mixture charged into the furnace

Melting the Glass.—The batch mixture is melted either in pot or in tank furnaces In the former the pots or crucibles constitute individual containers of which any number between three and 18 may be set in a single furnace, whilst in the latter the tank serves as one huge receptacle The pots are built of fireclay, usually by hand, are cylindrical, oval or egg-shape in cross-section according to circumstances, and may hold from ½ cwt to 30 cwt of glass, the small sizes being used mainly for supplies of coloured glasses The pots are, if possible, stored for 12 months, slowly drying and "maturing" before use

Open pots are universally used for plate glass melting and in Europe, outside Great Britain, are also used for general purposes In Great Britain and U S A covered pots are most frequently employed A 30 cwt pot will have a bottom thickness of about 5 in and walls tapering to about 3 in at the shoulder, smaller pots having proportionate thicknesses It is necessary to preheat them carefully to 1,000°–1,300° C in a subsidiary furnace (a pot-arch), a process taking 5–12 days, after which they are transferred with all speed to the melting furnace, fired hard for 12–36 hours, glazed inside with a little molten glass and then charged with the mixture When melting is complete, the fluid glass is "refined," that is, made homogeneous and free from bubbles of gas, an abundance of which is evolved during the melting One method is to plunge the glass with blocks of wood soaked in water, the large steam bubbles sweeping out small gas bubbles Subsequently the temperature is slowly lowered until the consistency of the glass is suitable for commencing to work it into articles The complete melting (melting, refining and cooling off) time depends on the nature of the glass and the furnace temperature, the normal range of melting temperature being 1,300°–1 500° C By using medium size pots and high melting temperatures many factories on the Continent and some in Great Britain are able to melt overnight (about 12 hours) but often 36–48 hours are required

In tank furnaces, charging-in of raw materials at one end, usually through a trough or "dog-house," and removal of glass from the working end are continuous, night and day Figs 1a, 1b and 1c illustrate general principles The heating flames may flow across the furnace (1a and 1c) or round the furnace (horse-shoe flame) (1b) in furnaces with regenerative preheating of gas and air, or straight down the tank with recuperative preheating

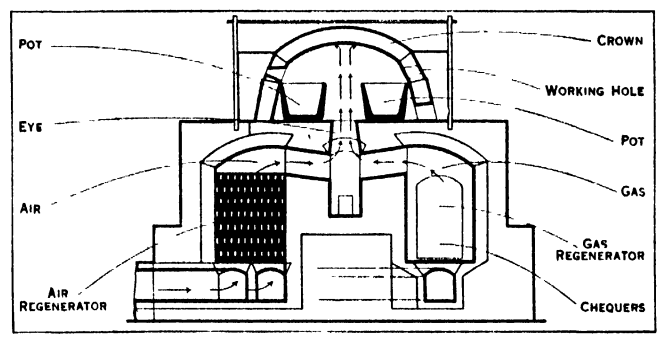


FIG 2.—CROSS-SECTIONAL PLAN OF A REGENERATIVE FURNACE MELTING GLASS IN POTS

of air or in small oil-fired furnaces Small tanks ("day tanks") without dividing bridge, are sometimes used like pots, being charged with batch which is melted overnight and worked out during the day

Glass Melting Furnaces.—These vary in design and capacity Fig 2 illustrates, in principle, a modern open-pot furnace with regenerative preheating of fuel gas and the air for combustion Producer gas is most frequently used for firing The gas and the preheated air emerge and burn above the "eye," the flame spreads over the "crown" and the waste gases are drawn down through

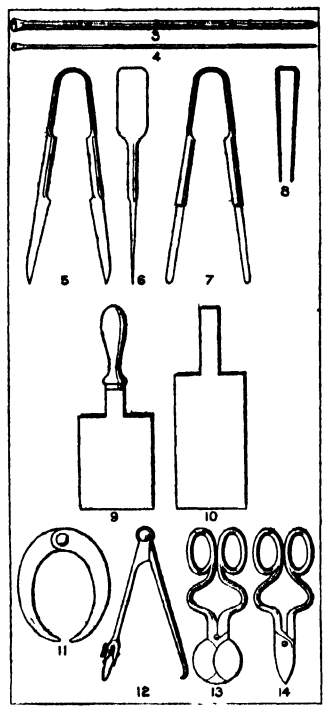
flues at the sides of the pot and away to the chimney by way of the recuperator channels or through the brick checker work in the care of regenerator chambers.

Glass tank furnaces are constructed, the glass-containing bath of thick (8 in–15 in) fireclay blocks for sides and bottom, the upper walls of fireclay bricks and the crown of silica bricks. They average 100–200 tons in deadweight capacity for bottle glass and about 500 for window glass, with actual limits of a few cwt to 1,000 tons for bottle and up to 1,500 tons or more for window glass. Owing to increased efficiency of operation the tendency now (1928) is to diminish tank furnace size. A bottle or domestic ware glass tank of average capacity will be 4 ft. deep when used for colourless glass and 2 ft 6 in. to 3 ft. 3 in. for coloured, a window glass tank 5 feet. The working end is usually divided from the melting end by a double-walled bridge, the glass flowing into the working end through a passage (called the "throat" or "dog-hole") near or at the tank bottom The refining zone lies immediately in front of the bridge and in window glass tanks may be divided from the melting zone by a floating fireclay barrier or bridge

Conversion of the Glass into Articles.—The glass industry is one of high skill since, unlike many of the metal making industries, not only is the glass melted, but it is also converted on the spot into innumerable forms. Factories making table glassware or ornamental hollow-ware usually cut, engrave, etch, enamel or paint the articles made in the "glasshouse" where the melting and shaping occur The greatest variety of glass articles can be made at factories employing pot furnaces and hand manipulation. Glass tank furnaces, introduced commercially subsequent to 1860, have been displacing pot furnaces rapidly within the past decade and, combined with mechanical methods, have led to specialization.

The methods for the conversion of molten glass into articles include: (1) Free-hand work, (2) blowing in moulds, (3) pressing in moulds, (4) drawing, (5) rolling. Examples of each type follow

Free-hand Work.—We may conveniently classify both general manipulation at the furnace and the lampworking industry under this heading The former is the oldest existing system of glassworking and is responsible for most of the finest artistic glass creations in the form of vessels, as well as a considerable, though now decreasing, variety of utilitarian articles, such as tumblers Some of the tools required are shown in figs 3 and 4, comprising blowpipes, at the wider end of which the necessary quantity of glass is obtained by dipping into the pot, a smooth iron plate called a "marver" (or, as an alternative or an adjunct a wooden shaping block), on which the gathered glass is rolled to produce regularity of shape, pincers and shaping tongs (figs. 5, 6, 7, 8), flattening boards (figs 9 and 10), calipers (fig. 11), compasses (fig 12) and shears (figs 13 and 14).



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Figs. 3 and 4.—Blowpipes. Figs 5 to 8.—Tools for opening out and shaping hollow ware. Figs 9 and 10.—Pallets or flattening tools Figs. 11 and 12.—Callipers. Figs. 13 and 14.—Shears for cutting the soft glass

The glassmaker sits at a chair (fig 15) having projecting arms shod with strips of iron across which he rolls the blowpipe backwards and forwards when engaged in shaping the body of any glass article of circular cross section Figs 16–20 illustrate the process of making a wine glass with a drawn-out stem and blown foot. The partly shaped and blown gathering (fig. 16) is further blown into the shape of the bowl and a knob, formed by pinching (fig. 17) is drawn out into a stem (fig. 18) to the end of which a small bulb, blown by an assistant, is stuck (fig. 19) and opened out and flattened (fig 20). The blowpipe is then cracked away by a wet tool, the wine glass held by the foot in a holder (a "gadget") and after being reheated at the mouth of the furnace until soft, the excess glass is sheared away, and, if desired, the rim pressed back to form a flange (fig. 21).

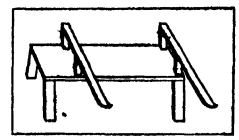

FIG 15.—GLASSMAKER'S CHAIR

Casing, inlaid enamelling, threaded and millefiori work are all done at the furnace. Iridescent surface effects are produced by treating the hot glass article by the vapours of salts (tin chloride, ferric chloride, etc) The handmaking of window glass, in which cylinders 5 ft. 6 in. to 6 ft long and 12 in diameter are blown, split and flattened out, is another example of freehand working It is dying out except for stained glass and special types like those made by the ancient craftsmen.

The lampworking industry converts glass tubing and glass rod into innumerable articles A piece of glass tubing is rotated in the flame of a blowpipe (usually coal gas and compressed air, but for very hard glasses coal gas and oxygen or even hydrogen or acetylene and oxygen) and softened, after which the tube may be drawn out, the ends sealed, bulbs may be blown in various ways or joints made The following are branches of the lampworking industry. (A) Electric filament lamp and radio-valve manufacture, although the sealing-in processes are now done almost entirely by automatic machines (B) Light-blown scientific and surgical apparatus, test-tubes, ampoules, glass condensers absorption bulbs, X-ray tubes, thermometers, etc. (C) Glass eyes (D) Beads, artificial gems and fancy goods

Mould Blown Glass.—Moulds are almost always of cast iron, although on the continent of Europe wooden moulds are frequently employed when only small quantities of an article are needed The mould is hinged to open and shut, and angular shaped articles may require moulds with two or more hinges The interior surface of a mould may be covered with a lubricating paste to prevent scratching of the glass and is known as a paste mould If used dry, it is often described as a hot mould The requisite amount of glass, if hand operation is in question, is gathered on a blow pipe, marvered into shape, partially blown up and then lowered into the mould which is afterwards tightly closed and the final blowing given When an article of circular cross section is to be made it is usually rotated as it is blown.

Blowing machines carry one or more moulds. (For glass bottle blowing *see* the article on BOTTLE MANUFACTURE) The Westlake machine for making electric light bulbs carries 24 moulds and blowing heads The glass is gathered by a ram which projects forward into a trough containing the molten glass, and obtains the charge which is conveyed to the mould The operation of this particular machine has steadily been improved so that in the latest types as many as 120,000 bulbs per day have been made (1928).

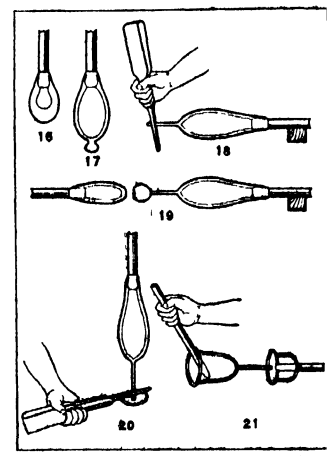

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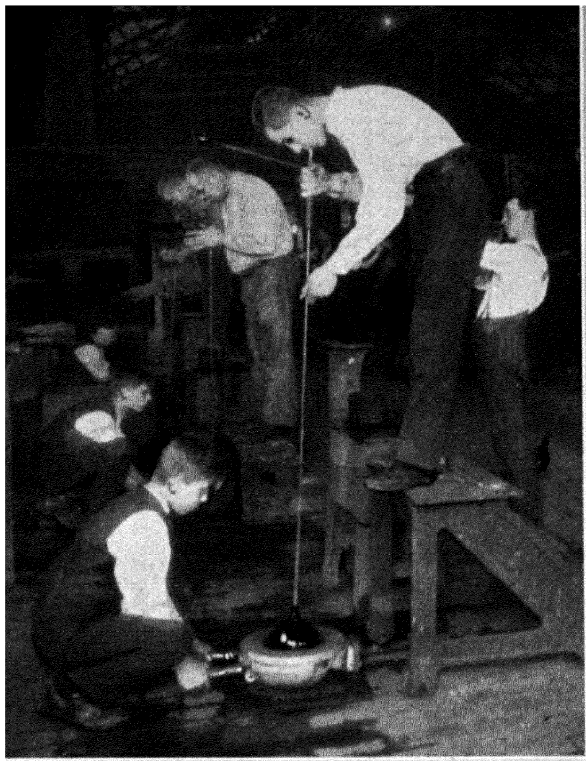
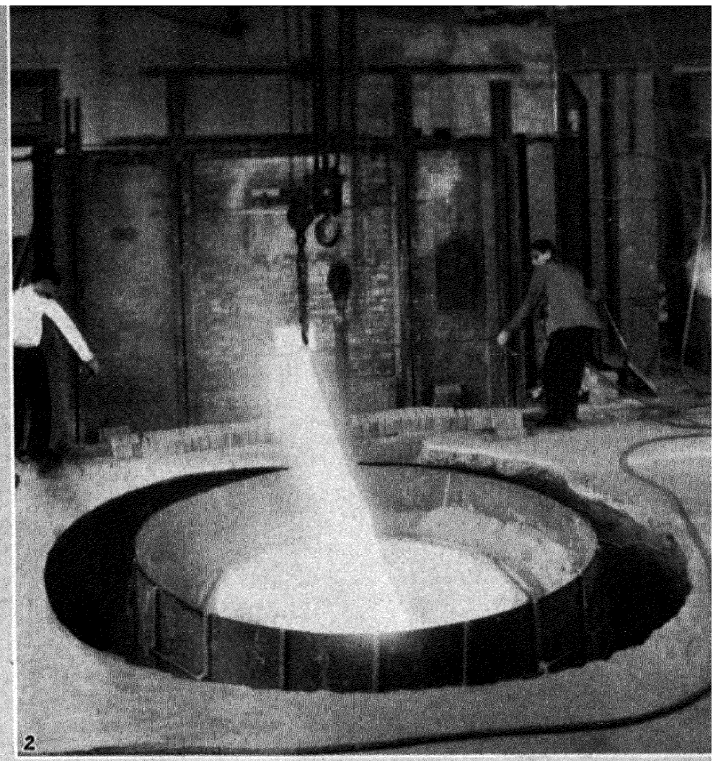
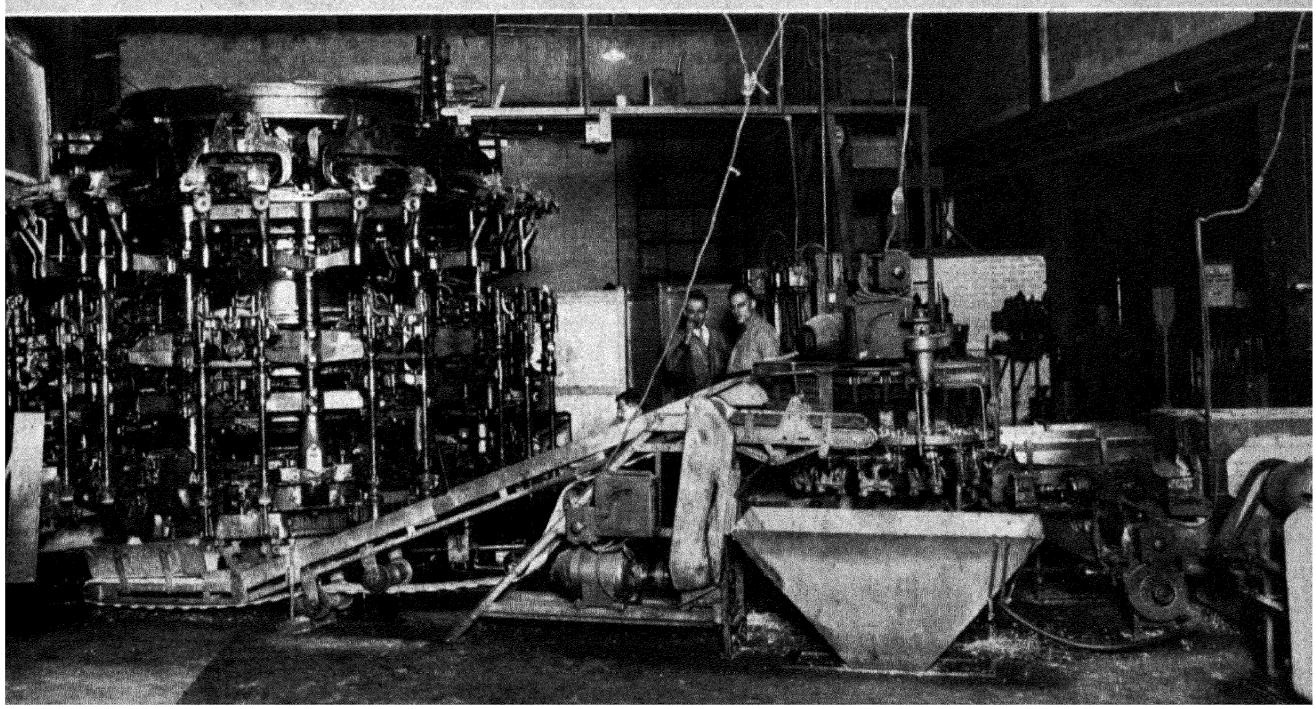
FIG 16.—MAKING A WINE GLASS BY HARD MOLTEN GLASS ON BLOWPIPE FORMED INTO HOLLOW BALL OR PEAR. FIG 17.—BALL DISTENDED BY BLOWING AND KNOB JOINED BY PINCERS FIG 18.—KNOB OF GLASS DRAWN INTO PINCERS ROD ON STEM FIG. 19.—HOLLOW BALL ATTACHED TO END OF STEM. FIG 20.—BALL OPENED OUT AND THEN FLATTENED TO FORM THE FOOT FIG 21.—BLOWPIPE CRACKED OFF; FOOT CLAMPED IN HOLDER, UPPER PART OF BULB REHEATED UNTIL SOFT AND OPENED OUT TO FORM A LIP

Pressed Glass.—Pressing is used for a great variety of thick walled articles such as dishes of all kinds, thick-walled tumblers

GLASS MANUFACTURE







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PROCESSES IN MANUFACTURING ARTICLES OF MOULD BLOWN GLASS

1. **Glass blowing,** a quantity of molten glass is gathered on the end of a blowpipe; the glass blower while blowing through the pipe, twists or rotates it between his hands. When partly blown the glass is placed in a mould held by an apprentice, and blown to its final shape
2. **Pouring** molten glass from a pot furnace (background) through a trough into a combined mould and annealing chamber below the floor. Before the raw materials are charged into them the refractory pots are pre-heated to over 1000 degrees C, the heating up taking about a week. The raw materials are then heated for from twelve to thirty-six hours. When smaller pots and higher temperatures are used, the time of process is shortened
3. **Westlake machine for manufacturing electric light bulbs. Molten glass** is brought from a furnace (extreme left) by suction cups on reciprocating arms which feed molten glass into the moulding machine (left) where bulbs are formed. A conveyor takes bulbs to the circular melting-off machine (right centre) which fuses off the heavy neck and trims mouths of bulbs. They are then taken to the annealing chamber on the extreme right of the picture

jars; reflectors, pavement lights, pressed lenses, tiles and electrical insulators. A charge of glass is poured into a mould and a plunger brought down into the mass, pressing it into all parts of the mould. A glass which is soft and not too quick in setting must be used for this process The moulds may be blank or may bear a more or less intricate pattern. Pressed glass tumblers are now made in large quantities by pressing machines carrying eight or more moulds on a rotating table.

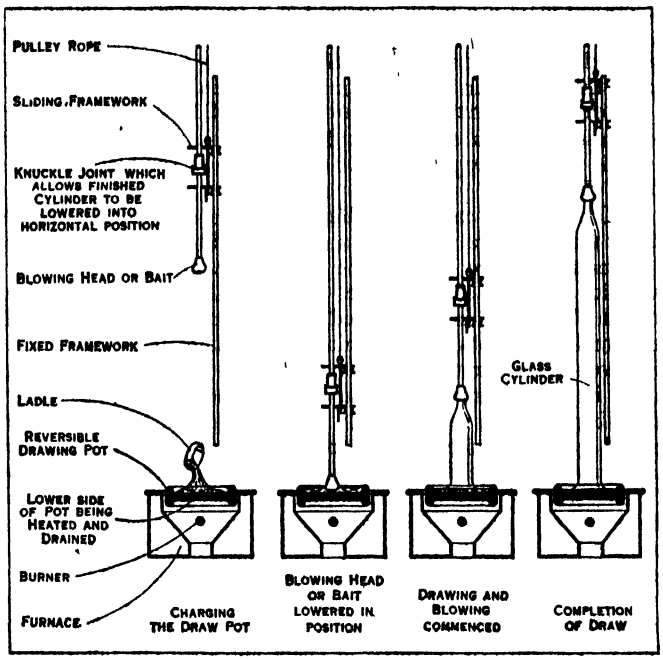

FIG 22.—DIAGRAMMATIC REPRESENTATION OF THE MACHINE CYLINDER (LUBBERS') PROCESS FOR DRAWING WINDOW GLASS

The Drawing of Glass.—This process is exemplified by the manufacture of window glass and of glass tubing. The manufacture of ordinary window glass by hand has disappeared from the U S A. and from Belgium, and is rapidly being displaced in other countries The machine cylinder process, due to Lubbers, is still operated in America, England and France The requisite quantity of glass (about 550 lb) is ladled from a tank furnace into a hot shallow fireclay pot and a blowing head let down into it, and after establishing contact, is drawn up steadily as may be seen in fig 22. Cylinders up to 40 ft. long and 36 in. to 40 in. diameter are thus drawn They are cut into sections, each is split, placed in a flattening furnace on smooth stone, and when sufficiently hot and soft, smoothed out by a block of wood

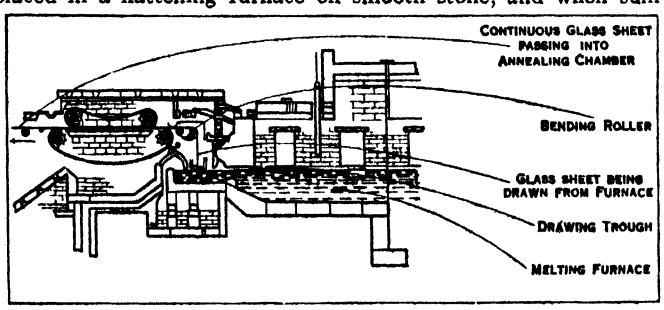

FIG 23.—PRINCIPLE OF THE COLBURN (OR LIBBEY-OWENS) SHEET-GLASS DRAWING PROCESS

Processes for drawing the sheet direct are now in widespread use. The Libbey-Owens process draws the glass from a trough fed from the main tank furnace, the sheet passing over a roller (fig 23) and being drawn horizontally through the annealing furnace which is 200 ft long. Two such machines can be operated by a single glass melting furnace. The rate of drawing is from about 26 in. to 72 in per minute, and is continuous night and day. In the Fourcault process (Belgium) the sheet is drawn vertically upwards from drawing chambers fed from the melting tank. The line of the drawing chambers forms a T-piece with the line of flow of the glass from the melting tank (fig 24). The glass oozes through a slit in a fireclay floater, is drawn upwards and immediately chilled by water coolers before it reaches the asbestos rollers which propel it up through the annealing chamber which is only about 20 ft. long. By this process glass up to about 6 ft. wide may be drawn (usually 4 ft. to 5 ft. wide) and from four to ten machines may be fed from one melting furnace.

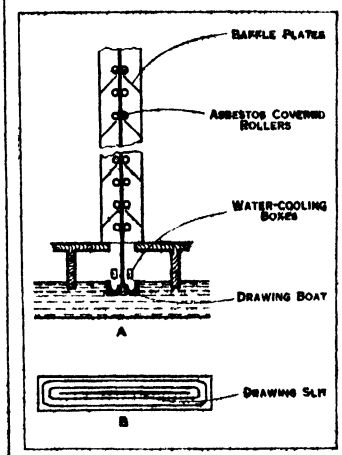

FIG 24.—PRINCIPLE OF THE FOURCAULT SHEET-GLASS DRAWING PROCESS

Glass tubing and glass rod may be obtained by drawing out the glass from a cylindrically shaped mass, hollow in the case of tubing, solid in the case of rod The process is now carried out mechanically and continuously by the Danner (American) tube-drawing machine (known also as the Libbey-Owens tube-drawing machine) and by the Philips (Holland) machine In the former fluid glass falls on and spreads over an inclined tapered fireclay mandrel through which air under slight pressure is blown if tubing is required, and the glass as it flows from the end is drawn away by a machine, the tubing in between the mandrel and the machine passing over pulleys (fig. 25). From 100 to 500 ft. per minute may be drawn.

Rolling of Glass.—This process is employed for the manufacture of plate glass, figured sheet glass and reinforced or wire glass. Glass is melted in open pots and when ready, the pot is transferred by a crane to a casting table of iron and distributed in front of a massive iron roller which traverses the table from end to end, rolling it out into a sheet, usually about ½ in thick The lower surface is roughened by the adherence of sand scattered over the table to prevent sticking and the upper surface is marked either by groovings or other markings in the roller designed to prevent sticking of this implement. The large rolled sheet passes down an annealing furnace about 400 ft long and after being discharged is cut into suitable pieces, set in plaster of Paris on circular grinding tables (up to 36 ft. diameter) and ground by iron-shod runners using a mixture of water and sand as abrasive. After grinding both faces the glass is reset on similar tables and polished with similar runners, but shod with felt and using water and rouge instead of sand In the Bicheroux process, the glass is cast between two rollers, enabling thin plate to be rolled and saving much of the time and cost of grinding.

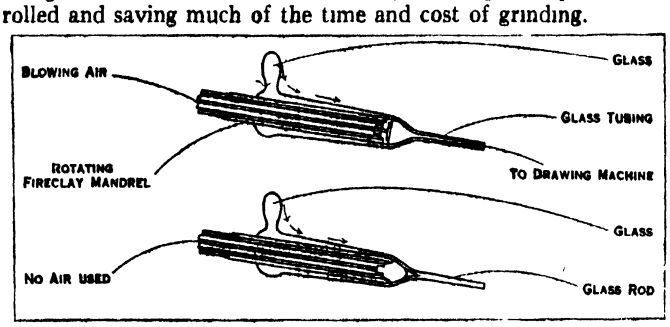

FIG 25.—DIAGRAMMATIC REPRESENTATION OF THE DANNER AUTOMATIC METHOD OF DRAWING GLASS TUBING AND GLASS ROD

For figured glass the rollers bear a pattern. (For wire glass *see* REINFORCED GLASS)

Optical Glass.—The term is usually regarded as applying to the highest qualities of glass used for telescopes, microscopes, camera lenses and scientific instruments of precision and not to spectacle lenses and pressed lenses for which inferior glass is used Optical glass is always purchased on specification and must be supplied as having definite refractice index (that for the D-line, n_D) dispersion and dispersion constant (ν). These are the properties on which the optician bases his calculations of achroma-

tizing two or more lenses, that is, of building up lens systems in instruments without colour fringes The importance of high quality optical glass is out of all proportion to the quantity made and the manufacture is seldom a profit-making venture Three firms in Great Britain, one in Germany and one in France make it; the Bureau of Standards (Department of Commerce), U S A, makes all that is produced in America Messrs. Chance Bros. make some 120 varieties and the following six from their list are selected to illustrate the range of optical properties

Glass No.	Type	n_D	Dispersion ($n_F - n_C$)	ν	Density
646	Boro-silicate crown	1·5087	0 00793	64·1	2 46
605	Hard crown	1·5175	0 00856	60 5	2 49
8894	Dense barium crown	1 6100	0 01145	53·3	3 53
407	Light flint	1 5787	0 01420	40 8	3 26
7972	Very dense flint	1·7566	0 02754	27 5	4·82
665	Light barium flint	1·5677	0·01291	44·0	3 08

The "crowns" were originally confined to alkali-lime-silica, and the "flints" to alkali-lead oxide-silica glasses Partial substitution of silica in the former by boric oxide gives boro-silicate crowns, and by phosphoric oxide or fluorine, phosphate crowns and fluorcrowns, respectively Substitution of lime by barium oxide or zinc oxide in crown glass gives barium crowns or zinc crowns; lead oxide by barium oxide in flints gives barium flints "Light," "medium" and "dense" refer to density Lead oxide tends to produce high refractive index (n_D), high dispersion and low value of ν Barium oxide leads to moderately high n_D and dispersion and still fairly high ν. The effect of each 1% of the oxides soda, potash, lime, lead oxide, barium oxide has been systematically worked out, so that the approximate composition of a glass required to fulfil certain optical conditions can be calculated (although this does not imply that it can successfully be melted)

The essentials of manufacture are (1) fireclay pots of low iron oxide content and as resistant as possible to corrosion by the glass, (2) sand and other raw materials as free as possible from iron oxide After being melted the glass is stirred for some hours to obtain homogeneity and freedom from bubbles and then slowly cooled, still stirring until too stiff to continue The pot of glass is cooled in several days to ordinary temperature and cracks irregularly into variously shaped and sized pieces which are carefully selected, softened sufficiently to be moulded into slabs, the ends of which are polished to examine the glass for striae and bubbles, and sold in block form Large discs for telescope refractors or reflectors are cast into a mould

Annealing Glassware.—Glass is a poor conductor of heat Hence, when cooling down and setting, the outer layers set hard prior to the inner, the contraction of which is retarded by the rigid outer layer Stresses are thus set up in the glass Thus, the outer layer may be in compression and the adjacent layer in tension. The working of glassware by tools or in metal moulds must naturally produce a rigid outer layer before the inner layers are set. A piece of hot glassware in which stresses are small or negligible can be prevented from developing stresses by retarding its rate of cooling appropriately, especially over what is known as the annealing range, whilst glassware which is stressed can be rendered relatively free from stress by maintenance for a suitable time at a temperature within the annealing range Once the temperature falls outside this range the cooling can be rapid without modifying the distribution of stresses or setting up permanent stresses if they have previously been removed

Arrangements for annealing, therefore, consist essentially of some hot chamber maintained at a temperature within the annealing range for a specified time and some means for cooling the glass at a controllable rate This may be done in kilns or in lehrs The latter consists of a hot chamber followed by a long tunnel in which cooling off occurs, a conveyor belt carrying the glassware traversing the hot chamber and the tunnel For commercial articles the temperature maintained in the hot chamber, either by gas or oil burners or other firing, or, again, in the latest methods, by the heat of the newly formed article, is the upper limit of the annealing range because the time required for annealing is greatly reduced thereby. For lead oxide glasses this upper temperature may range, according to composition, from 450° to 490°; bottle glass 540°–600°; for window glass 550° to 590°; whilst for chemical glasses it often exceeds 600° Thin-walled articles, such as electric light bulbs, may be rapidly annealed in a few minutes; the thicker the article the longer the time Slabs of optical glass are often annealed at a temperature towards the lower end of the annealing range and the time may be upwards of ten days A disc for a reflecting telescope 70 in. diameter and 12 in thick made in U S A. (1927) was given ten months to cool.

After-treatment and Decoration of Glass.—Mould blown ware usually has a shoulder and a heavy glass piece which connects it to the blow pipe, as, for example, with tumblers, beakers, blown dishes, etc

1 *Cracking-off and Edge Melting*—The shoulder is cracked off by mounting the article on a small rotating table and bringing a diamond point to bear on the side of the article at the height at which the top of the vessel is to be. After making a deep scratch the article is transferred to another small rotating table and small, horizontal, sharp-pointed gas flames impinge on it at the level of the scratch from which point a crack starts and proceeds in a horizontal direction right round the article (unless annealing has been very faulty). The edges of the article are then heated by a gas flame in order to round them off. With tumblers having walls of medium thickness it may be necessary to grind the edges flat by means of carborundum wheels before smoothing the edges in a flame Wine glasses and tumblers can be treated in mass in a melting machine by mounting them on a continuous belt and allowing them to pass between sets of burners

2 *Glass Cutting*—Decorative glass cutting such as is employed on drinking glasses, vases, dishes, etc, is carried out in several stages The pattern is traced in chalk and then cut out roughly by a rotating iron wheel with a triangular edge on which a continuous stream of sand and water is fed from an overhead hopper The actual cutting is done by the sand under pressure from the iron wheel The rough cutting is then smoothed by a stone wheel, Craigleith stone being much used in England, as well as artificial stone wheels Polishing is now frequently done by dipping in a mixture of concentrated hydrofluoric and sulphuric acids (Pl. II)

3 *Engraving*—Engraving is done by rotating copper wheels mounted in the chuck of a small lathe The wheels, which vary in diameter from $\frac{1}{16}$ in to 4 in, according to the size of the work to be done, are fed at their edges with oil containing fine emery powder

4 *Etching*—Electric lamp bulbs are now given an opal appearance by frosting them internally, the process depending on treatment with a solution of which the essential constituent is hydrofluoric acid Glass decoration may also be carried out by a similar etching solution For deep line etching a solution containing one part of concentrated hydrofluoric acid to four or five of water is employed When a matt or dulled surface is to be produced a mixture such as the following is employed Ammonium fluoride, 5; hydrofluoric acid, 2, water, 5 This mixture is best applied with a brush Parts of the article which are not to be etched are protected by a resisting medium made up from a mixture of asphalt, resin, beeswax, Venetian turpentine and rectified turpentine, one such mixture containing these materials in the respective proportions 500, 300, 150, 100, 1,000.

5. *Sand Blasting*—A matt but rather rough surface is produced by the process of blowing a stream of sand at considerable velocity against the glass surface to be decorated or marked (such as in badging with a number or other device) the parts of the glass to be marked being exposed through a metal stencil plate.

Historical.—Much of the earliest glass known has been found in Egypt and has suggested that country as having given birth to the art. Sir W. M. Flinders Petrie, however, regards objects earlier than about 1400 B C. found in Egypt as of foreign importation, the products of an earlier development in Syria. Glass has been found in the Euphrates region of date 2500 B C. The

GLASS MANUFACTURE









PHOTOGRAPHS, (1, 2, 3) EWING GALLOWAY, (4) PUBLISHERS PHOTO SERVICE

CRAFTSMEN CUTTING AND ETCHING ORNAMENTAL DESIGNS ON GLASS

1. Glass cutting: decorating a vase with a geometric combination of incised grooves cut in the surface of the piece. Work is done by means of a power driven stone or iron wheel having a sharp edge, upon which trickles a thin stream of water mixed with fine sand
2. Etching glass: producing designs on the glass surface by means of acids (hydrofluoric and sulphuric). The object to be decorated is covered with protective wax in which the design is traced with a needle. The piece is then placed in the etching bath until fluid has penetrated to the depth desired. Finally the wax or "resist" is removed, leaving the surface of the object decorated with the design. Craftsman is shown tracing design
3. Polishing the design cut on a large glass vase. Operator uses a disc of wood, cork or leather to remove rough surface in design left by the cutting wheel shown in fig. 1
4. Cutting the scalloped edge on a glass bowl. Considerable skill is required in cutting the facets to the proper depth and placing the designs

earliest known factory was that discovered by Petrie at Tell el Amarna in Egypt of date 1400 B.C. From this time onwards the art of glassmaking began to flourish in Egypt, the influence of foreign glass craftsmen being assigned by Petrie as the cause of the comparatively rapid development. Until shortly before the Christian era, the use of the blowpipe appears to have been unknown, the glass being first worked into rods or threads, and these in turn being softened and worked round a core of sand and welded together into the shape of the vessel The analysis (B. Neumann, 1926) of a sample of the colourless Tell el Amarna glass was silica 63 86, lime 7 86, magnesia 4 18, soda 22·66, potash 0 80, alumina 0·66, ferric oxide 0 67%. The use of the oxides of copper, of iron and of manganese for colouring glass was known at this very early date The manufacture of vases, coloured and decorated with Chevron patterns, and of beads, spread rapidly About 1200 B.C glass pressing in moulds was begun by the Egyptians.

Of early Assyrian glass-making we have no extensive knowledge, but R Campbell Thompson by his translations of inscriptions on tablets of the reign of Ashur-banipal (668–626 B C) has provided us with much information about the materials used and methods of manufacture.

Egyptian glassmaking continued through the Greek and Roman occupations and received impetus from the existence of a big demand in the Roman market Probably this demand led to the establishment of the art in Rome in the 1st century B C Certain it is that under the Romans the art made such strides that from the point of view of form and of manipulative skill their highest attainments have scarcely been surpassed The Portland vase, preserved in the Gold Room of the British Museum, is a magnificent example of this skill It was found in 1550 in a tomb of the 3rd century A D , but the vase itself is probably of the 1st century A D It consists of a dark blue body surmounted by an opal outer layer which has been chiselled or cut to form groups of figures in relief Glass cutting and engraving, glass mosaics (the latter already developed by the Egyptians) cameos, millefiori and filigree work were all the product of the Roman art, whilst bottles and jars were extensively made Glassmaking was carried on in many parts of the Roman empire, in Gaul, in Spain and on the Rhine

On the break-up of the Roman empire the art was carried on most actively in the Eastern empire The Greek workmen were largely preoccupied with the use of coloured glass as mosaics and their services for church decoration were in such request that they travelled far and wide plying their craft In Syria glassmaking appears to have been widespread and in the early centuries A D , Jewish craftsmen were engaged in working imitation gems Tyre, in the 12th century, contained many Jews engaged in glassmaking The Mohammedans became interested in the art We have definite records of the product of a factory at Sammara, in Mesopotamia, of the middle of the 9th century A D , whilst in the 11th to the 14th centuries another peak of development was reached in the Arabian enamelled glass, applied to vases and goblets and particularly to lamps for lighting mosques

The next great epoch of glassmaking was the Venetian, extending from the beginning of the 13th to the 18th century. It had its origin probably in the live contact of the Venetian trade with Syrian ports Early in the 13th century there is evidence of a gild of glassmakers in Venice Owing to the risk of fire within the city, the major operations of glassmaking were, towards the end of the 13th century, transferred to Murano and there greatly developed During the 14th century, the craft was so important that separate gilds were formed and finally well established in the 15th Membership carried important privileges, but involved heavy responsibilities and various severe penalties were imposed by enactments between the 13th and 16th centuries on Venetian workmen who travelled abroad and divulged the art of glassmaking Groups of them, however, and groups also from a rival establishment at L'Altare, travelled through western Europe, attracted by considerable reward and gave fresh impetus to the art in the Low Countries, in England, France and Germany. The Venetian productions, especially of the 16th century, were graceful in form and embodiments of the highest skill ever attained. The art of decoration attained a high standard and included lace pattern, filigree work, gilt and enamelled work and crackled glass Copper aventurine glass was discovered in the 17th century. Window glass, ships lanterns and spectacle lenses were all made in the 13th and 14th centuries, whilst mirror making, particularly in the 16th and 17th centuries, became a lucrative trade.

Of the development of glassmaking in France, Germany and England subsequent to Roman and Greek influences our knowledge is fragmentary only. A German worker, Theophilus, writing in the 12th century regarded the art of making stained glass windows as essentially French and there are records of skilled glassmakers in Normandy for several centuries from the 10th onwards, a band of whom at the end of the 11th century migrated to L'Altare on the Italian coast Glassmakers from Lorraine, a district which produced much window glass in the 16th century, migrated to England during the 16th century and eventually established themselves at Stourbridge and at Newcastle at the beginning of the 17th century, opening up those important centres The casting of plate glass was developed in 1691 by Louis Lucas de Nehou from an initial invention of Perrault in 1687. Very noteworthy, since the middle of the 19th century, have been the artistic glass productions of Rousseau, Gallé, Lalique Despres and Marinot

Well-defined knowledge of German glass begins with the writings of Agricola at the middle of the 16th century, but the industry had been carried on for some centuries in the forests of Saxony and Bohemia In the 16th century, Italian influence began greatly to stimulate the industry Enamelling, gilding, painting and engraving were brought to a high level of attainment during the two following centuries In England much patient research has led to the discovery of a number of details about glassmaking operations in the early 18th century at Chiddingfold, in Surrey. There is little doubt that bands of roving glassmakers plied their craft for some centuries in the forests of Sussex and Surrey, and probably elsewhere prior to the big development, beginning about the middle of the 16th century, when in 1547 a band of Venetian workmen came to London to carry on their craft and to teach it Various other bands followed and workmen from Lorraine, as already referred to, settled eventually in Stourbridge and in Newcastle The efforts of Sir Robert Mansell, in particular, at the beginning of the 17th century helped to establish the industry The English were the first to use coal for glass furnaces They also introduced covered crucibles and about 1670 began to employ a lead glass which soon became established as "English crystal" glass, composed of potash, lead oxide and silica Hitherto, including all glasses from the early Egyptian to the Venetian, a soda-lime (including magnesia) -silica basis had been universal, except that in the forests of Bohemia and south Germany potash instead of soda provided an improved variant on the older glass The new English glass could be made in thick articles suitable for cutting and engraving, and attained such popularity by the second half of the 18th century as to oust Venetian glass from favour

The chief contribution of America to glassmaking has been the invention and application of wonderful automatic machinery beginning with the Owens bottle machine (1899–1904) and followed by other types for bottles and jars, electric bulbs, tubing and rod, window and plate glass These inventions have placed America in the leading world position for quantity of glass produced and in recent years have made possible the manufacture of the articles named in countries such as South America, Japan, Australia and China, where skilled workers were unavailable

Scientific Development.—The basis of existing technique for making optical glass was developed by P L Guinand, a Swiss, between 1774 and 1805 The method was brought from France to England in 1848 by G. Bontemps Faraday spent several years (1824–30) in improving optical glass manufacture and Rev V Harcourt, working in the period 1834–65, in the latter years jointly with G G Stokes, was the pioneer in correlating the optical properties with the composition of glass O Schott and R Abbé, in Germany, began their collaboration in 1879. The famous Jena works (1882) sprang from their efforts and a mass of sci-

entific information about glass was published. The World War opened a new scientific era The Department of Glass Technology, University of Sheffield, was founded in 1915; the Society of Glass Technology in 1916 In America a Glass Division of the Ceramic Society was set up in 1918. The Deutsche Glastechnische Gesellschaft was founded in 1922 in Germany and several laboratories for research have subsequently been opened there. Japan has made a number of contributions to glass research

Industrial.—Only in the United States, Canada and Great Britain are censuses taken of production. The unofficial statistics are often uncertain and contradictory, and the data in the following tables must, therefore, be regarded as approximate for countries other than U.S A, Great Britain and Canada:

TABLE I
Number of Establishments

Country	Year	Total factories	Bottles	Window glass	Mirror, cast, wired and plate glass	Electric bulbs
United States	1925	310	120	42	51	7
Germany	1924	355	46	65	23	6
Great Britain	1927	143	83	2	1	5
Czechoslovakia	1927	154	8	26		4
France	1927	120	30	22	8	
Belgium	1926				8	4
Sweden	1925	59	12			2
Austria	1925	27	9			
Rumania	1925	23	10			
Holland	1925	21	6			2

TABLE II
Employment, Production and Exports in the Glass Industry

Country	Year	No. of employees	Total value of production	Value of exports	Value of imports
			£	£	£
U S.A.	1925	69,371	67,712,407†	1,823,523*†	3,497,541*†
Germany	1924	72,535		9,650,850*§	
Czechoslovakia				6,943,879*§‖	
Great Britain	1924	37,713	13,260,000#	2,261,495*	5,160,226*
Russia	1925–26	52,887	Rbl. 5,693,000	Rbl 850,000	Rbl 936,000
Belgium	1926	35,241			
Japan	1926			£1,430,800††	
Canada	1925	2,778			£1,368,000†
France	1926			£4,080,000⊕	

*For year 1927. †Calculated at $4 87 per £1.
§Calculated at 20 marks to £1
#Calculated at pre-war prices
‖Calculated at 165 crowns per £1.
††For year 1926. Calculated at 10 yen per £1
⊕Calculated at 124 francs to £1.

The number of employees is no longer a true measure of the glass producing power of a country Commencing with the U S A, there has been in the last decade some diminution in the number of establishments and a check to increase of workpeople employed as the result of the invention of mechanical appliances This process has spread to Great Britain and is now being felt on the continent of Europe

In 1927, Germany was the biggest exporter of glass; but, relative to production, the two most important exporting countries are Czechoslovakia and Belgium The former exported (1927) approximately 80% of its glass production

Window glass and plate glass constitute Belgium's chief glass exports Of polished plate, Belgium was Europe's biggest producer, with 37,660 thousand sq.ft in 1926, less than one-third, however, of that of U S.A in the same year (128,857,875 sq.ft.).

(*See* also BOTTLE MANUFACTURE; GLASS [SAFETY]; GLASS: ULTRA VIOLET RADIATION)

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GLASS-PAPER. An abrasive material much used for smoothing the surface of wood manufactures. It consists of thick cartridge paper coated with powdered glass. The paper is coated with liquid glue and the glass particles powdered over the surface before the glue has set (*See* also SAND-PAPER and EMERY.)

GLASSPORT, a borough of Allegheny county, Pa, U S A, 10m. S.E. of Pittsburgh, on the Monongahela river and the Pittsburgh and Lake Erie railroad The population was 6,959 in 1920 (25% foreign-born white) and was estimated locally at 7,500 in 1928 The leading industries are glass-making, copper welding and steel foundry work Glassport was settled about 1900.

GLASS PRINTS, or, as the French call them, *clichés-verres*, were an imitation of etchings in the making of which the Barbizon group of artists, Daubigny, Rousseau, Millet and Corot, would amuse their leisure during the years between 1855 and 1860. On a blackened piece of glass, covered with a white opaque varnish, they would draw their subjects with an etching-needle, as on a copper-plate, then they would take an impression on a sensitized paper exposed to the light behind the glass. The effect was curiously like an etching, though the print was really rather in the nature of a photograph, for no pressure had been used to crush the paper into bitten lines which did not exist. Daubigny was, we fancy, the most successful maker of these *clichés-verres*, though the needling of his lines, not being subjected to any mordant process, looked rather like lines drawn with a pen and ink, as in *Le Bouquet d'Aunes*, for instance, which, of course, has not at all the essential character of etching There was another form of glass prints popular in England in the later decades of the 18th century, which transferred to glass many contemporary mezzotint and stipple colour-prints, mostly of the cruder kind, but occasionally some of a more pretentious artistic order The glass, cut to the size of the print, was covered with a thin coating of turpentine, then the print, well damped, was laid on this, face downwards. The paper was most carefully rubbed away with the finger, until only the veriest film of the print was left with its design on the turpentine-covered glass. When this was dry, the



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GLASS PRINTS BY THE BARBIZON GROUP

Glass prints or *clichés verres* were an imitation of etchings made by artists of the Barbizon group between 1855 and 1860. The print was made by covering a blackened glass with white opaque varnish, and drawing the subject on it with an etching needle. An impression was then taken on a sensitized paper exposed to the light through the glass. The print was in reality a kind of photograph, though resembling an etching in effect

1. **Le Bouquet d'Aunes, by Charles François Daubigny (1817–78)**
2. **La Plaine de la Plante à Biau, by Théodore (Étienne Pierre) Rousseau (1812–67).** Scene at Barbizon, near the Forest of Fontainebleau
3. Le Grand Cavalier sous bois, by Jean Baptiste Camille Corot (1796–1875). Landscape with a human figure characteristic of Corot's mood and style; in reversed form
4. Femme vidant un seau, by Jean François Millet (1814–74). Country scene and subject typical of Millet's work; in reversed form

impression was painted on the back, sometimes richly, sometimes simply, even crudely, but often with a brilliancy of colouring superior to that of the original print on paper These glass coloured prints enjoyed a brief contemporary vogue, but they died out with the old coloured stipple and mezzotint Some 25 years ago there was a fashion in collecting them, but the field, it appears, was soon exhausted, and the actual old prints are valued too highly for it to be extended. (M C S.)

GLASSWORT, *Salicornia herbacea* (also known as marsh samphire), a salt-marsh herb, widely distributed in the northern hemisphere, with succulent, jointed, leafless stems, in reference to its former use in glass-making, when it was burnt for barilla. *Salsola Kali,* an allied plant with rigid, fleshy, spinous-pointed leaves, which was used for the same purpose, was known as prickly glasswort. Both plants belong to the family Chenopodiaceae

GLASTONBURY, a market town and municipal borough of Somerset, England, 6 m S of Wells, on the main road from London to Exeter, and on the Somerset and Dorset railway. Pop. (1921) 4,325 The town lies in the midst of orchards and water-meadows reclaimed from the fens which surround the Tor, a conical height of some 500 ft , which rises abruptly from the moor and is crowned by the ruins of St Michael's chapel The chief buildings, apart from the abbey, are the churches of St. John the Baptist, Perpendicular in style, with a fine tower and some 15th century monuments; and St Benignus, commonly called St Benedict's, dating from 1493–1524; St John's hospital, founded 1246; the Tribunal, and the George inn The Antiquarian museum, in Magdalene street has a good collection of objects discovered in the Glastonbury lake village in 1892 and consisting of sixty mounds within a space of five acres There is a Roman Catholic missionaries' college. In the 16th century the woollen industry was introduced by the duke of Somerset; and silk manufacture was carried on in the 18th century Tanning and tile-making, and the manufacture of boots and sheep-skin rugs are practised The town is governed by a mayor, 4 aldermen and 12 councillors Near the museum is the Abbey gateway, the restored Gatehouse of which was until lately the Red Lion inn

The Lake Village.—Near Glastonbury, in the Brue district of the Somersetshire lowland, which is about 14–16 m long and 2–5 m wide, has been found a lake village in what is now meadow land, but was, in the 16th and 17th century maps, a pool, "Meare Pool" Most of the Brue lowland is floored by peat, varying from a foot to several yards in thickness, near the lake village it is 13–15 ft thick The site is some 18 ft above present sea-level, and Bulleid thinks that about the time the British village site was first occupied the country was a maze of meres and broads, with branches of the Brue still influenced by inroads of the sea The village site lay west of a water channel which is the boundary between the parishes of Glastonbury and Meare, and was probably navigable in mediaeval times The village was built on a timber sub-structure resting on the swamp and including piles of logs laid across one another, as well as mortised timbers On this substructure were laid mounds of clay, and on these again were built the dwellings, with a border palisade surrounding the whole village, coarse wattle work bound the upper parts of the palisades together and they enclosed a space of about 10,530 sq yards There were 89 clay mounds, most with one to four dwelling floors, but a few with larger numbers (one had ten) Each dwelling floor was circular, the diameter ranging from 14 to 40 ft , or more commonly 18–28 ft The wall was a line of posts (3–9 in diameter), 6–15 in apart, set around a circle The roofs seem to have been of reed thatch. A few rectangular dwellings probably existed Most of the hearths in the houses were baked clay, but some were of stone. A pivoted door has been found, as well as doorsteps and pathways

A very considerable collection of fibulae is made up entirely of late Celtic types, they were probably made on the spot as crucibles, bronze wire, dross, slag, etc , have been found They almost all belong to the La Tène III. type, though two are earlier Ten penannular brooches, very late Celtic or almost Romano-British, were also found, as was a fine bronze bowl Thirty-five finger rings have been collected as well as various other ornaments and a bronze mirror. Three bronze terret-rings or loops for harness have been recovered, as well as a large variety of other bronze objects, 32 objects in lead and 18 in tin are accounted for by Gray and armlets and other objects in Kimmeridge shale are a feature, as in many other places in the west of England Long-handled weaving-combs are specially important finds, and 89 have been found in the lake village, nearly all made of red-deer antler, with a few of bone The situation of the village has led to the preservation of a number of wooden objects which give many clues to the skill of the people. Remains of two boats, a loom, an axle-box and a ladder, etc , have been identified.

Of iron objects, 109, some with wooden handles, have been catalogued One piece of tin-money of the earlier part of the first century AD and a number of currency-bars are a further link between Glastonbury and the La Tène III civilization of the regions further north-east and south-east The quantity of pottery discovered was very large, but only a very few fragments, on the flood soil above the village, could be conjecturally connected with Roman influence. The pottery obviously belongs to the Late Celtic period, but is mostly of rather coarse paste Reid found remains of peas, beans, wheat, barley, etc., while the domestic animals included a small breed of horse, an ox (*Bos longifrons*), two breeds of sheep, a goat, a small type of pig and a dog Forty-four human remains have been found, and are thought by Boyd Dawkins to indicate a massacre The crania which could be examined had breadth-length indices about 76·5 to 78 The general conclusion is that the village was the abode of cultivators and craftsmen, probably not entirely cut off from the sea via the meres, and that the place was occupied in the last century BC and part of the 1st century AD This valuable work furnishes the best indication so far available of the life of the British people at the time of the Roman invasion British earthworks and Roman roads and relics prove later occupation The name of Glastonbury, however, is of much later origin, being a corruption of the Saxon *Glæstyngabyrig* By the Britons the spot seems to have been called Ynys yr Afalon (latinized as Avallonia) or Ynysvitrin (*see* AVALON), and it became the local habitation of various fragments of Celtic romance

See Arthur Bulleid and H St George Gray, *The Glastonbury Lake Village* (1911 and 1917)

The Benedictine Abbey of St. Mary.—The earliest account we have of the beginnings of this famous monastery comes from William of Malmesbury, who wrote (*c* 1125) a book, *On the Antiquity of the Church of Glastonbury* He says that "annals of good authority" tell us that a little wattle church, dedicated to the Blessed Virgin, had been built there by missionaries whom the pope sent from Rome at the request of King Lucius in the year 166 He was aware of a still earlier story, but he would not commit himself to it After his death his work was re-edited, and details were added to show that the missionaries were not the builders, but merely the restorers of the old wattle church which had been built a century before by companions of St Philip the Apostle, who had placed Joseph of Arimathea at their head We may fairly assume that Malmesbury really saw this ancient church while he was staying at Glastonbury from 1125 until about 1130 or a little later In his *Gesta Regum* he states that King Ina (*c* 700) built from the foundations the Church of the Blessed Apostles, as an appendix to the old church This church, too, we may be sure existed, as it is mentioned in a 10th century Saxon genealogy From the decadent state into which English monasticism had fallen after the Danish invasions, Glastonbury was rescued by Dunstan, who had been educated within its walls and afterwards became its abbot, about 942

Ina's church, which may have been partly ruinous, St Dunstan restored He lengthened it considerably by the addition of a tower and made it square with its length by adding aisles That this church was standing while Malmesbury was at Glastonbury would appear to be certain from the careful description he gives of the position of certain tombs of Saxon abbots and bishops within it The first Norman abbot, Turstin, had begun a new

church on Norman lines, probably leaving the Saxon church of Dunstan alone. His successor, Herlewin, pulled down all that Turstin had put up, and started afresh, as he did not consider the building was sufficiently dignified for so important an abbey Whether this Norman church obliterated or incorporated St Dunstan's church we do not at present know, for the excavations that have been carried out by the Society of Antiquaries of London jointly with the Somerset Archaeological Society during 1927–28, while they appear to have revealed the remains of Ina's church and the additions made to it by St Dunstan, have not gone far enough to show the relation of the later Norman building to these earlier structures

On May 25, 1184, this great church, all the monastic buildings, and, most serious of all, the venerable old wattle church, were consumed in a terrible fire Four years previously the abbot had died, and his successor had not been appointed as the king was glad to keep the revenues in his hands Henry II now did his part with unusual generosity, placing the whole of the revenues at the disposal of Ralph Fitz Stephen, to whom the king entrusted the work of rebuilding after the fire First the Lady chapel was built on the site the old church had once occupied for so many centuries This was finished and consecrated within three years The foundation for the main church, the ruins of which are now standing, were put in on a magnificent scale, but the progress of the work was checked by the death of Henry II and the conflict of the monks with Savary, bishop of Bath, who had succeeded in making himself abbot Of the various additions made under successive abbots, one of considerable interest was the building of a Galilee to join the west end of the great church to the Lady chapel. This was effected during the time that John of Taunton was abbot, between 1274 and 1291 The east wall of the Lady chapel was removed, an open arch substituted, and then a building of the same width and length as the chapel itself filled the space between it and the west wall of the new church

As the Lady chapel was said to record by its length the exact size of the original wattle church, now that it had been added to it was feared that this celebrated measurement would in time be lost To guard against this, a cross or pillar was built at a later date outside the chapel, 48 ft northwards from the original easternmost buttress, so that the length from east to west could be easily calculated A bronze plate, giving the story of St Joseph's wattle church was fixed to the monument In Aug 1921, the foundations of this pillar, about 7 ft in diameter, were uncovered Another important alteration also affected the Lady chapel Abbot Richard Bere, the last abbot but one (1493–1524) hollowed out a crypt under the floor of this chapel and the adjoining Galilee under-pinning the walls for the purpose It was this crypt chapel that was dedicated to St Joseph of Arimathea, and that contained his statue

Of the monastic buildings themselves nothing remains standing except the Abbot's Kitchen, as it is popularly called, a solid and substantial building, square in plan, but rendered octagonal interiorly by great fireplaces which are planted across the angles The central ventilating shaft is a fine and ingenious piece of work and leads the roof up to a decorated octagon in which it finishes Of other parts of the monastery nothing can now be seen except the undercroft of the refectory, excavated in 1911, under the direction of Bligh Blond, and the line taken by the cloisters leading to the church The foundations of the rest of the monastery remain to be uncovered in time The dissolution of the abbey commenced on Aug 25, 1539, when Dr Layton visited the place The venerable abbot, Richard Whiting, was taken at his manor at Sharpham, and sent up to London and lodged in the Tower, on account of "divers and sundry treasons" Cromwell, in his *Remembrances* writes, "Item, the abbot of Glaston to be tryed at Glaston and also executed there with his complycys" (Cott mss Titus B 1, fol 41) The abbot was sent down to Wells, where he was "arraigned and next day (Nov 15, 1539) put to execution for robbing of Glastonbury church" The execution took place on Glastonbury Tor His body was quartered and his head fixed on the abbey gate A darker passage does not occur in the annals of the English Reformation than this murder of an able and high-spirited man, whose worst offence was that he defended as best he could from the hand of the spoiler the property in his charge.

In 1907 the site of the abbey, with the remains of the buildings, which had been in private hands since the granting of the estate to Sir Peter Carew by Elizabeth in 1559, was bought by Mr Ernest Jardine for the purpose of transferring it to the Church of England Bishop Kennion of Bath and Wells entered into an agreement to raise a sum of £31,000, the cost of the purchase, this was completed, and the site and buildings were formally transferred at a dedicatory service in 1909 to the Diocesan Trustees of Bath and Wells, who are to hold and manage the property according to a deed of trust This deed provided for the appointment of an advisory council, consisting of the archbishop of Canterbury, the bishop of Bath and Wells and four other bishops, each with power to nominate one clerical and one lay member The council has the duty of deciding the purpose for which the property is to be used "in connection with and for the benefit of the Church of England" To give time for further collection of funds and deliberation, the property was re-let for five years to the original purchaser. The Abbot's Kitchen was purchased in 1921 and has been added to the original trust

The two legends most closely connected with the story of the abbey are those of King Arthur and St Joseph of Arimathea It was claimed that the former was buried there and that the latter was the builder of the original wattle church These legends "are truly venerable traditions, which greatly influenced the story of the past and have left an abiding mark on the nomenclature of the present They are not very ancient, when the long life of the abbey is taken into account From first to last they occupied only the last three centuries and a half of its history They were unknown to William of Malmesbury when he wrote his book, *On the Antiquity of the Church of Glastonbury*, about the year 1125, although he had free access to all the abbey's records before the Great Fire, and made, as we know, excellent use of his opportunities of investigation Our earliest date for any of them is 1191 (*Two Glastonbury Legends*, p 50, by the Very Rev J Armitage Robinson) The Glastonbury thorn (*Crataegus praecox*), which flowers at Christmas as well as in the spring, a late legend asserted sprang from the staff of Joseph of Arimathea It is probably nothing more than a perpetuated *sport* from the common thorn obtained by grafting Trees raised from seeds of *C praecox* revert to the ordinary type

The abbey was overlord of the town of Glastonbury until the Dissolution Henry II granted a charter by which the men of Glastonbury were exempted from the jurisdiction of royal officials, and this exemption was recognized by Edward I when on a visit to the abbey in 1278, he yielded to the abbot's plea and held his court of justice at the chapel of St Gildas at Street, which was just outside "the Twelve Hides" The borough was incorporated by Anne in 1706, and the corporation was reformed by the act of 1835 In 1319 Glastonbury received a writ of summons to parliament, but made no return, and has not since been represented A fair on the 8th of September was granted in 1127, another on the 20th of May was held under a charter of 1282 Fairs known as Torr fair and Michaelmas fair are now held on the second Mondays in September and October and are chiefly important for the sale of horses and cattle The market day every other Monday is noted for the sale of cheese Glastonbury owed its medieval importance to its connection with the abbey At the Dissolution, a number of foreign weavers, chiefly Flemings, were introduced to check the decay of the town, and some settled among the ruins of the abbey The cloth trade flourished for a century and was replaced by silk-weaving, stocking-knitting and glove-making, all of which have died out.

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Gl," and *Saxon Abbots of Glastonbury* (Somerset Hist. Essays, 1921), and *Two Glastonbury Legends* (1926). (D. E. H.)

GLATIGNY, JOSEPH ALBERT ALEXANDRE (1839–1873), French poet, was born at Lillebonne (Seine Inférieure), received an elementary education at Bernay, was apprenticed to a printer at Pont Audemer, where he produced a three-act play, and joined a travelling company of actors to whom he acted as prompter Inspired primarily by the study of Théodore de Banville, he published his *Vignes folles* in 1857; his best collection of lyrics, *Les Flèches d'or*, appeared in 1864, and a third volume, *Gilles et pasquins*, in 1872 After Glatigny settled in Paris he improvised at café concerts and wrote several one-act plays On an expedition to Corsica with a travelling company of actors he was on one occasion arrested and put in irons for a week through being mistaken by the police for a notorious criminal His marriage with Emma Dennie brought him great happiness, but the hardships of his life weakened his health and he died at Sèvres on April 16, 1873

See Catulle Mendès, *Légende du Parnasse contemporain* (1884), and *Glatigny, drame funambulesque* (1906).

GLATZ (Slav *Kladsko*), a town in the Prussian province of Silesia, on the left bank of the Neisse, 58 m S W from Breslau by rail Pop (1925) 16,558 Glatz existed as early as the 10th century, and received German settlers about 1250 The county of Glatz, long contended for by Poland and Bohemia, eventually became part of the latter, and in 1534 was sold to the house of Habsburg, from whom it was taken by Frederick the Great during his attack on Silesia The town with its narrow streets winds up the fortified hill which is crowned by the old citadel Across the river, on the Schaferberg, lies a fortress built by the Prussians about 1750 Before the town on both banks of the river there is a fortified camp by which bombardment from the neighbouring heights can be hindered and which affords accommodation for 10,000 men The inner ceinture of walls was razed in 1891 and their site is now occupied by new streets. There are a Lutheran and two Roman Catholic churches, one of which, the parish church, contains the monuments of seven Silesian dukes Among the other buildings the principal are the Royal Catholic gymnasium and the military hospital

Glatz existed as early as the 10th century, and received German settlers about 1250 It was besieged several times during the Thirty Years' War and during the Seven Years' War and came into the possession of Prussia in 1742 In 1821 and 1883 great devastation was caused here by floods The county of Glatz was long contended for by the kingdoms of Poland and of Bohemia Eventually it became part of the latter country, and in 1534 was sold to the house of Habsburg, from whom it was taken by Frederick the Great during his attack on Silesia

GLAUBER, JOHANN RUDOLF (1604–68), German chemist, was born at Karlstadt, Bavaria He resided successively in Vienna, Salzburg, Frankfurt and Cologne before settling in Holland, where he made his living chiefly by the sale of secret chemical and medicinal preparations He clearly described the preparation of hydrochloric acid by the action of sulphuric acid on common salt, the manifold virtues of sodium sulphate—*sal mirabile*, Glauber's salt—formed in the process being one of the chief themes of his *Miraculum mundi;* and he noticed that nitric acid was formed when nitre was substituted for the common salt Further he prepared a large number of substances, including the chlorides and other salts of lead, tin, iron, zinc, copper, antimony and arsenic, and he even noted some of the phenomena of double decomposition, he also made a number of useful observations on dyeing and gave a clear description of the preparation of tartar-emetic

His treatises, about 30 in number, were collected and published at Frankfort in 1658–59, at Amsterdam in 1661, and, in an English translation by Packe, at London in 1689.

GLAUBER'S SALT, first described by J. R. Glauber, occurs native as the mineral mirabilite in Spain, the western States of North America, and the Caucasus Sodium sulphate is the active principle of many mineral waters, *e g*, Friedrichshall, Carlsbad waters It occurs in sea water and is a normal constituent of the blood (*See* ALKALI MANUFACTURE)

Glauber's salt is decahydrated sodium sulphate, $Na_2SO_4,10H_2O$ (*see* HYDRATE); it separates from cold aqueous solutions of sodium sulphate in colourless monoclinic prisms which effloresce in dry air and at 32 38° C melt in their water of crystallization Its maximum solubility in water is at 32 38° C, and above that temperature it no longer exists as decahydrate but changes to anhydrous salt, which becomes decreasingly soluble as the temperature rises Glauber's salt readily forms supersaturated solutions in which crystallization is induced by adding a particle of the salt In medicine it is employed as an aperient, being one of the safest and most innocuous For children or patients who refuse other drugs it may be mixed with common salt

GLAUCHAU, a town of Germany, in the republic of Saxony, on the right bank of the Mulde, 7 m N of Zwickau and 17 m W of Chemnitz by rail Pop (1925) 27,318 It has important manufactures of woollen and half-woollen goods There are also dye-works, print-works, and manufactories of paper, aluminium, thread and machinery Glauchau possesses a weaving school Some portions of the old castle date from the 12th century, the Gottesacker church contains objects of this period Glauchau was founded by a colony of Sorbs and Wends, and belonged to the lords of Schonburg as early as the 12th century

GLAUCONITE, a green mineral, a hydrous silicate of iron with potassium It especially occurs in the green sands and muds which are gathering at the present time on the sea bottom at many different places The wide extension of these sands and muds was first made known by the naturalists of the "Challenger," and it is now found that they occur in the Mediterranean as well as in the open ocean, but they have not been found in the Black sea or in any freshwater lakes These deposits are not in a true sense abyssal, but are of terrigenous origin, the mud and sand being derived from the wear of the continents, transported by marine currents The depth in which they accumulate varies a good deal, viz , from 200 up to 2,000 fathoms, but as a rule is less than 1,000 fathoms, and it is believed that the most common situations are where the continental shores slope rather steeply into moderate depths of water

The glauconites, though crystalline, never occur well crystallized but only as dense clusters of very minute particles which react feebly on polarized light They have one well-marked characteristic, inasmuch as they often form rounded lumps In many cases it is certain that these are casts, which fill up the interior of empty shells of Foraminifera It is now believed that glauconite is essentially the same as the green iron silicate that forms the primary substance of so many iron ores of marine origin, and that the presence of potash is merely due to colloidal adsorption, the source of the potash is, however, by no means clear

In a small number of Tertiary and older rocks glauconite occurs as an essential component It is found in the Pliocene sands of Holland, the Eocene sands of Paris and the "Molasse" of Switzerland, but is much more abundant in the Lower Cretaceous rocks of northern Europe, especially in the subdivision known as the Greensand Rounded lumps and casts like those of the green sands of the present day are plentiful in these rocks, and it is obvious that the mode of formation was in all respects the same The green sand when weathered is brown or rusty coloured, the glauconite being oxidized to limonite Calcareous sands or impure limestones with glauconite are also by no means rare, an example being the well-known Kentish Rag In the chalk-rock and chalk-marl of some parts of England glauconite is rather frequent, and glauconitic chalk is known also in the north of France Among the oldest rocks which contain this mineral are the Ordovician of the Leningrad district and southern Sweden, as well as the basal Cambrian quartzite in Shropshire, but it is very rare in the Palaeozoic formations, possibly because it undergoes crystalline change and is also liable to be oxidized and converted into other ferruginous minerals. It has been suggested that certain deposits of iron ores may owe their origin to deposits of glauconite, as for example those of the Mesabi range, Minnesota (J S F)

GLAUCOUS, a word meaning of a sea-green colour, in botany covered with bloom, like a plum or a cabbage-leaf

GLAUCUS, a word meaning "bright," and the name of several figures in Greek mythology, the most important of which are the following:

1 GLAUCUS, surnamed *Pontius,* a sea divinity. Originally a fisherman and diver of Anthedon in Boeotia, having eaten a certain magical herb, he leaped into the sea, where he was changed into a god, and endowed with the gift of unerring prophecy. According to others he sprang into the sea for love of the sea-god Melicertes, with whom he was often identified. He was worshipped in most parts of the Greek world by fishermen and sailors In art he is depicted as a merman covered with shells and seaweed Various legends, none very important, connect him with the saga of the Argonauts and other cycles He was famous for his amours, especially those with Scylla and Circe. *See* especially Athenaeus, 296, 297

2 GLAUCUS, of Potniae near Thebes, son of Sisyphus by Merope and father of Bellerophon According to the legend he was torn to pieces by his own mares (Virgil, *Georgics,* iii 267; Hyginus, *Fab,* 250, 273).

3 GLAUCUS, the son of Minos and Pasiphaë. When a child, while playing at ball or pursuing a mouse, he fell into a jar of honey and was smothered. His father, after a vain search for him, consulted the oracle, and was referred to the person who should suggest the aptest comparison for one of the cows of Minos which had the power of assuming three different colours Polyidus of Argos, who had likened it to a mulberry (or bramble), which changes from white to red and then to black, soon afterwards discovered the child; but on his confessing his inability to restore him to life, he was shut up in a vault with the corpse Here he killed a serpent which was revived by a companion, which laid a certain herb upon it With the same herb Polyidus brought the dead Glaucus back to life. According to others, he owed his recovery to Asklepios

4 GLAUCUS, son of Hippolochus, and grandson of Bellerophon, mythical progenitor of the kings of Ionia He was a Lycian prince who, along with his cousin Sarpedon, assisted Priam in the Trojan War. When he found himself opposed to Diomedes, his guest-friend, they ceased fighting and exchanged armour Since the equipment of Glaucus was golden and that of Diomedes bronze, the expression "gold for bronze" (*Iliad,* vi 236) came to be used proverbially for a bad exchange Glaucus was afterwards slain by Ajax, son of Telamon

See further Roscher's *Lexikon,* s v.

GLAZE: *see* CERAMICS. CHINAWARE.

GLAZEBROOK, SIR RICHARD TETLEY (1854–), K C B (1920), Kt (1917), C B. (1910), was born on Sept 18, 1854, and educated at Liverpool college and at Trinity college, Cambridge, where he became a fellow in 1877 In 1898 he was appointed principal of University college, Liverpool, and in 1899 director of the National Physical laboratory, a post which he held until 1919 In 1908 he became chairman of the Aeronautical Research committee, and from 1920 to 1923 was Zaharoff professor of aviation and director of the department of aeronautics at the imperial college of technology

He is the author of many scientific textbooks, and papers on scientific subjects, and the editor of the *Dictionary of Applied Physics*

GLAZING. The business of the glazier is confined to the mere fitting and setting of glass, even the cutting up of the plates into squares being generally an independent art, requiring a degree of skill and judgment not necessarily possessed by the building artificer.

The tools generally used by the glazier are the diamond for cutting, laths or straight edges, tee square, measuring rule, glazing knife, backing knife and hammer, duster, sash tool, two-foot rule and a glazier's cradle for carrying the glass Glazier's materials are glass, putty, priming or paint, sprigs, wash-leather or india-rubber for door panels, size, black The glass is supplied by the manufacturer and cut to the sizes required for the particular work to be executed Putty is made of whiting and linseed oil, and is generally bought in iron kegs of ½ or 1 cwt ; the putty should always be kept covered over, and when found to be getting hard in the keg a little oil should be put on it to keep it soft. Priming is a thin coat of paint with a small amount of red lead in it. In the majority of cases after the sashes for the windows are fitted they are sent to the glazier's and primed and glazed and then returned to the job and hung in their proper positions When priming sashes it is important that the rebates be thoroughly primed, else the putty will not adhere All wood that is to be painted requires before being primed to have the knots coated with knotting When the priming is dry, the glass is cut and fitted into its place; each pane should fit easily with about $\frac{1}{16}$ in play all round. The glazier runs the putty round the rebates with his hands, and then beds the glass in it, pushing it down tight, and then further secures it by knocking in small nails, called glaziers' sprigs, on the rebate side He then trims up the edges of the protruding putty and bevels off the putty on the rebate or outside of the sash with a putty knife The sash is then ready for painting Large squares and plate glass are usually inserted when the sashes are hung to avoid risks of breakage. For inside work the panes of glass are generally secured with beads (not with putty), and in the best work these beads are fixed with brass screws and caps to allow of easy removal without breaking the beads and damaging the paint, etc In the case of glass in door panels where there is much vibration and slamming, the glass is bedded in wash-leather or india-rubber and secured with beads as before mentioned The most common glass and that generally used is clear sheet in varying thicknesses, ranging in weight from 15 to 30 oz per sq ft, *i.e.*, from $\frac{1}{16}$ to $\frac{3}{16}$ in thick

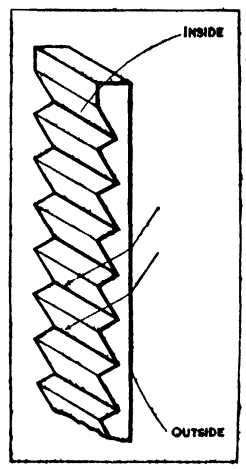


FIG. 1.—PRISM WINDOW GLASS, SHOWING INTERNAL ARRANGEMENT OF PRISMS GIVING MOST EFFICIENT DIFFUSION

Lead Lights.—Lead light glazing is the glazing of frames with small squares of glass, which are held together by strips of lead, these are secured by means of copper wire to iron saddle-bars, which are let into mortices in the wood frames or stone jambs The strips of lead are soldered at the angles, the glass is placed between the strips, and the lead is flattened over the edges to secure it Lead lights originated in days when glass could only be made in small pieces, and when, therefore, it was necessary to join the small pieces together to glaze a window of any size In modern days the method is used only to obtain a picturesque effect To look really well, the lead "cames" or strips should be ⅜in wide In modern lead lights the lead strips are often reinforced with steel to make saddle-bars unnecessary In a patent "copper-lite" glazing, thin connecting strips of copper are substituted for lead by a method which produces a rigid panel of small squares

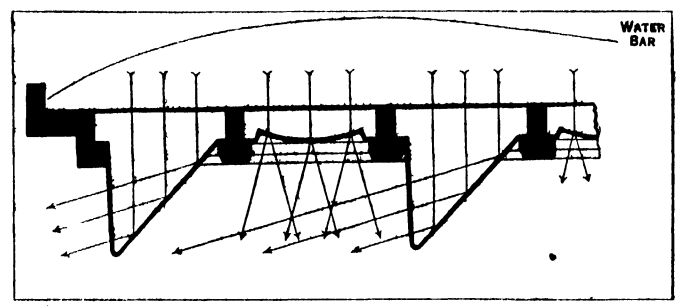


FIG 2.—SECTION OF PRISM PAVEMENT USED TO LIGHT BASEMENTS
The thick glass prisms are set in square iron frames, and serve to diffuse the light as indicated by arrows

Wired Glass.—Wired rolled plate or wired cast plate, usually ¼in thick, has wire netting embedded in it to prevent the glass from falling in case of fire, its use is obligatory in London for all lantern- and sky-lights, and for screens and doors on the staircases of public and warehouse buildings, in accordance with the London Building Act It is also used for the decks of ships and for port and cabin lights, as it is much stronger than plain glass, and if fractured is held together by the wire Patent prismatic

rolled glass, or "refrax" (fig. 1), consists of an effective application of the well-known properties of the prism, it absorbs all the light that strikes the window opening, and diffuses it in the most efficient manner possible through the darkest parts of the room. It can be fixed in the ordinary way or placed over the existing glass. Pavement lights (fig 2) and stallboard lights are constructed with iron frames in small squares and glazed with thick prismatic glass, and are used to light basements They are placed on the pavement and under shop fronts in the portion called the stallboard, and are also inserted in iron coal plates

Roof Glazing.—The glazing of roofs demands the use of metal sashes, wood is only used in inferior work The fixing of pieces of glass to metal bars raises technical points which are met in many different ways, covered by a host of patents Usually a bar of T section is employed, and the edges of the glass secured with strips of lead It is not difficult to devise systems of this sort in which allowance is made for the effects of heat upon the metal, and for condensation In one method the steel is entirely covered with lead to make painting unnecessary

GLAZUNOV, ALEXANDER CONSTANTINOVICH (1865–), Russian composer, was born in St Petersburg (Leningrad) Aug 10, 1865, the son of a publisher and bookseller. He showed an early talent for music, and studied, on the advice of Balakirev, with Rimsky-Korsakov At the age of sixteen he composed a symphony (afterwards elaborated and published as op 5), but his *opus* 1 was a quartet in D, followed by a pianoforte suite on *S-a-c-h-a,* the diminutive of his name Alexander In 1884, helped to some extent by Liszt, he began to make a name outside Russia His first symphony was played that year at Weimar, and he appeared as a conductor at the Paris exhibition in 1889 In 1897 he conducted his fourth and fifth symphonies in London In 1900 he became professor at the St Petersburg conservatoire, and in 1906 director Glazunov is a leading representative of the modern Russian school, and a master of orchestration though his tendency as compared with most contemporary Russian composers is towards classical form Nevertheless his music is full of colour, and, on occasion, descriptive. His fine ballet, *Raymonda,* shows that he also shares to the full the Russian love for oriental splendour and movement In short if his leanings are classical he is a classicist à la Russe, and in any event, a great master of his art and craft. Of his many compositions, the most famous are perhaps, among the orchestral works, the noble sixth symphony, in C minor (op 58), among those for solo instruments, the theme and variations for pianoforte (op. 72), and the fine violin concerto in A minor (op 73), and among those for the stage (very few in number) the ballet *Raymonda* (op 57), already mentioned

GLEBE, in ecclesiastical law the land devoted to the maintenance of the incumbent of a church. Burn (*Ecclesiastical Law, s v.* "Glebe Lands") says. "Every church of common right is entitled to house and glebe, and the assigning of them at the first was of such absolute necessity that without them no church could be regularly consecrated The house and glebe are both comprehended under the word *manse,* of which the rule of the canon law is, *sancitum est ut unicuique ecclesiae unus mansus integer absque ullo servitio tribuatur.*" In the technical language of English law the fee-simple of the glebe is said to be in *abeyance,* that is, it exists "only in the remembrance, expectation and intendment of the law" But the freehold is in the parson, although at common law he could alienate the same only with the consent of the bishop and patron The disabling statutes of Elizabeth (Alienation by bishops, 1559, and Dilapidations, etc., 1571) made void all alienations by ecclesiastical persons, except leases for the term of 21 years or three lives By an Act of 1842 (5 and 6 Vict c 27, Ecclesiastical Leases) glebe land and buildings may be let on lease for farming purposes for 14 years or on an improving lease for 20 years. But the parsonage house and ten acres of glebe situate most conveniently for occupation must not be leased By the Ecclesiastical Leasing Acts of 1842 (5 and 6 Vict. c. 108) and 1858 glebe lands may be let on building leases for not more than 99 years and on mining leases for not more than 60 years. The Tithe Act 1842, the Glebe Lands Act 1888 and various other Acts make provision for the sale, purchase, exchange and gift of glebe lands. In Scots ecclesiastical law, the manse now signifies the minister's dwelling-house, the glebe being the land to which he is entitled in addition to his stipend All parish ministers appear to be entitled to a glebe, except the ministers in royal burghs proper, who cannot claim a glebe unless there be a landowner's district annexed, and even in that case, when there are two ministers, it is only the first who has a claim

See H W Cripps *Law of Church and Clergy* (5th ed enlarged, 1869), Sir R J Phillimore *Ecclesiastical Law of England* (2nd ed 1895), G P Leach *Tithe Acts* (6th ed 1896), J. H. Dart *Vendors and Purchasers* (7th ed 1905)

GLEDITSIA, a genus of thorny shrubs and trees of the pea family (Leguminosae), containing 11 species, found chiefly in subtropical America and Asia Some are used for hedges and some supply useful timber, as the honey locust (*G triacanthos*) and the water locust (*G aquatica*), of the eastern and southern United States

GLEE, a musical term signifying, broadly speaking, a piece of concerted vocal music, generally unaccompanied, and for male voices, though exceptions are found to the last two restrictions The number of voices ought not to be less than three As regards musical form, the glee is little distinguished from the catch (*q v*) —the two terms being often used indiscriminately for the same work; but there is a distinct difference between it and the madrigal (*q.v*)—one of the earliest forms of concerted music known in England While the madrigal does not show a distinction of contrasted movements, this feature is absolutely necessary in the glee.

The originator of the glee in its modern form was Dr. Arne, born in 1710.

GLEICHEN, LORD EDWARD (Albert Edward Wilfred) (1863–), British major-general, was born on Jan 15, 1863, eldest son of Admiral Prince Victor of Hohenlohe-Langenburg and Laura, daughter of Admiral Sir George Seymour He was educated at Charterhouse, and passed through Sandhurst into the Grenadier Guards in 1881 He saw service in Egypt (1884–85), was attached first to the War Office intelligence department and then to special missions in the Sudan and in Abyssinia. He served in the South African War, where he won the D S O Later he was military attaché at Berlin and at Washington During the World War he commanded the 37th Division (1915–16), and then returned to the intelligence department of the War Office. He retired with the rank of major-general in 1916. He is the author of several books on the various missions in which he was employed

GLEICHEN, two groups of castles in Germany, thus named from their resemblance to each other (Ger *gleich*=like) The first is a group of three, each situated on a hill in Thuringia between Gotha and Erfurt One of these called Gleichen, the Wanderslebener Gleiche (1,221 ft above the sea), was besieged unsuccessfully by the emperor Henry IV in 1088 After belonging to the elector of Mainz the castle became the property of Prussia in 1803

The second castle is called Muhlburg (1,309 ft above the sea). This existed as early as 704 and was besieged by Henry IV in 1087 It came into the hands of Prussia in 1803 The third castle, Wachsenburg (1,358 ft), is still inhabited and contains a collection of weapons and pictures collected by the former duke of Saxe-Coburg-Gotha, whose family obtained possession of it in 1368. It was built about 935 (*see* Beyer, *Die drei Gleichen,* Erfurt, 1898) The other group consists of two castles, Neuen-Gleichen and Alten-Gleichen. Both are in ruins and crown two hills about 2 m S E from Gottingen

GLEIG, GEORGE ROBERT (1796–1888), British divine and author, son of George Gleig, bishop of Brechin (1753–1840), was born at Stirling, and educated at Glasgow University and Balliol College, Oxford He served with distinction in the Peninsular War (1813–14), and in the American War, in which he was thrice wounded Resuming his studies at Oxford, he was ordained priest in 1820, was chaplain-general of the forces (1844–75) and inspector-general of military schools (1846–57). From 1848 till his death he was prebend of Willesden in St Paul's cathedral During the last sixty years of his life he was a prolific, if not

very scientific, historical writer. Those of his works which deal with contemporary campaigns have historical value. They include. *Life of Sir Thomas Munro* (3 vols , 1830), *The Leipsic Campaign* (1831), *Story of the Battle of Waterloo* (1847), *Sale's Brigade in Afghanistan* (1847), biographies of Lord Clive (1848), the duke of Wellington (1862), and Warren Hastings (1848).

GLEIM, JOHANN WILHELM LUDWIG (1719–1803), German poet, was born on April 2, 1719 at Ermsleben, near Halberstadt He studied law at Halle, where he founded the so-called *Anacreontik,* with other young poets He was successively secretary to Prince William of Brandenburg-Schwedt at Berlin, to Prince Leopold of Dessau, and secretary (1747), of the cathedral chapter at Halberstadt "Father Gleim" was the title accorded to him throughout all literary Germany on account of his generosity to young poets. He looked with some suspicion on their revolutionary tendencies, but helped them none the less Gleim himself wrote feeble imitations of Anacreon, Horace and the minnesingers, a dull didactic poem entitled *Halladat oder das rote Buch* (1774), and collections of fables and romances Of higher merit are his *Preussische Kriegslieder von einem Grenadier* (1758), inspired by the campaigns of Frederick II Gleim died at Halberstadt on Feb. 18, 1803

Gleim's *Samtliche Werke* appeared in 7 vols. in the years 1811–13

GLEIWITZ, a town in the Prussian province of Silesia, on the Klodnitz, and the railway between Oppeln and Cracow, 40 m S E of the former town Pop (1875) 14,156, (1925) 81,571 Gleiwitz is the centre of the mining industry of Upper Silesia There are also foundries with which are connected machine manufactories and boiler-works, and manufactories of wire, chemicals, glass, cement and paper The town is rather more than a mile north of the new frontier between Germany and Poland

GLENALMOND, a glen of Perthshire, Scotland, south-east of Loch Tay. It comprises the upper two-thirds of the course of the Almond, or a distance of 20 m For the greater part it follows a direction east by south, but at Newton Bridge it inclines sharply to the south-east for 3 m , and narrows to such a degree that this portion is known as the Small (or Sma') Glen At the end of this pass the glen expands and runs eastwards as far as the well-known public school of Trinity college, where it may be considered to terminate The most interesting spot in the glen is that traditionally known as the grave of Ossian

GLENCAIRN, EARLS OF. The 1st earl of Glencairn in the Scottish peerage was ALEXANDER CUNNINGHAM (d 1488), a son of Sir Robert Cunningham of Kilmaurs in Ayrshire Made a lord of the Scottish parliament as Lord Kilmaurs not later than 1469, Cunningham was created earl of Glencairn in 1488, and a few weeks later he was killed at the battle of Sauchieburn whilst fighting for King James III against his rebellious son, afterwards James IV His son and successor, ROBERT (d *c* 1490), was deprived of his earldom by James IV , but before 1505 this had been revived in favour of Robert's son, CUTHBERT (d *c* 1540), who became 3rd earl of Glencairn, and whose son WILLIAM (*c* 1490–1547) was the 4th earl This noble, an early adherent of the Reformation, was during his public life frequently in the pay and service of England

William's son, ALEXANDER, the 5th earl (d. 1574), was a more pronounced reformer than his father, whose English sympathies he shared, and was among the intimate friends of John Knox He anticipated Lord James Stewart, afterwards the regent Murray, in taking up arms against the regent, Mary of Guise, in 1558 When in Aug 1561 Mary queen of Scots returned to Scotland, Glencairn was made a member of her council, he changed sides more than once, and was found fighting against Mary at Carberry Hill and at Langside The earl, who was a violent iconoclast, died on Nov 23, 1574 His short satirical poem against the Grey Friars is printed by Knox in his *History of the Reformation*

JAMES, the 7th earl (d *c* 1622), took part in the seizure of James VI , called the raid of Ruthven in 1582. WILLIAM, the 9th earl (*c* 1610–64), was a somewhat lukewarm Royalist during the Civil War In March 1653 Charles II gave him temporary command of the Royalist forces in Scotland, and the insurrection of this year is generally known as Glencairn's rising. After its failure he was betrayed and imprisoned; when Charles II. was restored he became lord chancellor of Scotland He died at Belton, Haddingtonshire on May 30, 1664

GLENCOE, a glen in Scotland, situated in the north of Argyllshire. Beginning at the north-eastern base of Buchaille Etive, it takes a gentle north-westerly trend for 10 m. to its mouth on Loch Leven, a salt-water arm of Loch Linnhe On both sides it is shut in by wild and precipitous mountains and its bed is swept by the Coe—Ossian's "dark Cona,"—which rises in the hills at its eastern end About half-way down the glen the stream forms the tiny Loch Triochatan Towards Invercoe the landscape acquires a softer beauty. The late Lord Strathcona, in 1894, purchased the heritage of the Macdonalds of Glencoe. The principal mountains on the south side are the various peaks of Buachaille Etive, Stob Dearg (3,345 ft) Bidean nam Bian and Meall Mor, and on the northern side the Pap of Glencoe, Sgor nam Fiannaidh and Meall Dearg Points of interest are the Devil's Staircase, a steep, boulder-strewn "cut" across the hills to Fort William, the Study, the cave of Ossian, where tradition says that he was born, and the Iona cross erected in 1883 by a Macdonald in memory of his clansmen who perished in the massacre of 1692 About 1 m beyond the head of the glen is Kingshouse inn, a relic of the old coaching days Now the Glencoe excursion is usually made from Oban One mile to the west of the Glen lies the village of BALLACHULISH, celebrated for slate quarries, worked since 1760 Ballachulish is a station on the L M S R The pier and ferry are some 2 m W of the village

GLEN COVE, a city of Nassau county, New York, on the north shore of Long Island, 22 m N E of the Brooklyn borough hall. It is served by the Long Island railroad The population in 1925 was 10,822. Glen Cove was settled in 1668, chartered as a city in 1918, and has a commission form of government

GLENDALE, a rapidly growing city of Los Angeles county, Calif , U S A , 6 m from the heart of Los Angeles, at the southern extremity of the San Fernando valley It is served by the Pacific Electric, the Southern Pacific and the Union Pacific railways The population was 2,746 in 1910, 13,536 in 1920 (87% native white), and was estimated locally at 78,000 in 1928 The elevation of the city varies from 400 to 2,000 ft It is a popular residential suburb, and is also developing rapidly as an industrial centre There are large potteries, and sundry other manufacturing industries, with an aggregate factory output in 1925 valued at $4,863,991 Glendale was incorporated in 1906

GLENDALOUGH, VALE OF, 8½ m N N W of Rathdrum, Co Wicklow, Ireland, noted for its ecclesiastical ruins Here, early in the 6th century, Kevin lived as a hermit for four years and later founded a monastery which, despite many Danish raids, remained for some centuries an important ecclesiastical and educational centre There was a succession of bishops until 1214 when the see was united to that of Dublin In close proximity are a round tower, 110 ft high and 52 in circumference, St Kevin's kitchen or church which measures 25 ft by 15, with a high pitched roof and round belfry, the cathedral, about 73 ft in total length by 51 in width, a Lady chapel, chiefly remarkable for its doorway of wrought granite, a priest's house (restored), and slight remains of St Chiaran's church Here is also St Kevin's cross, a granite monolith never completed; and the enclosure is entered by a fine though dilapidated gateway Other remains are Trinity or the Ivy Church, towards Laragh, and St Saviour's monastery, while on the upper lough are Reefert Church, the burial-place of the O'Toole family, and Teampull-na-skellig, the church of the rock St Kevin's bed is a cave above the lough, to which attaches the legend of St Kevin's hermitage

GLENDOWER, OWEN [OWAIN GLYN DWR] (1359?–1415), the last independent prince of Wales, more correctly described as Owain ab Gruffydd, lord of Glyndyvrdwy in Merioneth, was a man of good family, with two great houses, Sycharth and Glyndyvrdwy in the north, besides smaller estates in south Wales His father was called Gruffydd Vychan, and his mother Helen; on both sides he had pretensions to be descended from the old Welsh princes Owen was probably born about 1359, studied law at Westminster, was squire to the earl of Arundel, and a witness

for Grosvenor in the famous Scrope and Grosvenor lawsuit in 1386 Afterwards he was in the service of Henry of Bolingbroke, the future king. Welsh sympathies were, however, on the side of Richard II., and combined with a personal quarrel to make Owen the leader of a national revolt

The lords of Glyndyvrdwy had an ancient feud with their English neighbours, the Greys of Ruthin Reginald Grey neglected to summon Owen, as was his duty, for the Scottish expedition of 1400, and then charged him with treason for failing to appear. Owen thereupon took up arms, and when Henry IV returned from Scotland in September he found north Wales ablaze A hurried campaign under the king's personal command was ineffectual In the spring of 1401 Owen was raiding in south Wales. A second campaign by the king in the autumn was defeated, through bad weather and the Fabian tactics of the Welsh Owen had already been intriguing with Henry Percy (Hotspur), who during 1402 held command in north Wales, and with Percy's brother-in-law, Sir Edmund Mortimer During the winter of 1401–1402 he treated with the rebel Irish, the Scots and the French In the spring he attacked Ruthin, and took Grey prisoner. In the summer he defeated the men of Hereford under Edmund Mortimer at Pilleth, near Brynglas, in Radnorshire Mortimer was taken prisoner and treated with such friendliness as to make the English doubt his loyalty, within a few months he married Owen's daughter In the autumn the English king was for the third time driven "bootless home and weather-beaten back" In May 1403 Henry of Monmouth was allowed to sack Sycharth and Glyndyvrdwy unopposed. Owen had a greater plot in hand The Percies were to rise in arms, and meeting Owen at Shrewsbury, overwhelm the prince before help could arrive But Owen was defeated near Carmarthen on July 12, and Percy was crushed at Shrewsbury ten days later But the Welsh revolt was still formidable Owen styled himself openly prince of Wales, established a regular government, and called a parliament at Machynlleth As a result of a formal alliance the French sent troops to his aid, and in the course of 1404 the great castles of Harlech and Aberystwith fell into his hands

In the spring of 1405 the tide turned Prince Henry defeated the Welsh at Grosmont in March, and twice again in May Scrope's rebellion in the North prevented the English from following up their success The earl of Northumberland took refuge in Wales, and the tripartite alliance of Owen with Percy and Mortimer (transferred by Shakespeare to an earlier occasion) threatened a renewal of danger But the English under Prince Henry gained ground steadily, and the recovery of Aberystwith, after a long siege (1408), marked the end of serious warfare In February 1409 Harlech was recaptured, and Owen's wife, daughter and grandchildren were taken prisoners According to Adam of Usk Owen died in 1415 Welsh legend represents him as spending a peaceful old age with his sons-in-law at Ewyas and Monington in Herefordshire, till his death and burial at the latter place The dream of an independent and united Wales was never nearer realization than under Owen's leadership The disturbed state of England helped him, but he was indeed a remarkable personality, and has become a national hero Sentiment and tradition have magnified his achievements, and confused his career with tales of portents and magical powers Owen left many bastard children; his legitimate representative in 1433 was his daughter Alice, wife of Sir John Scudamore of Ewyas

The facts of Owen's life must be pieced together from scattered references in contemporary chronicles and documents, perhaps the most important are Adam of Usk's *Chronicle* and Ellis's *Original Letters* On the Welsh side something is given by the bards Iolo Goch and Lewis Glyn Cothi For modern accounts consult J H. Wylie's *History of England under Henry IV* (4 vols., 1884–1898), A C. Bradley, *Owen Glyndwr* (1904); and Professor Tout's article in the *Dictionary of National Biography* For further references *see* the Bibliography (1915) compiled by D Rhys Phillips

GLENELG, CHARLES GRANT, Baron (1778–1866), eldest son of Charles Grant (*q v*), chairman of the directors of the East India Company, was born in India on Oct 26, 1778, and was educated at Magdalene college, Cambridge, of which he became a fellow in 1802. Called to the bar in 1807, he entered parliament for the Inverness burghs in 1807 He was a lord of the treasury (1813-19), secretary to the lord lieutenant of Ireland (1819), vice-president of the board of trade (1823–27), and president in 1828 Joining the Whigs, he was president of the board of control under Earl Grey and Lord Melbourne from Nov. 1830 to Nov 1834 At the board of control Grant was primarily responsible for the act of 1833, which altered the constitution of the Government of India In April 1835 he became secretary for war and the colonies, and was created Baron Glenelg His differences with Sir Benjamin d'Urban (*q v*), governor of Cape Colony, were serious, but more so were those with King William IV and others over the administration of Canada He was still secretary when the Canadian rebellion broke out in 1837, his wavering and feeble policy was fiercely attacked in parliament, he became involved in disputes with the earl of Durham, and the movement for his supersession found supporters even among his colleagues in the cabinet. In Feb 1839 he resigned Grant has been called "the last of the Canningites" He died at Cannes on April 23, 1866, when his title became extinct

GLENELG, a municipal town and watering place of Adelaide county, South Australia, 6½ m by rail S S W of the city of Adelaide It is connected with Adelaide by two lines of railway In the vicinity is the "Old Gum Tree" under which South Australia was proclaimed British territory by Governor Hindmarsh in 1836

GLENGARRIFF or **GLENGARIFF,** a tourist resort in Co Cork, Ireland, on an inlet of Bantry bay, 11 m from Bantry A mountain road from Macroom, and a branch line from the north, facilitate tourist traffic. The harbour has been described by Thackeray

GLEN GREY, a division of the Cape province south of the Stormberg, adjoining on the east the Transkeian Territories Pop (1926), *c* 65,800. Chief town, Lady Frere, 32 m N E of Queenstown The district is well watered and fertile, and large quantities of cereals are grown Over 96% of the inhabitants are of the Zulu-Xosa (Kafir) race, and a considerable part of the district was settled during the Kafir wars of Cape Colony by Tembu (Tambookies) who were granted a location by the colonial Government in recognition of their loyalty to the British Act No 25 of 1894 of the Cape parliament, passed at the instance of Cecil Rhodes, which laid down the basis upon which is effected the change of land tenure by natives from communal to individual holdings, and also dealt with native local self-government and the labour question, applied in the first instance to this division, and is known as the Glen Grey Act (*see* Cape Colony. *History*). The provisions of the Act respecting individual land tenure and local self-government were in 1898 applied, with certain modifications, to the Transkeian Territories The division is named after Sir George Grey, governor of Cape Colony 1854–61

GLEN RIDGE, a residential borough of Essex county, New Jersey, U S A, 6 m N of Newark, served by the Erie and the Lackawanna railways. The population in 1920 was 4,620

GLENS FALLS, a city of Warren county, New York, U S A, on the Hudson river, 60 m above Albany It is on Federal highways 4 and 9, has an airport, and is served by the Delaware and Hudson railway The population was 16,638 in 1920 (89% native white) and was estimated locally at 20,000 in 1928 The principal residence streets are arched with superb elms It is a busy manufacturing city, making especially shirts and collars, cement, pulp and paper, dresses and blouses, wall paper and pigments The aggregate output of its factories in 1925 was valued at $15,239,396 There are valuable quarries of black marble and limestone in the vicinity In the river bank, under a beautiful concrete bridge, is the entrance to the cave which figures in J Fenimore Cooper's *The Last of the Mohicans* Glens Falls was settled in 1763, by a group of Quakers under the leadership of Abraham Wing At first it was called Wing's Falls, but in 1788 the name was changed to satisfy a debt of honour (so the story goes) owed by Wing to Colonel Johannes Glen of Schnectady During the Revolution the village suffered from the armies of Burgoyne, Schuyler and Gates, and was burned to the ground in 1780, but because of the valuable water-power and advantageous location it was soon rebuilt It was chartered as a city in 1908

GLENTILT, a glen in the extreme north of Perthshire, Scotland, following a north-westerly direction excepting for the last 4 m., when it runs due south to Blair Atholl It is watered by the Tilt. Carn nan Gabhar (3,505 ft), Ben y Gloe (3,671) and Carn Liath (3,193) dominate the lower half of the glen. Marble of good quality is occasionally quarried

GLIDING, the art of flying a heavier than air craft similar to an aeroplane but not provided with an engine The history of American gliding is mainly a record of the scientific achievements of the great pioneers, Chanute, Montgomery, Wilbur and Orville Wright In the first half of the 19th century the English pioneers, Cayley, Henson and Stringfellow, made valuable theoretical investigations and model flight experiments. It is this group of workers who may be said to have "invented" the aeroplane But their invention would never have been reduced to practice without the subsequent effort of the early exponents of gliding.

Captain Le Bris, a French sailor, carried out the first significant glider work in the '70s, building gliders with wings shaped like those of an albatross and with a boat-shaped body Le Bris made many remarkable glides, but he succeeded more by instinct than by scientific skill, and did not make any substantial contribution to the science of flight The most famous exponent of gliding was undoubtedly Otto Lilienthal, who with his brother Gustav began to make experiments in 1867. Lilienthal realized that data were needed for success and accumulated much information from a study of the flight of birds He was perhaps the first man to understand the superiority of the cambered or curved surface over the flat plate Lilienthal insisted however that practice should go hand in hand with theoretical study and in 1891 he built his first man-carrying glider, with a framework of peeled willow rods covered with tough cotton fabric Lilienthal in both his monoplane and biplane machines attached himself to the glider by thrusting his arms through padded tubes and holding on to a cross-bar He sailed through the air with his body and legs below the machine and was convinced that stability and control could be best achieved by movements of the flier's body While Percy Pilcher made many interesting flights in England, his sole addition to the structure of the glider was a horizontal plane Both Lilienthal and Pilcher lost their lives in their experiments

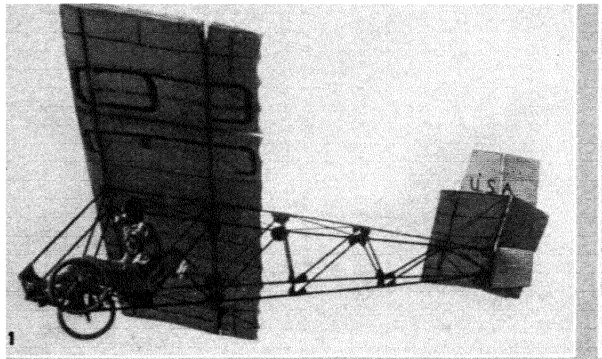
Octave Chanute, of greater engineering ability than Pilcher or Lilienthal, brought the Lilienthal tradition to the United States. In 1896, then in his 64th year, he began to make gliding flights Chanute was sure that Lilienthal was not on the right track in seeking control mainly by the shifting of the pilot's body The first original design made by Chanute was a glider with five superposed surfaces, well trussed together The pilot was still placed below the glider, and the rudder was in the rear But the wings on either side could be swerved fore and aft, so as to provide both longitudinal and lateral control With the five-deck glider Chanute found tractability in winds as high as 20 m an hour, and in a wind of 13 m. per hour obtained a gliding slope of one in four

The five-deck glider was succeeded by a three-decker, soon to be followed by the famous Chanute biplane In this glider, Chanute braced the two wings of the biplane together with vertical posts and diagonal wires forming a Pratt truss This has been used frequently by biplane designers The biplane glider weighed 23 lb., had a wing area of 135 sq ft and carried a total weight of 178 lb. at 23 m. per hour. It had a double rudder in addition to the horizontal control. It could navigate in a wind as high as 40 m per hour, and glided on a path of between 7 5° to 11° to the horizontal. Chanute did a great deal to achieve strong and light construction, and to increase stability and efficiency. So stable were his gliders that his 2,000 flights were without a single accident

Chanute was the first American to make a large number of successful glides, but the first American exponent of this art as a means of aerodynamic study was John J Montgomery. Between 1883 and 1894 he was almost continuously engaged in fruitful experimentation His first glider, built about 1884, consisted of two wings placed in tandem, each 10 ft long and 4½ ft. in width, united by a framework to which a seat was suspended, and provided with a horizontal tail which could be elevated or depressed by pulleys. The wings were curved or cambered, and also arched sidewise like those of a gull, with a total surface of 90 square feet. Lateral balance was achieved by motion in the seat. The weight of the apparatus was 40 lb , and that of the rider some 130 lb more Montgomery took this apparatus to the top of a hill nearly a mile long which gradually sloped at an angle of about 10°. On his first glide he faced a sea breeze steadily blowing from 8 to 12 m an hour and jumped into the air without previous running. He found himself at once launched upon the wind and executed a glide of 600 feet This experiment led Montgomery to build a second glider, in which (probably to increase stability) flat surfaces were employed. To secure lateral control he endeavoured to relieve undue pressure upon either side by providing a diagonal hinge in each wing, along which the rear triangle might fold back against the restraining action of a spring and yield to a wind gust In addition to the spring, he arranged a saddle which was so constructed that by leaning to one side or the other the rear portion of that wing would yield The lateral control was greatly improved, but the lifting power was diminished because of the flat plane. In a third glider, the wings were made like those of a soaring vulture To give lateral control, the wing was so built and braced as to allow rotation in a socket at the front end of the frame which supported the seat. The machine was perfectly controllable but was inferior in lifting power even to the second glider Montgomery then undertook experiment to determine the proper form of wing surface In 1903 he stretched a cable between two mountains 150 ft above the valley and liberated various models In 1904, at San Juan he extended experiments on this principle with a man-carrying glider, and made observations on the effects of wind currents

In 1905, while the Wright brothers were making their most successful private flights, Montgomery built his last and largest glider, the Santa Clara, weighing 45 lb and patterned largely after his first glider He conceived the idea that the most interesting way of using gliders was to launch them from a balloon. On April 29, 1905, Daniel Maloney, an experienced parachute jumper, rose 4,000 ft from the college grounds in a hot-air balloon and let his glider loose One of Montgomery's pupils described the event: "In the course of the descent, the most extraordinary and complex manoeuvres were accomplished—spiral and circling turns being executed with an ease and grace almost beyond description, level travel accomplished with the wind and against it, figure-eight revolutions performed without difficulty, and hair-raising dives were terminated by abrupt checking of the movement by changing the angles of the wing surfaces. At times the speed as estimated by eye-witnesses, was over 68 m an hour, and yet after a flight of approximately 8 m in 20 min , the machine was brought to rest upon a previously designated spot, ¾ m from the place where the balloon had been released, so lightly that the aviator was not even jarred, despite the fact that he was compelled to land on his feet, not on a special alighting gear." Subsequent exhibitions with other hot-air balloons, other gliders, and two other pilots, Wilkie and Defolco, gave equally striking results.

The next great American exponents of gliding were the Wright brothers The Wrights from the first experimented with kites and gliders, though they were also great exponents of the wind tunnel method, and used a small wind tunnel to carry out scientific tests on a variety of wing surfaces Their first plan was to construct a glider which could be used as a man-carrying kite in a steady breeze. Their calculations indicated that a glider with 200 sq ft of wing area would be sufficient for their purpose in a steady wind of some 20 m. per hour. For their flights they selected the Kill Devil sand hills near Kitty Hawk, N C , which provided strong and steady sea breezes Through some errors in calculations, their first man-carrying glider, tried out in the summer of 1900, proved a failure as a kite and they soon turned to gliding The glider of 1900, though a biplane, differed in many respects from the Chanute glider To decrease the air resistance the pilot was placed prone above the lower wing. They discarded the vertical



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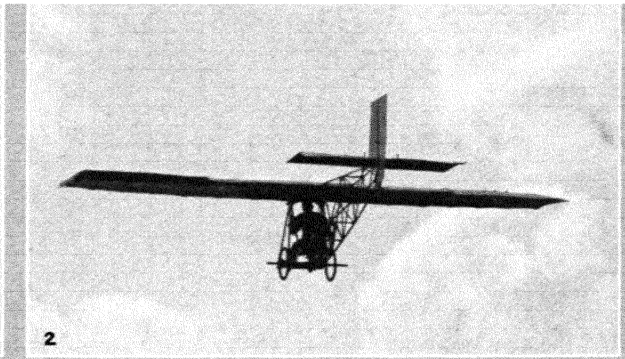
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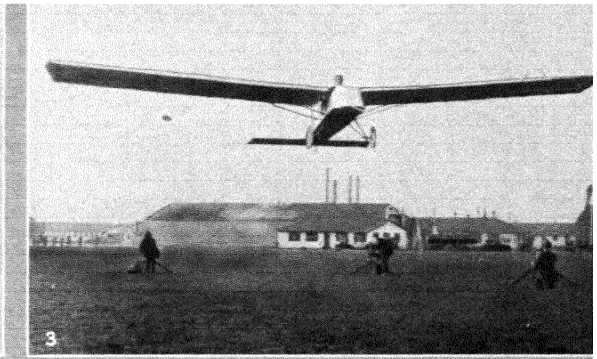
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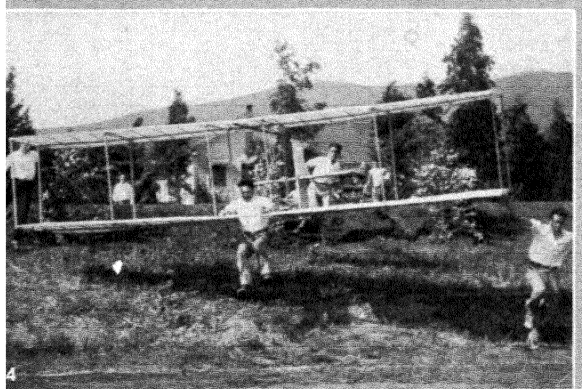
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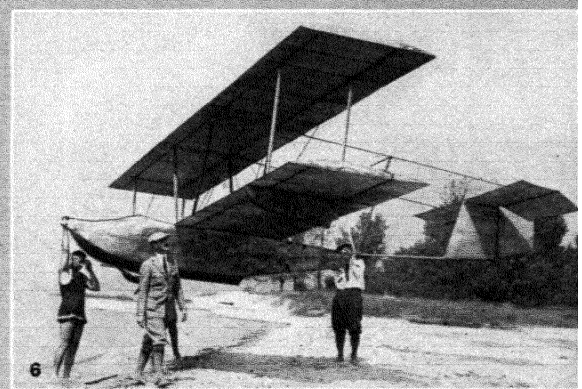
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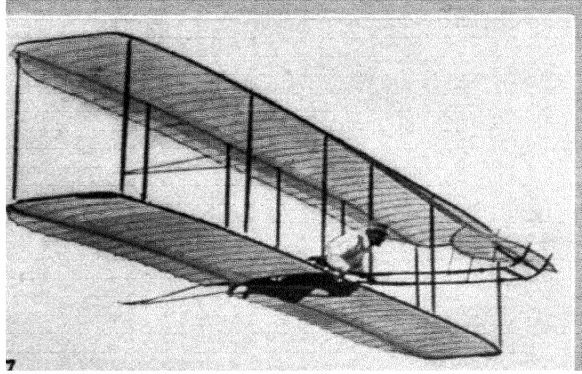
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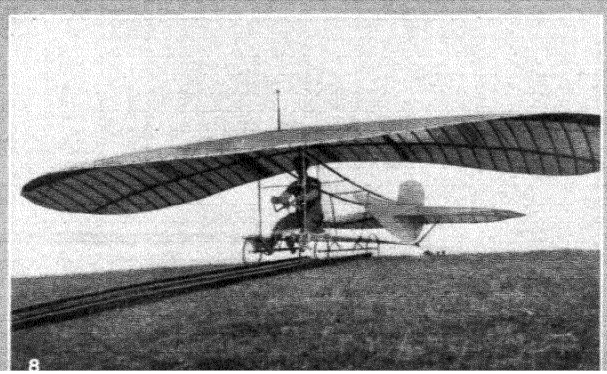
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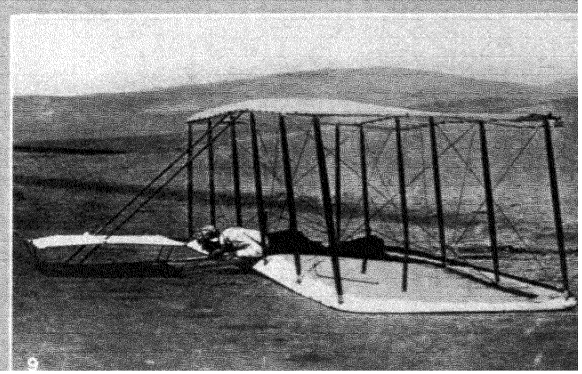
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AMERICAN TYPES OF GLIDERS OR MOTORLESS AEROPLANES IN FLIGHT

1. E. T. Allen competing in gliding contest in France, 1922
2. Rear view of monoplane glider (fig. 1), showing open fuselage
3. Testing the Nordman glider at a Long Island field, June 1923
4. Starting a flight in 75lb. Army Air Corps glider, California
5. American glider (*see* fig. 3), wings 40 ft. span, weight 200 lb., 1923
6. Glenn Curtiss with his seaplane glider on Hempstead Bay, 1922
7. Chanute, inventor of early gliders, shown in biplane glider
8. Montgomery's glider, 1911, ready for take-off in California
9. Orville Wright demonstrating an early glider, Kitty Hawk, N.C.

rudder, and placed the horizontal rudder forward. To secure lateral balance they warped the wings on either side, so as to vary the angle of attack and hence the lift on either side. For launching and landing they used sled runners With a surface of 165 sq ft. they could glide down a slope of 9·5° at a speed of 25 to 30 m. per hour. The front horizontal rudder and the warping wings gave adequate control

The Wrights' most successful glider was built in 1902. As a result of their previous experiments, they decided to use a vertical rudder, which was subsequently made adjustable The 1902 machine had two main surfaces, measuring 32 ft by 15 ft each, a front horizontal rudder measuring 15 sq ft and the vertical rudder measuring 12 sq ft, later reduced to six This glider showed greater efficiency than previous models. In Sept. and Oct. 1902, nearly 1,000 gliding flights were made, several of which covered distances of over 600 feet Some were made in perfect safety against a wind of 36 m an hour and gave an extraordinary demonstration of the control achieved The great glider achievement of the Wright brothers was in securing complete control by combining the horizontal rudder, with an adjustable vertical rudder, and the warping wings It was this perfect control which made their gliding so safe, and which enabled them to proceed to the building of the first successful power-driven aeroplane While the Wrights from 1903 onwards devoted the greater part of their energies to power-driven craft, they never lost their interest in gliding

With much more powerful controls, and the horizontal rudder in the rear, many very long glides were made, the longest being of a duration of 9 min 45 seconds. This remained the record until Hentzen, a German, in Aug 1922, remained soaring aloft in the Rhine valley for 3 hr and 6 minutes.

For many years after the Wrights' duration record of 1911, no gliding experiments were made in the United States. In 1922 the remarkable gliding endurance flights in the Rhine valley induced another famous pioneer, Glenn Curtiss, to try his hand at glider construction A biplane glider with a flying boat hull, and outriggers carrying the tail surface, was built by the Curtiss Company It weighed only 150 lb without the pilot, had a wing area of 310 sq ft, and was remarkable as being the first flying-boat glider ever constructed Tests were made in the waters of Long Island sound near Ft Washington The glider when towed behind a high speed motor boat rose readily in the air and, cast adrift, performed admirably

In Germany gliding had reached a high degree of popularity mainly for two reasons. First, the Versailles treaty prevented the construction of large aeroplanes, and the Germans turned to gliding as a patriotic method of maintaining and increasing their skill in the matter of heavier-than-air craft Second, the meteorological conditions in the Rhine valley, providing continuous upward currents of air, were most favourable to soaring flight

In the United States, on the other hand, full sway was given to the construction of powered craft, and meteorologically suitable localities such as Kitty Hawk were found to be difficult of access from large centres of population As a result, while the German glider experiments were followed with great interest both in the technical and the daily press, attempts at popularization of this art in America were difficult.

In 1922 Nordman, a young aeronautical engineer of College Point, L I, built a neat monoplane glider, which was towed behind a motor cycle and behaved well when released in the air

An excellent glider was built by the students of the Massachusetts Institute of Technology and entered in a French contest at Clermont-Ferrand (1923), with E T Allen as the pilot This was a high wing cantilever monoplane with a non-covered fuselage The machine crashed during one of its flights in the meet at a time when it had a higher score than any other competitor. Under the direction of Prof A A. Merrill, two students of the California Institute of Technology built a glider (1922) of the cantilever monoplane type with a span of 40 ft. and a chord of 4½ feet In this glider the vertical rudder and fin were discarded, and tip vanes on the wings were used successfully for control Several hundred towed flights were made

On May 30, 1928, three German glider pilots, Capt. Paul Roehre, Dr. Paul Laubenthal and Peter Hesselbach, arrived in the United States bringing with them three German gliders, including the Darmstadt which held many German records The expedition arrived under the auspices of the American Motorless Aviation club. Cornhill, near Provincetown, Mass, was the locality selected for the first American flights of these gliders With headquarters in Detroit, the Evans Glider clubs were being organized to promote national glider contests to be held annually and thus popularize a sport both exhilarating and scientific.

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How to Glide.—In order to glide successfully, four things are required. (1) a properly designed machine, (2) proper terrain, (3) the man power to give the glider its initial impetus in the air; and (4) the necessary experience on the part of the pilot in manipulating the controls of the machine so as to preserve the proper equilibrium A properly designed plane should have high aspect ratio, low parasite resistance and great torsion rigidity The modern gliders are equipped with controls for ailerons, rudder and tail surfaces the same as an ordinary aeroplane, and are very carefully stream-lined The length of wing is usually 25 to 50 ft, the cord from 4 to 5 feet Specifications can be obtained from the National Advisory Committee of Aeronautics, Washington, D.C, or from various glider clubs in the United States.

For elementary gliding, which means the more or less rapid descent either in circles or in a straight line from the top of a hill to its base, the requirements are simple But where soaring is desired, the requirements are much more exacting First there should be chosen a hill from 100 to 300 ft high which slopes up from a level plain first slowly and then more abruptly to a rounded crest The hill should face toward prevailing winds and, preferably, should be several miles long The length is necessary in order to permit the glider to perform figure eights, so as to keep always on the top of the current of air flowing up and over the hill There should be no fences, trees or shrubbery on the hillside or the plain at its foot, as these might cause disaster at time of landing Attached to the nose of the glider is a ring with two ropes leading therefrom, which can be used to pull the glider rapidly along until it has reached the necessary speed to carry it into the air, from the crest of the hill Preferably, these ropes should be made of rubber, which being stretched to their limit before the glider leaves the ground, will give a snap to the motion of the glider The ring which holds the ropes is detachable by the pilot, and should be released as soon as the glider leaves the hill There should always be enough men pulling the glider so that it can move with ease and quickness, as a sluggish start will often cause an accident

In attempting to glide, the pilot should first learn the elements of the sport by using gliders of the simpler type. As he improves in circling and gliding downward, he can then graduate to gliders of a less simple type, which will permit him to do soaring in a strong up current of air After graduating from this type of machine he will then be equipped to use the intricate type described above, with controls like an aeroplane During this period of training, a pilot learns a great deal about air currents and perfects his technique in handling his plane so as to maintain its equilibrium He is now prepared to actually fly He seats himself in the glider which is facing the wind His helpers, pulling on the ropes, run at full speed down the hill pulling him off the crest and he soars into the air All that now remains is a careful manipulation of the controls to maintain his elevation while gliding parallel to the hill, doubling back and forth as long as the air currents permit him to remain aloft When finally he has to land, he should nose the glider into the wind and descend slowly and gently to the ground. (E S E)

GLINKA, FEDOR NIKOLAYEVICH (1788–1880), Russian poet and author, a cousin of the composer, was born at Smolensk in 1788. He was educated for the army, and served in the Austrian campaign of 1805 He then retired to his estate, but served again in the campaigns of 1812–14. For some time he commanded a regiment under Count Miloradovich, military governor of St Petersburg. Under suspicion of revolutionary tendencies he was, in 1820, banished to Petrozavodsk, but was after a time allowed to return to St Petersburg Glinka was an independent and original writer, whose work was never fully appreciated during his life-time He is one of the few Russian poets who have chosen principally biblical subjects, he was something of a mystic, and his verse has been compared with that of Vaughan and Herbert

His works include martial songs, the descriptive poem *Kareliya (Careha, or the Captivity of Martha Joanovna,* 1830), and a metrical paraphrase of the book of Job Some translations are published in C T. Wilson's *Russian Lyrics* (1887)

GLINKA, MICHAEL IVANOVICH (1803–1857), Russian composer, was born at Novospassky, Smolensk, on June 2, 1803 The folk-music of his native province made a deep impression on the child, and he himself said that perhaps the songs he heard in his early days suggested the idea to him of making use of the national music in his compositions At 13 he was sent to an aristocratic school at St Petersburg, the Blagorodrey Pension, where he studied music under Carl Maier and John Field, the Irish composer and pianist, who had settled in Russia In his 17th year he had already begun to compose romances and songs . From 1824 to 1828 he held a post in the civil service in St Petersburg, and mixed in the literary and scientific society of the capital, where he had the reputation of being a good mathematician and something of a scientist His thorough musical training began in 1830, when he spent three years in Italy studying the works of old and modern Italian masters His thorough knowledge of the requirements of the voice may be connected with this course of study, but the study of Italian music did not wean him from his early passion for Russian national melody His training as a composer was finished under the contrapuntist Dehn, with whom he stayed for several months at Berlin In 1833 he returned to Russia, and devoted himself to operatic composition On Sept 27 (Oct 9, N S), 1836, his opera *A Life for the Tsar* (the libretto by Baron de Rosen) was produced at St Petersburg This was the turning-point in Glinka's life, and in Russian music, for the production marks the beginning of a Russian school of national music The story is taken from the invasion of Russia by the Poles early in the 17th century, and the hero, Ivan Susanin, is a peasant Glinka has wedded this patriotic theme to inspiring music His melodies, moreover, show distinct affinity to the popular songs of the Russians, so that the term "national" may justly be applied to them His appointment as imperial chapelmaster and conductor of the opera of St Petersburg followed His second opera *Russlan and Ludmila,* founded on Pushkin's poem, did not appear till 1842 Musically it was a great advance on *A Life for the Tsar,* but it had less popular success Just as in his first opera he had contrasted Russian and Polish music, so in the second, Oriental themes were set over against Russian melodies An overture and four entre-actes to Kukolnik's drama *Prince Kholmsky* followed In 1844 Glinka went to Paris, where he made the acquaintance of Berlioz, and a mutual admiration sprang up between the two composers Glinka's *Jota Aragonesa* (1847), and the symphonic work on Spanish themes, *Une Nuit à Madrid,* reflect the musical results of two years' sojourn in Spain On his return to St Petersburg he wrote and arranged several pieces for the orchestra, amongst which the so-called *Kamarinskaya* achieved popularity beyond the limits of Russia He also composed numerous songs and romances In 1852 he went abroad for the third time, he now wrote his autobiography, orchestrated Weber's *Invitation à la valse,* and began to consider a plan for a symphonic work on Gogol's *Taras-Bulba* But he now developed a passion for ecclesiastical music, and went to Berlin to study the ancient church modes Here he died suddenly on Feb 2, 1857

See H Berlioz, *Michael Glinka* (Milan, 1874), M D Calvocoressi, "Glinka," *Les Musiciens Célèbres* (Paris)

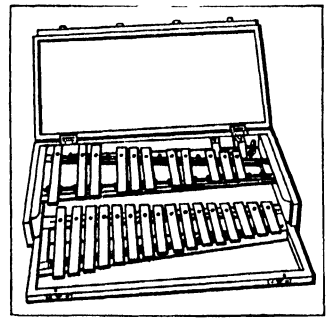
GLOBE, a city of Arizona, U.S A., 75m. E. by S of Phoenix, on Federal highway 180 and the Southern Pacific railway; the county seat of Gila county The population was 7,044 in 1920, and was estimated at 8,500 in 1928 It is the centre of a cattle-raising and copper-mining region In recent years the Globe-Miami district has outranked the Bisbee district in production of copper (175,272,000lb in 1925), and has stood third in the United States Silver, gold, asbestos and cinnabar also are mined, and there are coal fields and quicksilver properties in the vicinity. Roosevelt dam and reservoir are 25m N W , and 16m E is the community summer resort on Pinal mountains Coolidge dam (under construction 1928) is 30m south-west. Globe was founded about 1874, and was incorporated as a city in 1907.

GLOBE-FISH or **SEA-HEDGEHOG,** the name of some sea-fishes of the families Diodontidae and Tetrodontidae, which have the faculty of inflating their stomachs with air or water Their jaws resemble the beak of a parrot, the bones and teeth being coalesced into one sharp-edged mass By means of these they are able to break off branches of corals, and to masticate other hard substances on which they feed. Usually they are of a short, thick, cylindrical shape, with powerful fins. Their body is covered with tough skin, without scales, but provided with variously formed spines When they inflate their capacious stomachs they assume a globular form, and the spines protrude, forming a defensive armour A fish thus blown out turns over and floats belly upwards, driving before the wind and waves Many of these fishes are highly poisonous when eaten They are most numerous in the tropics, a few species live in large rivers, as, for instance, *Tetrodon fahaka,* of the Nile Nearly 100 species are known

GLOBEFLOWER, a genus of Ranunculaceae (*q v*), which takes it name from the special shape and formation of the flower There are several species including the spreading globeflower (*Trollius laxus*), native to certain parts of America, especially the Rocky mountains, and the common globeflower (*T. europeus*) which is extensively cultivated in England

GLOBIGERINA, a genus of perforate *Foraminifera* (*q v*) of pelagic habit, and formed of a conical spiral aggregate of spheroidal chambers with a crescentic mouth The shells accumulate at the bottom of moderately deep seas to form "Globigerina ooze" and are preserved thus in the chalk *Hastigerina* only differs in the "flat" spiral.

GLOCKENSPIEL, or Orchestral Bells, an instrument of percussion of definite musical pitch, used in the orchestra, and made in two or three different styles The oldest form of *glockenspiel* consisted of a set of bells of graduated size mounted pyramid-fashion on a frame and played by one performer by means of steel hammers The lyre-shaped *glockenspiel,* or steel harmonica (*Stahlharmonika*), is a newer model, which has instead of bells 12 or more bars of steel, graduating in size according to their pitch These bars are fastened horizontally across two bars of steel set perpendicularly in a steel frame Wagner has used the *glockenspiel* with exquisite effect in the fire scene of the last act of *Die Walkure* and in the peasants' waltz in the last scene of *Die Meistersinger* When chords are written for the *glockenspiel,* as in Mozart's *Magic Flute,* the keyed harmonica is used It consists of a keyboard having a little hammer attached to each key, which strikes a bar of glass or steel when the key is depressed



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THE GLOCKENSPIEL CONSISTED ORIGINALLY OF A SET OF TUNED BALLS, WHICH WERE STRUCK WITH A HAMMER, BUT LATER BARS OF STEEL OF VARYING LENGTH, ATTACHED TO A FRAME WERE SUBSTITUTED

GLOGAU, a town in the Prussian province of Silesia, 59 m. N W. from Breslau by rail Pop (1925) 25,968 Early in the 11th century it withstood a siege by the emperor Henry V ; and in 1157 it was set on fire. In 1252 the town, restored by Henry I , became the capital of a principality of Glogau, and in 1482 town

and district were united to the Bohemian crown. During the Thirty Years' War Glogau suffered greatly. In 1741 the Prussians took it by storm and utilized it as a base during the Seven Years' War. After the battle of Jena (1806) it fell to the French; and was held against Russian and Prussian besiegers after the battle of Katzbach in 1813, for many months Glogau is built partly on an island and partly on the left bank of the Oder. The cathedral, in the Gothic, and a castle (now used as a courthouse), in the Renaissance style, are notable. Glogau carries on extensive trade by river and rail. Industries include iron founding, machinery-building, tobacco, starch and sugar. It has also lithographic works and its book trade is celebrated.

GLORIA, in general a doxology or ascription of praise, specifically two ancient Latin hymns *Gloria in excelsis* and *Gloria Patri,* referred to sometimes as the Greater and the Lesser Doxology respectively, and employed in the services of the Catholic Church. The former, known as the angelic hymn, on the strength of a passage in Luke (ii. 14), is an important part of the Ordinary of the Mass; the latter is appended to the singing of the psalms For further particulars and for discussion of the Gloria in music, *see* MASS; also LITURGY, MISSAL and EUCHARIST.

GLORIOSA, in botany, a small genus of plants of the family Liliaceae, natives of tropical Asia and Africa. They are bulbous plants, the slender stems of which support themselves by tendril-like prolongations of the tips of some of the narrow generally lanceolate leaves. The flowers, which are borne in the leaf-axils at the ends of the stem, are very handsome, the six, generally narrow, petals are bent back and stand erect, and are a rich orange yellow or red in colour; the six stamens project more or less horizontally from the place of insertion of the petals They are grown in cultivation as stove or greenhouse plants, and often called climbing-lily.

GLOSS AND GLOSSARY. The Greek word γλῶσσα (*glōssa*), meaning originally a tongue, then a language or dialect, gradually came to denote any obsolete, foreign, provincial, technical or otherwise peculiar word or use of a word (*see* Arist *Rhet* iii 3, 2). The making of collections and explanations of such γλῶσσαι was at a comparatively early date a well-recognized form of literary activity Even in the 5th century B C, among the many writings of Abdera was included a treatise entitled Περι Ὁμήρου ἢ ὀρθοεπείης καὶ γλωσσέων. It was not, however, until the Alexandrian period that the γλωσσογράφοι, glossographers (writers of glosses), or glossators, became numerous.

Of many of these perhaps even the names have perished, but Athenaeus the grammarian (*c.* AD 250) alone alludes to no fewer than 35 Among the earliest was Philetas of Cos (d *c* 290 B C), the elegiac poet, who was the compiler of a lexicographical work entitled Ἄτακτα or Γλῶσσαι (sometimes Ἄταικτοι γλῶσσαι). Next came his disciple Zenodotus of Ephesus (early 3rd century B C), the compiler of Γλῶσσαι Ὁμηρικαί (uncommon words in Homer), he was succeeded by his greater pupil Aristophanes of Byzantium (*c.* 260–180 B C), whose great compilation Περὶ λέξεων (still partially preserved in that of Pollux), is known to have included Ἀττικαὶ λέξεις, Λακωνικαὶ γλῶσσαι, and the like From the school of Aristophanes issued more than one glossographer of name,—Diodorus, Artemidorus (Γλῶσσαι, and a collection of λέξεις ὀψαρτυτικαί), Nicander of Colophon (Γλῶσσαι, of which some 26 fragments still survive) and Aristarchus (*c* 210 B C), the famous critic, whose numerous labours included an arrangement of the Homeric vocabulary (λέξεις) in the order of the books Contemporary with the last named was Crates of Mallus, who, besides making some new contributions to Greek lexicography and dialectology, was the first to create at Rome a taste for similar investigations in connection with the Latin idioms From his school proceeded Zenodotus of Mallus, the compiler of Ἐθνικαὶ λέξεις or γλῶσσαι, a work said to have been designed chiefly to support the views of the school of Pergamum as to the allegorical interpretation of Homer.

Of later date were Didymus (Chalcenterus, 1st cent. B C), who made collections of λέξεις τραγωδουμέναι κωμικαί, etc ; Apollonius Sophista (*c.* 20 B C.), whose Homeric *Lexicon* has come down to modern times; and Neoptolemus, known distinctively as ὁ γλωσσογράφος. In the beginning of the 1st century of the Christian era Apion, a grammarian and rhetorician at Rome during the reigns of Tiberius and Claudius, followed up the labours of Aristarchus and other predecessors with Γλῶσσαι Ὁμηρικαὶ and a treatise Περὶ τῆς Ῥωμαϊκῆς διαλέκτου ; Heliodorus or Herodorus was another almost contemporary glossographer; Erotian also, during the reign of Nero, prepared a special glossary for the writings of Hippocrates. To this period also Pamphilus, the author of the Λειμών, from which Diogenianus and Julius Vestinus afterwards drew so largely, most probably belonged. In the following century one of the most prominent workers in this department of literature was Aelius Herodianus, whose treatise Περὶ μονήρους λέξεως has been edited in modern times, and whose Ἐπιμερισμοί we still possess in an abridgment; also Pollux, Diogenianus (Λέξις παντοδαπή), Julius Vestinus (Ἐπιτομὴ τῶν Παμφίλου γλωσσῶν) and especially Phrynichus, who flourished towards the close of the 2nd century, and whose *Eclogae nominum et verborum Atticorum* has frequently been edited.

To the 4th century belong Ammonius of Alexandria (*c.* 389), who wrote Περὶ ὁμοίων καὶ διαφόρων λέξεων, a dictionary of words used in senses different from those employed by older and approved writers, Hesychius, whose Λεξικόν, has come down only in a 15th-century recension. From the 5th century date, Cyril, the celebrated patriarch of Alexandria (one form of his work is the basis of Συναγωγὴ λέξεων χρηόιμων); Orus of Miletus (Περὶ πολυσημάντων λέξεων), and Orion of Egyptian Thebes who flourished in Alexandria, *c.* 425.

The Compilations of Justinian.—To a special category of technical glossaries belongs a large and important class of works relating to the law-compilations of Justinian Although the emperor forbade under severe penalties all commentaries (ὑπομνήματα) on his legislation, yet indices (ἴνδικες) and references (παράτιτλα), as well as translations (ἑρμηνεῖαι κατὰ πόδα) and paraphrases (ἑρμηνεῖαι εἰς πλάτος), were expressly permitted, and lavishly produced Among the numerous compilers of alphabetically arranged λέξεις Ῥωμαϊκαί or Λατεινικαί, and γλῶσσαι νομικαί (*glossae nomicae*), Cyril and Philoxenus are particularly noted; but the authors of παραγραφαί, or σημειώσεις, whether ἔξωθεν or ἔσωθεν κείμεναι are too numerous to mention A collection of these παραγραφαὶ τῶν παλαιῶν, combined with νέαι παραγραφαί on the revised code called τὰ βασιλικά, was made about the middle of the 12th century by a disciple of Michael Hagiotheodorita The collection of these glossaries is known as the *Glossa ordinaria* τῶν βασιλικῶν.

In Italy, also, during the period of the Byzantine ascendancy, and later, after the total extinction of Byzantine sway in the West, various glossae (glosae) and scholia on the Justinian code and various legal treatises were produced The series of legal glossators was closed by Accursius (*q v*) with the compilation known as the *Glossa ordinaria* or *magistralis,* the authority of which soon became very great. For some account of the glossators on the canon law, *see* CANON LAW

Latin, like Greek glossography, had its origin chiefly in the practical wants of students and teachers, of whose names we only know a few No doubt even in classical times collections of glosses ("glossaries") were compiled, to which allusion seems to be made by Varro (*De ling. Lat.* vii 10, "tesca, aiunt sancta esse qui glossas scripserunt") and Verrius-Festus (166[b] 6 "naucum . glossematorum . scriptores fabae grani quod haereat in fabulo") The *scriptores glossematorum* were distinguished from the learned glossographers like Aurelius Opilius, Servius Clodius, Aelius Stilo, L Ateius Philol., whose *liber glossematorum* Festus mentions (181[a]. 18).

Verrius Flaccus (who died under Tiberius), and his epitomists, Festus and Paulus, have preserved many treasures of early glossographers who are now lost to us. He copied Aelius Stilo, author of *De verborum significatu,* Aurelius Opilius, Ateius Philologus, the treatise *De obscuris Catonis* He often made use of Varro and was also acquainted with later glossographers Perhaps we owe to him the *glossae asbestos.* Festus was used by Pseudo-Philoxenus (*see* below)

In late classical and mediaeval Latin, *glosa* was the vulgar and

romanic, *glossa* the learned form. The diminutive *glossula* occurs in Diomedes (426. 26) and elsewhere. The same meaning is borne by *glossarium*, which also occurs in the modern sense of "glossary," as do the words *glossa, glossae, glossulae, glossemata*, expressed in later times by *dictionarium, dictionarius, vocabularium, vocabularius* (*see* DICTIONARY) *Glossa* and *glossema* are synonyms, signifying (*a*) the word which requires explanation; or (*b*) such a word (called *lemma*) together with the interpretation (*interpretamentum*); or (*c*) the interpretation alone.

The Bilingual Glossaries.—The *bilingual* (Gr.-Lat., Lat.-Gr.) glossaries also point to an early period, and were used by the grammarians (1) to explain the peculiarities (*idiomata*) of the Latin language by comparison with the Greek, and (2) for instruction in the two languages The most important remains of bilingual glossaries are two well-known lexica, one (Latin-Greek), formerly attributed, but wrongly, to Philoxenus (consul A.D. 525), clearly consists of two closely allied glossaries (containing glosses to Latin authors, as Horace, Cicero, Juvenal, Virgil, the Jurists, and excerpts from Festus), worked into one by some Greek grammarian, or a person who worked under Greek influence (his alphabet runs A, B, G, D, E, etc.), the other (Greek-Latin) is ascribed to Cyril (Stephanus says it was found at the end of some of his writings), and is considered to be a compilation of not later than the 6th century Furthermore, the bilingual medico-botanic glossaries had their origin in old lists of plants, as Pseudo-Apuleius in the treatise *De herbarum virtutibus*, and Pseudo-Dioscorides, the glossary, entitled *Hermeneuma*, printed from the *Cod Vatic* reg Christ. 1260, contains names of diseases.

Of Latin glossaries of the first five or six centuries of the Roman emperors few traces are left, if we except Verrius-Festus. Of this early period we know by name only Fulgentius and Placidus. All that we know of the second of these tends to show that he lived in north Africa in the 6th century, from whence his glosses came to Spain, and were used by Isidore and the compiler of the *Liber glossarum* (*see* below). These glosses we know from (1) Codices Romani (15th and 16th centuries); (2) the *Liber glossarum;* (3) the Cod. Paris. nov acquis. 1298 (11th century), a collection of glossaries, in which the Placidus-glosses are kept separate from the others (Fabius Planciades) Fulgentius (*c* A.D. 468–533) wrote *Expositio sermonum antiquorum* in 62 paragraphs, each containing a lemma (sometimes two or three) with an explanation giving quotations and names of authors Next to him come the *glossae Nomianae*, which arose from the contents of the various paragraphs in Nonius Marcellus' work being written in the margin without the words of the text, these epitomized glosses were alphabetized and afterwards copied for other collections In a similar way arose the *glossae Eucherii* or *glossae spiritales secundum Eucherium episcopum* found in many mss., which are an alphabetical extract from the *formulae spiritalis intelligentiae* of St. Eucherius, bishop of Lyons, *c.* 434–450 The so-called *Malberg glosses*, found in various texts of the Lex Salica, are not glosses in the ordinary sense of the word, but precious remains of the parent of the present literary Dutch, namely, the Low German dialect spoken by the Salian Franks who conquered Gaul from the Romans at the end of the 5th century The antiquity and the philological importance of these glosses may be realized from the fact that the Latin translation of the Lex Salica probably dates from the end of the 5th century *See* Jac Grimm's preface to Joh Merkel's ed (1850), and H Kern's notes to J H. Hessels's ed. (1880) of the Lex Salica.

The Middle Ages.—During the 6th, 7th and 8th centuries glossography developed in various ways; old glossaries were worked up into new forms, or amalgamated with more recent ones It ceased, moreover, to be exclusively Latin-Latin, and interpretations in Germanic (Old High German, Anglo-Saxon) and Romanic dialects took the place of or were used side by side with earlier Latin ones. Among Celtic glosses the most important are Old Irish, and of these Bishop Cormac's and O'Davoren's have been edited by Whitley Stokes, the former also by Kuno Meyer. The origin and development of the late classic and mediaeval glossaries preserved to us can be traced with certainty. While reading the manuscript texts of classical authors, the Bible or early Christian and profane writers, students and teachers, on meeting with any obscure or out-of-the-way words which they considered difficult to remember or to require elucidation, wrote above them, or in the margins, interpretations or explanations in more easy or better-known words. The interpretations written above the line are called "interlinear," those written in the margins of the mss. "marginal glosses." Again, mss of the Bible were often provided with interlinear literal translations. (i.) From these glossed mss. and interlinear versions glossaries were compiled; that is, the obscure and difficult Latin words, together with the interpretations, were excerpted and collected in separate lists, in the order in which they appeared in the mss., with the names of the authors or the titles of the books whence they were taken or placed at the head of each separate collection In this arrangement each article by itself is called a gloss; when reference is made only to the word explained it is called the *lemma*, while the explanation is termed the *interpretamentum*. In most cases the form of the lemma was retained just as it stood in its source, and explained by a single word, so that we meet with lemmata in the accusative, dative and genitive, explained by words in the same cases, *e g*, the forms of verbs being treated in the same way Of this first stage in the making of glossaries, many traces are preserved, in the late 8th century Leyden Glossary (ed. J H Hessels), where chapter iii. contains words or glosses excerpted from the *Life of St Martin* by Sulpicius Severus; chs iv., v and xxxv. glosses from Rufinus, and so forth (ii.) By a second operation the glosses came to be arranged in *alphabetical* order according to the *first* letter of the lemma, but still retained in separate chapters Of this second stage the Leyden Glossary contains traces also. (iii.) The third operation collected all the accessible glosses in alphabetical order, in the first instance according to the first letters of the lemmata Here the names of the authors or the titles could no longer be preserved, and consequently the sources of the glosses became uncertain (iv.) A fourth arrangement collected the glosses according to the first two letters of the lemmata, as in the Corpus Glossary and in the still earlier *Cod Vat* 3321 (Goetz, *Corp* iv 1 *sqq*.), where even many attempts were made to arrange them according to the first three letters of the alphabet. A peculiar arrangement is seen in the *Glossae affatim* (Goetz, *Corp* iv 471 *sqq*.), where all words are alphabetized, first according to the initial letter of the word and then further according to the first vowel in the word (a, e, i, o, u.)

No date or period can be assigned to any of the above stages or arrangements For instance, the first and second are both found in the Leyden Glossary (end of 8th century) whereas the Corpus Glossary (beginning of 8th century) represents already the fourth stage. For the purpose of identification titles have been given to the various nameless collections of glosses, derived partly from their first lemma, partly from other characteristics, as glossae *abstrusae;* glossae *abavus major* and *minor;* g *affatim;* g *ab absens;* g. *abactor;* g *Abba Pater;* g *a, a;* g *Vergilianae;* g *nominum;* g *Sangallenses*

Isidore and His Successors.—A chief landmark in glossography is represented by the *Origines* (*Etymologiae*) of Isidore (d 636), an encyclopaedia in which he, like Cassiodorus, mixed human and divine subjects together, and the etymological part of which (book x.) became a great mine for later glossographers His principal source is Servius, the fathers of the church, and Donatus Next comes the *Liber glossarum*, chiefly compiled from Isidore, but with all articles arranged alphabetically, its author lived in Spain *c.* A.D. 690–750, he has been called Ansileubus, but this name may be merely that of some owner of a copy of the book Here come, in regard to time, some Latin glossaries already largely mixed with Germanic, more especially Anglo-Saxon interpretations. (1) the Corpus Glossary (ed J H Hessels, W M Lindsay), of the beginning of the 8th century, in Corpus Christi college, Cambridge, (2) the Leyden Glossary (end of 8th century, ed Hessels, Plac. Glogger), in Leyden ms Voss Q° Lat. 69; (3) the Epinal Glossary, written in the beginning of the 9th century and published in facsimile by the London Philol. Society from the ms at Epinal; (4) the *Glossae Amplonianae, i e*, three gloss-

aries preserved in the Amplonian library at Erfurt, known as Erfurt[1], Erfurt[2] and Erfurt[3], which are arranged alphabetically according to the first or the first two letters of the lemmata.

The first great glossary or collection of various glosses and glossaries is that of Salomon, bishop of Constance, who died A.D. 919 An edition of it was printed *c* 1475 at Augsburg as *Salemonis ecclesie Constantiensis episcopi glosse ex illustrissimis collecte auctoribus.* Its sources are the *Liber glossarum,* the glossary preserved in the 9th-century ms *Lat Monac* 14429, and the *Abavus* major Gloss The *Liber glossarum* has also been the chief source for the important (but not original) glossary of Papias, of A D 1053, who also wrote a grammar chiefly compiled from Priscian It is also the source of (1) the *Abba Pater* Glossary, published by G M Thomas (*Sitz Ber. Akad Munch*, 1868, ii. 369 *sqq*); (2) the Greek glossary *Absida lucida;* and (3) the Lat.-Arab glossary in the *Cod Leid. Scal Orient.* No. 231 (published by Seybold in *Semit Studien,* Heft xv.–xvii, 1900). The Paulus-Glossary is compiled from the second Salomon-Glossary (*abacti magistratus*), the *Abavus major* and the *Liber glossarum,* with a mixture of Hebraica

Osbern of Gloucester (*c* 1123–1200) compiled the glossary entitled *Panormia* (ed Angelo Mai as *Thesaurus novus Latinitatis,* from Cod Vatic. reg Christ 1392), giving derivations, etymologies, testimonia collected from Paulus, Priscian, Plautus, Horace, Virgil, Ovid, Mart. Capella, Macrobius, Ambrose, Sidonius, Prudentius, Josephus, Jerome, etc Osbern's material was also used by Hugucio, whose compendium was still more extensively used (Goetz enumerates 103 mss of his treatise)

Johannes de Janua.—The great work of Johannes de Janua, entitled *Summa quae vocatur catholicon,* dates from the year 1286, and mostly uses Hugucio and Papias, its classical quotations are limited, except from Horace, it quotes the Vulgate by preference; it excerpts Priscianus, Donatus, Isidore, the fathers of the church; it borrows many Hebrew glosses, especially from Jerome; it mentions the *Graecismus* of Eberhardus Bethuniensis, the works of Hrabanus Maurus, the *Doctrinale* of Alexander de Villa Dei, and the *Aurora* of Petrus de Riga

The gloss mss of the 9th and 10th centuries are numerous, but a diminution becomes visible towards the 11th A peculiar feature of the late middle ages are the medico-botanical glossaries based on earlier ones The additions consisted in Arabic words with Latin explanations, while Greek, Latin, Hebrew and Arabic, interchange with English, French, Italian and German forms Of glossaries of this kind we have (1) the *Glossae alphita,* (2) *Sinonoma Bartholomei,* of the end of the 14th century, ed. J L G Mowat, (3) the compilations of Simon de Janua (*Clavis sanationis,* end of 13th century), and of Matthaeus Silvaticus (*Pandectae medicinae,* 14th century)

Of biblical glossaries we have a large number, mostly mixed with glosses on other, even profane, subjects, as Hebrew and other biblical proper names, and explanations of the text of the Vulgate in general, and the prologues of Hieronymus So we have the *Glossae veteris ac novi testamenti* (beginning "Prologus graece latine praelocutio sive praefatio") in numerous mss of the 9th to 14th centuries, mostly retaining the various books under separate headings Special mention should be made of Guil Brito, who lived about 1250, and compiled a *Summa* (beginning "difficiles studeo partes quas Biblia gestat Pandere") which gave rise to the *Mammotrectus* of Joh Marchesinus, about 1300, of which we have editions of 1470, etc

Finally we may mention such compilations as the *Summa Heinrici* (the *Breviloquus,* which drew its chief material from Papias, Hugucio, Brito, etc); the *Vocabularium Ex quo;* the various *Gemmae* and *Vocabularia rerum*

BIBLIOGRAPHY.—The modern historical interest in glosses and glossaries began with J Scaliger (1540–1609), who in his edition of Festus made great use of Ps.-Philoxenus, which enabled O. Muller, the later editor of Festus, to follow in his footsteps Scaliger also planned the publication of a *Corpus glossarum,* and left behind a collection of glosses known as *glossae Isidori.* The study of glosses was greatly furthered through the publication, in 1573, of the bilingual glossaries by Henri Stephanus (Estienne) In 1600 Bonav. Vulcanius republished the same glossaries, adding (1) the glossae *Isidori,* which now appeared for the first time; (2) the *Onomasticon,* (3) *notae* and *castigationes,* derived from Scaliger In 1606 Carolus and Petrus Labbaeus published, with the help of Scaliger, another collection of glossaries, republished, in 1679, by Du Cange, after which the 17th and 18th centuries produced no further glossaries, though glosses were constantly used or referred to by scholars at Leyden, where a rich collection of glossaries had been obtained by the acquisition of the Vossius library In the 19th century came Osann's *Glossarii Latini specimen* (1826), the glossographical publications of Angelo Mai (*Classici auctores,* vols iii., vi., vii., viii., 1831–36, containing Osbern's *Panormia,* Placidus and various glosses from Vatican mss.), Fr Oehler's treatise (1847) on the *Codex Amplonianus* of Osbern, and his edition of the three Erfurt glossaries, so important for Anglo-Saxon philology, in 1854 G F. Hildebrand's *Glossarium Latinum* (an extract from *Abavus minor*), preserved in a Cod Paris lat 7690, 1857, Thomas Wright's vol of Anglo-Saxon glosses, which were republished with others in 1884 by R Paul Wulcker under the title *Anglo-Saxon and Old English Vocabularies,* L. Diefenbach's supplement to Du Cange, entitled *Glossarium Latino-Germanicum mediae et infimae aetatis;* Ritschl's treatise (1870) on Placidus, which called forth an edition (1875) of Placidus by Deuerling; G Loewe's *Prodomus Corporis Glossariorum Latinorum* (1876), and other treatises by him, published after his death by G Goetz (Leipzig, 1884), 1888, the second volume of Goetz's own great *Corpus glossarium Latinorum,* of which seven volumes (except the first) had seen the light by 1907, the last two being separately entitled *Thesaurus glossarum emendatarum,* containing many emendations and corrections of earlier glossaries by the author and other scholars, 1885, H Sweet, Latin-Anglo-Saxon glossaries in *Oldest English Texts,* 1890, J H Hessels, apograph of the Corpus Glossary, 1906 of the Leyden Glossary, 1900, Arthur S Napier, *Old English Glosses,* collected chiefly from Aldhelm mss., 1921, W M Lindsay, *Corpus Glossary* and *The Corpus, Epinal, Erfurt, and Leyden Glossaries,* 1922, Lindsay, *Palaeographia Latina*

Among encyclopaedic articles the chief are Tolkiehn's article "Lexicographie" and G Goetz's article "Lateinische Glossographie" in Pauly's *Realencyklopadie.* By the side of Goetz's *Corpus* stands the great collection of Steinmeyer and Sievers, *Die althochdeutschen Glossen* (4 vols., 1879–98), containing a vast number of glosses culled from Bible mss and mss of classical Christian authors Besides the works of the editors of, or writers on, glosses, already mentioned, we refer here to a few others: De-Vit (at end of Forcellini's *Lexicon*); J. H Gallée (*Altsachs Sprachdenkm.,* 1894), K Gruber (*Hauptquellen des Corpus, Epin u Erfurt Gloss.,* Erlangen, 1904), W Heraeus (*Die Sprache des Petronius und die Glossen,* Leipzig, 1899), W Meyer-Lübke ("Zu den latein Glossen" in *Wiener Stud* xxv 90 *sqq*), Henry Nettleship, *Lectures and Essays,* R Reitzenstein, *Geschichte der Griechischen Etymologika* (1897), on the three Philemons, *see* L Cohen in *Philologus* 57 (N F 11), 353–67, (many important articles in *Anglia, Englische Studien, Archiv f latein Lexicographie, Romania, Zeitschr. fur deutsches Alterthum, Journal of English and Germanic Philology, American Journal of Philology, Classical Review* Lindsay and J H Thomson, *Ancient Lore in Mediaeval Latin Glossaries* (1921) is an important guide to the problem of gloss-derivation

(J H Hes., C T. O)

GLOSSOP, market town, municipal borough, High Peak parliamentary division, Derbyshire, England, 13 m E of Manchester by the L N E railway Pop (1921) 20,531. It is the chief seat of the cotton manufacture in Derbyshire, and has also woollen and paper mills, dye, print and bleaching works The town consists of three main divisions, the Old Town (or Glossop proper), Howard Town (or Glossop Dale) and Mill Town. An older parish church was replaced by that of All Saints in 1830 In the neighbourhood is Glossop hall, the seat of Lord Howard, lord of the manor On a hill near the town is Melandra castle, the site of a Roman fort guarding Longdendale and the way into the hills of the Peak District To the north, in Longdendale, there are five reservoirs belonging to the water-supply system of Manchester, formed by damming the Etherow, a stream which descends from the high moors north-east of Glossop. Area, 3,052 acres. Glossop was granted by Henry I to William Peverel but later it reverted to the crown

GLOUCESTER, GILBERT DE CLARE, Earl of (1243–1295), 8th earl of Gloucester and 9th earl of Clare, was born at Christchurch, Hampshire, on Sept 2, 1243 He married Alice of Angoulême, niece of king Henry III., succeeded his father in July 1262, and joined the baronial party led by Simon de Montfort. With Simon Gloucester was at the battle of Lewes in May 1264, when the king himself surrendered to him, and after this victory he was one of the three persons selected to nominate a council Soon, however, he quarrelled with Simon Leaving London for his lands on the Welsh border he met Prince Edward, afterwards king Edward I., at Ludlow, just after his escape from captivity, and contributed largely to the prince's victory at Evesham in August

1265. But this alliance was as transitory as the one with Leicester. Gloucester championed the barons who had surrendered at Kenilworth in November and December 1266, and after putting his demands before the king, secured possession of London (April 1267). The earl quickly made his peace with Henry III and with Prince Edward. Under Edward I. he spent several years in fighting in Wales, or on the Welsh border, in 1289 when the barons were asked for a subsidy he replied on their behalf that they would grant nothing until they saw the king in person (*nisi prius personaliter viderent in Anglia faciem regis*), and in 1291 he was fined and imprisoned on account of levying private war on Humphrey de Bohun, earl of Hereford. Having divorced his wife Alice, he married in 1290 Edward's daughter Joan, or Johanna (d. 1307). The "Red Earl," as he is sometimes called, died at Monmouth on Dec. 7, 1295, leaving in addition to three daughters a son, Gilbert, earl of Gloucester and Clare, killed at Bannockburn.

See references under MONTFORT, SIMON DE.

GLOUCESTER, HUMPHREY, DUKE OF (1391–1447), the fourth son of Henry IV. by Mary de Bohun, was born in 1391. He was created duke of Gloucester by Henry V. at Leicester on May 16, 1414. He served in the war next year, and was wounded at Agincourt, where he owed his life to his brother's valour. In the second invasion of France Humphrey commanded the force which during 1418 reduced the Cotentin and captured Cherbourg Afterwards he joined the main army before Rouen, and took part in subsequent campaigns till January 1420 He then went home to replace Bedford as regent in England, and held office till Henry's own return in February 1421 He was again regent for his brother from May to September 1422

Henry V. measured Humphrey's capacity, and by his will named him merely deputy for Bedford in England Humphrey at once claimed the full position of regent, but the parliament and council allowed him only the title of protector during Bedford's absence, with limited powers He married (1422) Jacqueline of Bavaria, heiress of Holland, to whose lands Philip of Burgundy had claims In October 1424 Humphrey took up arms in his wife's behalf, but after a short campaign in Hainault went home, and left Jacqueline to be overwhelmed by Burgundy. His marriage was annulled in 1428 Returning to England in April 1425 he entangled himself in a quarrel with the council and his uncle Henry Beaufort, and stirred up a tumult in London Open war was averted only by Beaufort's prudence, and Bedford's hurried return With some difficulty Bedford effected a formal reconciliation at Leicester in March 1426 To check his indiscretion the council, in November 1429, had the king crowned, and so put an end to Humphrey's protectorate, but during Henry VI 's absence in France he acted as warden in England The defection of Burgundy roused English feeling, and Humphrey won popularity as leader of the war party. In 1436 he commanded in a short invasion of Flanders In 1441 Eleanor Cobham, his former mistress, whom he had married (about 1430), was charged with practising sorcery against the king, and Humphrey had to submit to see her condemned, and her accomplices executed Nevertheless, he continued to thwart Suffolk, who was now taking Beaufort's place in the council, by opposing the king's marriage to Margaret of Anjou. Under Suffolk's influence Henry VI. grew to distrust his uncle altogether The crisis came in the parliament of Bury St Edmunds in February 1447. Immediately on his arrival there Humphrey was arrested, and four days later, on Feb 23, he died.

Humphrey was buried at St. Albans Abbey, in a fine tomb, which still exists He was long remembered, in spite of his bad political record, as the good Duke Humphrey, on account of his liberal patronage of scholars and of learning He had been a great collector of books, many of which he presented to the university of Oxford. He contributed also to the building of the Divinity School, and of the room still called Duke Humphrey's library. His books were dispersed at the Reformation and only three volumes of his donation now remain in the Bodleian library. Titus Livius, an Italian in Humphrey's service, wrote a life of Henry V. at his patron's bidding Other Italian scholars, as Leonardo Aretino, benefited by his patronage. Amongst English men of letters he befriended Reginald Pecock, Whethamstead of St. Albans, Capgrave the historian, Lydgate and Gilbert Kymer, who was his physician and chancellor of Oxford university. A popular error found Humphrey a fictitious tomb in St. Paul's Cathedral. The adjoining aisle, called Duke Humphrey's Walk, was frequented by beggars and needy adventurers Hence the 16th-century proverb "to dine with Duke Humphrey," used of those who loitered there dinnerless.

The most important contemporary sources are Stevenson's *Wars of the English in France,* Whethamstead's *Register,* and Beckington's *Letters* (all in Rolls Ser), with the various *London Chronicles,* and the works of Waurin and Monstrelet. For his relations with Jacqueline *see* F von Loher's *Jacobaa von Bayern und ihre Zeit* (2 vols, Nordlingen, 1869). For other modern authorities consult W Stubbs's *Constitutional History;* J. H Ramsay's *Lancaster and York, Political History of England,* vol iv.; R Pauli, *Pictures of Old England,* pp. 373–401 (1861), and K. H Vlekers, *Humphrey, Duke of Gloucester* (1907). For Humphrey's correspondence with Piero Candido Decembrio *see* the *English Historical Review,* vols. x, xix, xx.

GLOUCESTER, RICHARD DE CLARE, EARL OF (1222–1262), 7th earl of Gloucester and 8th earl of Clare, was born on Aug 4, 1222 He succeeded his father in October 1230 About 1258 Gloucester became a leader of the barons in their resistance to the king, and he was prominent during the proceedings which followed the Mad Parliament at Oxford in 1258 In 1259, however, he quarrelled with Simon de Montfort, earl of Leicester, the dispute, begun in England, was renewed in France and he was again in the confidence and company of the king This attitude, too, was only temporary, and in 1261 Gloucester and Leicester were again working in concord Gloucester died on July 15, 1262

GLOUCESTER, ROBERT, EARL OF (d 1147), was a natural son of Henry I of England He was born, before his father's accession, at Caen in Normandy; but the exact date of his birth, and his mother's name are unknown. His father married him to a daughter of Robert Fitz Hamon, heiress of the lordships of Gloucester and Glamorgan About 1121 the earldom of Gloucester was created for his benefit After his father's death, he was sedulously courted by the rival parties of his half-sister the empress Matilda and of Stephen He tendered his homage to Stephen upon strict conditions, the breach of which should be held to invalidate the contract But in 1137 Robert left England for Normandy, renewed his relations with the Angevin party, and in 1138 sent a formal defiance to the king Returning to England in 1139, he revolted, and won the greater part of western England and the south Welsh marches for the empress By the battle of Lincoln (Feb 2, 1141), in which Stephen was taken prisoner, the earl made good Matilda's claim to the whole kingdom. He accompanied her to Winchester and London, but was captured by the king's supporters after the siege of Winchester He was exchanged for Stephen, and after his release continued to fight for Matilda until his death on Oct 31, 1147. Robert hardly deserves the extravagant praise which is lavished upon him by William of Malmesbury The sympathies of the chronicler are too obviously influenced by the earl's munificence towards literary men

See the *Historia novella* by William of Malmesbury (Rolls edition), the *Historia Anglorum* by Henry of Huntingdon (Rolls edition), J H Round, *Geoffrey de Mandeville* (1892), and O. Rossler, *Kaiserin Mathilde* (1897)

GLOUCESTER, THOMAS OF WOODSTOCK, DUKE OF (1355–1397), seventh and youngest son of the English king Edward III, was born at Woodstock on Jan. 7, 1355 Having married Eleanor (d 1399), daughter and co-heiress of Humphrey de Bohun, earl of Hereford, Essex and Northampton (d 1373), Thomas became constable of England, and was made earl of Buckingham by his nephew, Richard II, at the coronation in July 1377. He helped to defend the English coasts against the attacks of the French and Castilians, led an army through northern and central France, and unsuccessfully besieged Nantes.

Returning to England early in 1381, Buckingham found that his brother, John of Gaunt, duke of Lancaster, had married his wife's sister, Mary Bohun, to his own son, Henry, afterwards King Henry IV The relations between the brothers, already somewhat strained, were not improved by this proceeding After taking some part in crushing the rising of the peasants in 1381, Buckingham became more friendly with John of Gaunt; and while

marching with the king into Scotland in 1385 was created duke of Gloucester. Lancaster having left the country, Gloucester headed the party opposed to the royal advisers, Michael de la Pole, earl of Suffolk and Robert de Vere, earl of Oxford, whose recent elevation to the dignity of duke of Ireland had aroused profound discontent Gloucester forced on the dismissal and impeachment of Suffolk; was a member of the commission appointed in 1386 to reform the kingdom and the royal household; and took up arms when Richard began proceedings against the commissioners After defeating Vere at Radcot in December 1387 the duke and his associates entered London to find the king powerless in their hands Gloucester was restrained by his colleagues from deposing the king, but, as the leader of the "lords appellant" in the "Merciless Parliament," (February 1388), he took a savage revenge upon his enemies

In 1396 uncle and nephew were again at variance Gloucester disliked the peace with France and Richard's second marriage with Isabella of France, it was asserted that the duke was plotting to seize the king On July 11, 1397 he was arrested by the king himself at his residence, Pleshey castle, Essex He was taken at once to Calais, and it is probable that he was murdered by order of the king on Sept 9 following Gloucester had one son, Humphrey (*c* 1381–1399), who died unmarried, and four daughters, the most notable of whom was Anne (*c* 1380–1438), who was successively the wife of Thomas, 3rd earl of Stafford, Edmund, 5th earl of Stafford and William Bourchier, count of Eu Gloucester is supposed to have written *L'Ordonnance d'Angleterre pour le camp à l'outrance, ou gaige de bataille*

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GLOUCESTER (abbreviated as pronounced *Glo'ster*), city, port and county town, Gloucestershire, England, on the river Severn, 114 m W of London Pop (1921) 51,330 It is served by the G W and L M S railways, while the Berkeley Ship Canal runs south-west to Sharpness Docks in the Severn estuary (16½ m) Gloucester is sheltered by the Cotswolds on the east and the Forest of Dean on the west

The cathedral originates in the foundation of an abbey in 681, the present church being founded (1072–1104) and its first mitred abbot being appointed in 1381 Gloucester lay in the see of Worcester until 1541 when the separate see was constituted, with John Wakeman, last abbot of Tewkesbury, as first bishop The diocese covers the greater part of Gloucestershire, with small parts of Herefordshire and Wiltshire The cathedral consists of a Norman nucleus, with additions in every style of Gothic architecture It is 420 ft long, and 144 ft broad, with a beautiful 15th century pinnacled tower rising 225 feet The nave is massive Norman with Early English roof, the crypt, aisles and chapels are Norman, as is the chapter-house The crypt is one of the four apsidal cathedral crypts in England The south porch is Perpendicular, with fan-tracery roof, as also is the north transept, the south being transitional Decorated The choir has Perpendicular tracery over Norman work, with an apsidal chapel on each side The splendid late Decorated east window is partly filled with ancient glass. Between the apsidal chapels is a cross Lady chapel, and north of the nave are the cloisters, a very early example of fan-tracery, the carols or stalls for the monks' study and writing lying to the south There are shrines of Edward II, Robert Curthose (eldest son of the Conqueror), Bishop Warburton, Dr Jenner and others The Festival of the Three Choirs is held annually in this cathedral and those of Worcester and Hereford in turn

Quaint gabled and timbered houses preserve the ancient aspect of the city None of the old public buildings is left, but the New Inn in Northgate Street is a beautiful timbered house, built in 1450 Of the churches St Mary de Lode, with a Norman tower and chancel, is on the site of a Roman temple which became the first Christian church in Britain; St. Mary de Crypt is a cruciform structure of the 12th century, the church of St Michael is said to have been connected with the ancient abbey of St Peter, and St Nicholas church, originally of Norman erection In the neighbourhood of St Mary de Crypt are remains of Greyfriars and Blackfriars monasteries, and also of the city wall Early vaulted cellars remain under the Fleece and Saracen's Head inns

There are three endowed schools the College school, refounded by Henry VIII, the school of St Mary de Crypt, founded by Dame Joan Cooke and Sir Thomas Rich's Blue Coat hospital (1666) The first Sunday school was held in Gloucester, being originated by Robert Raikes, in 1780

A park in the south has a spa, a chalybeate spring having been discovered in 1814 West of this are the remains of Llanthony Priory

Gloucester possesses match works, foundries, marble and slate works, saw-mills, chemical works, rope works, flour-mills, engines and agricultural implements, and boat and ship-building yards Gloucester was declared a port in 1882 The Gloucester-Berkeley ship canal (opened 1827) has a depth of water of 18 ft Principal imports are timber and grain, and exports, coal, salt, iron, manufactured articles and bricks The salmon and lamprey fisheries in the Severn are valuable The tidal bore in the river attains its extreme height just below the city, and sometimes surmounts the weir in the western branch of the river

History.—Gloucester (Caer Glow, Gleawecastre, Gleucestre) was the Roman municipality or *colonia* of *Glevum,* founded by Nerva AD 96–98 Its situation and the foundation in 681 of the abbey of St Peter by Aethelred favoured the growth of the town; and before the Conquest Gloucester was a borough with a royal residence and a mint Numerous charters have been granted to the town Gloucester was incorporated by Richard III in 1483, the town being made a county in itself The chartered port of Gloucester dates from 1580 Numerous fairs have been granted The iron trade of Gloucester dates from before the Conquest, tanning was carried on before the reign of Richard III, pin-making and bell-founding were introduced in the 16th, and the long-existing coal trade became important in the 18th century The cloth trade flourished from the 12th to the 16th century The seaborne trade in corn and wine existed before the reign of Richard I

GLOUCESTER, a city of Essex county, Massachusetts, 28 m N E of Boston, occupying 31 sq m on Cape Ann, a port of entry, a summer resort, and the greatest salt-fishing port of the country It is served by the Boston and Maine railroad and by steamers to Boston The resident population was 23,375 in 1925 and is increased by 20,000 in summer Rock-bound coasts, bald hills, bold and precipitous ledges, acres of boulders, interspersed by small tracts of vegetation, quaint old village streets, houses dating from the 18th and even the 17th centuries and luxurious modern estates, combine to make a picturesque region Within the city limits are the summer resorts of Magnolia, Annisquam, Bass Rocks and East Gloucester The assessed valuation of property in 1925 was $33,742,331, of which about 25% represents summer homes Non-resident tax-payers are listed from every city and 141 towns of Massachusetts, 32 other States, and two foreign countries On the coast at Magnolia is Rafe's chasm, a fissure 60 ft deep and 6 to 10 ft wide, cut into the rock ledge for a distance of 200 ft, and near its entrance is the reef of Norman's Woe, celebrated in Longfellow's "Wreck of the Hesperus" The harbour is deep and commodious Its commerce in 1925 amounted to 91,739 tons, valued at $4,698,968, of which $730,381 represented foreign trade While the aggregate amount of freight received by the city has increased since the World War, the traffic of the port has declined to about ¼ of its former volume, as part of the coal now comes in by rail, and much of the general merchandise by motor truck Fishing for cod, mackerel, haddock and halibut is still, as it has been for three centuries, the principal occupation, engaging 5,000 men In 1925 the catch by Gloucester vessels totalled 150,000,000 lb, of which 80,000,000 lb was landed in Gloucester and the rest in other ports The fishing vessels range from the Capes of Virginia to Greenland and even Iceland, and the length of their trips varies from a few days to

three or four months. The curing, boning, and packing of the fish, and the making of glue and other by-products, are important subsidiary industries. The beautiful dark granite of the Cape is quarried at several places in Gloucester and the adjoining town of Rockport. This industry, dating from 1823, has furnished stone for government fortifications, the Woolworth Building in New York, and the towers of the Brooklyn bridge. The aggregate product of all the manufacturing industries in 1925 was valued at $14,075,718.

In 1605 Champlain sailed around the Cape, which he called *Cap aux Isles,* and in 1606 he mapped the harbour and named it *Le Beau Port*. A settlement was made in 1623 by English fishermen sent out by the Dorchester company, and in 1642 the town was incorporated. It was chartered as a city in 1874. During the 18th century and half of the 19th Gloucester had a considerable foreign trade. The fishing industry has had fluctuations in prosperity, a continuous evolution of methods and types of craft, and a history of daring, fortitude, hardships, heroism, and adventure. In 1923 a monument was erected to the 8,000 men who since 1830 have lost their lives in the fisheries.

Gloucester life has been described in many books: Rudyard Kipling, *Captains Courageous;* Elizabeth Stuart Phelps-Ward, *A Singular Life* and *Old Maid's Paradise;* James B. Connolly, *Out of Gloucester* (1902), *The Deep Sea's Toll* (1905), *The Crested Seas* (1907), and *Gloucester Fishermen* (1927).

GLOUCESTER CITY, a city of Camden county, New Jersey, on the Delaware river, opposite Philadelphia, adjoining Camden on the south. It is served by the Pennsylvania and the Reading railways. The population was 12,162 in 1920 (88% native white). Its manufactures include paper, cotton and silk fabrics, rugs, gas mantles and fixtures, and the aggregate product in 1925 was valued at $6,310,335. Near the site of Gloucester City the Dutch in 1623 planted the short-lived colony of Fort Nassau. Permanent settlement dates from 1677, and a town (at first called Axwamus) was laid out in 1689. During the Revolution it was frequently occupied, and several skirmishes were fought in the vicinity. The most important was a successful attack on a detachment of Hessians, Nov. 25, 1777, by American troops commanded by Gen. Lafayette. The city was chartered in 1868.

GLOUCESTERSHIRE, a county of the west midlands of England, bounded by Worcestershire, Warwickshire, Oxfordshire, Berkshire, Wiltshire, Somerset, Monmouth and Herefordshire. Its area is 1,255 square miles.

Physical Features.—The outline is very irregular, but three physical divisions are well marked—the hills, the vale and the forest. (1) The first (the eastern part of the county) lies among the uplands of the Cotswold hills (*q.v.*) whose westward face, the escarpment made by the Lower Oolites (Jurassic), is a line of heights of an average elevation of 700 ft., but exceeding 1,000 ft. at some points. This line bisects the county from south-west to north-east. The watershed between the Thames and Severn lies close to it, Thames Head near Cirencester and most of the upper feeders of the Thames being in Gloucestershire. (2) The "Vale" division is the rich valley of the lower Severn which can be separated into the vale of Gloucester and the vale of Berkeley. This great river receives, near Tewkesbury, the Stratford Avon which joins it on the left. The latter is to be distinguished from the Bristol Avon, which rises in the county as an eastward flowing stream of the Cotswolds, sweeps round through Wiltshire, pierces the hills through a narrow valley which becomes a gorge where the Clifton suspension bridge crosses it below Bristol, and enters the Severn estuary at Avonmouth. For 17 m. from its mouth it forms the boundary between Gloucestershire and Somersetshire, and for 8 m. it is an important commercial waterway connecting the port of Bristol with the sea. The third great tributary of the Severn is the Wye. From its mouth in the estuary, 8 m. north of that of the Bristol Avon, it forms the county boundary for 16 m. northward and above this, over two short reaches of its beautiful winding course, it is again the boundary.

(3) Between the Wye and the Severn lies the Forest of Dean, which, unlike the majority of English forests, maintains its ancient character. The minor rivers of the county are never long. The vale is at no point within the county wider than 24 m., and so does not permit the formation of any considerable tributary to the Severn from the Dean hills on the one hand or the Cotswolds on the other. The Leadon rises east of Hereford, and joins the Severn near Gloucester. In the southern part, the Stroudwater traverses a narrow, picturesque and populous valley, and the Little Avon flows past the town of Berkeley, joining the Severn estuary on the left. The Frome runs southward to the Bristol Avon at Bristol. The principal northern feeders of the Thames are the Churn rising in the Seven Springs, above Cheltenham, the Coln, a noteworthy trout-stream, the Windrush and the Evenlode. The Churn and the Coln form the eastern county boundary along parts of the course.

Geology.—Gloucestershire is divided geologically into two distinct sections by a line passing from north to south, from the eastern side of the Malvern hills to Keynsham (east of Bristol). This divides the Mesozoic rocks on the east from the Palaeozoic and older rocks on the west and is an important structural feature. In the north of the county it separates, by means of a great fault, the Pre-Cambrian gneisses of the Malverns from the Trias of the Severn valley. The fault passes southward between the Old Red Sandstone (with some Carboniferous) and the Trias, to May Hill, which elevation is formed of Silurian shales, grits and limestones (with a small outcrop of Pre-Cambrian grits at Huntley). Thence the boundary line continues southward to the Severn still being between the two great red sandstone formations.

Rising up almost sheer from the Severn on the west is the plateau of the Forest of Dean which is a basin of Carboniferous rocks (limestones, shales, grits and coal-measures), resting upon the Old Red Sandstone, the Carboniferous limestones forming scarp faces round most of the outlier. South of the Severn is the Bristol coal-field, with Silurian rocks and included volcanic rocks north and north-east of it. The Silurian occurs as inliers (*e.g.,* Tortworth) and Old Red Sandstone rocks crop out beneath the Carboniferous of the coal-field. Liassic and Triassic rocks also occur, resting upon the older rocks. In the vale of the Severn, east of the great boundary line, the structure is comparatively simple. Between the Malvern-fault and a line from Newnham through Tewkesbury is an area of Trias and east of this, stretching to the Jurassic escarpment of the Cotswolds, is a broad belt of Liassic clay with Rhetic rocks (with famous bone beds) at their base. It is the soils from these two rocks which yield such excellent crops. With the exception of alluvial deposits, and glacial and fluvio-glacial drifts and gravels, there are no rocks in the county newer than the Oxford clay, a small outcrop of which occurs near Lechdale.

History and Early Settlement.—The most interesting prehistoric feature of Gloucestershire is its wealth of long Barrows (*see* O. G. S. Crawford *Ord. Survey, Professional Papers* New Series No. 6, 1922). Almost as striking is the absence of Beaker pottery so abundant in Wiltshire to the south and Oxfordshire to the east. The lower Severn valley was apparently largely forest and swamp in early times. The Cotswolds are again remarkably poor in brooches of the first period of La Tène though Wiltshire and Oxfordshire are again rich. In Roman times the famous Fosse way from Bath to Lincoln ran east of the Cotswold ridge with Corinium (Cirencester) as a station on it, and branches west to Glevum (Gloucester), south-east and east. There were numerous Roman villas not far from these roads.

The English conquest of the Severn Valley began in 577. The Hwiccas who occupied the district were a West Saxon tribe, but their territory had become a dependency of Mercia in the 7th century, and was not brought under West Saxon dominion until the 9th century. No important settlements were made by the Danes. Gloucestershire probably originated as a shire in the 10th century, and is mentioned by name in the Anglo-Saxon Chronicle in 1016. Towards the close of the 11th century the boundaries were readjusted to include Winchcomb, and at the same time the forest district between the Wye and the Severn was added to Gloucester. The divisions of the county for a long time remained very unsettled and Gloucestershire formed part of Harold's

earldom at the time of the Norman invasion, but it offered slight resistance to the Conqueror. In the wars of Stephen's reign the cause of the empress Maud was supported by Robert of Gloucester who had rebuilt the castle at Bristol, and the castles at Gloucester and Cirencester were also garrisoned on her behalf. Bristol and Gloucester actively supported the Yorkist cause during the Wars of the Roses. In 1643 Bristol and Cirencester were captured by the Royalists, but the latter was recovered in the same year, and Bristol in 1645 Gloucester was garrisoned for the parliament throughout the struggle

On the sub-division of the Mercian diocese in 680 the greater part of modern Gloucestershire was included in the diocese of Worcester, and shortly after the Conquest constituted the archdeaconry of Gloucester The district west of the Severn, with the exception of a few parishes was within the diocese of Hereford In 1541 the diocese of Gloucester was created, its boundaries being identical with those of the county On the erection of Bristol to a see in 1542 the deanery of Bristol was transferred from Gloucester to that diocese In 1836 the sees of Gloucester and Bristol were united, but in 1897 the diocese of Bristol was recreated, and included the deaneries of Bristol, Stapleton and Bitton After the conquest extensive lands and privileges were acquired by the church, the abbey of Cirencester alone holding seven hundreds The large estates held by William Fitz Osbern, earl of Hereford, escheated to the Crown in 1075 The Berkeleys have held lands in Gloucestershire from the time of the Domesday Survey, and the families of Basset, Tracy, Clifton, Dennis and Poyntz have figured prominently in the annals of the county Gilbert de Clare, earl of Gloucester, and Richard of Cornwall claimed extensive lands and privileges in the shire of the 13th century, and Simon de Montfort owned Minsterworth and Rodley In the Cotswold region the churches typically show Romanesque work and Perpendicular work thus illustrating two special periods of economic development in the county related to the manors and the wool trade respectively

Bristol was made a county in 1425, and in 1483 Richard III created Gloucester an independent county, and both have continued to rank as independent counties, with separate jurisdiction, county rate and assizes The chief officer of the Forest of Dean was the warden, who was generally also constable of St Briavel castle The first justice-seat for the forest was held at Gloucester castle in 1282, the last in 1635

Iron was worked in the county in Roman times and later, and the forest district was one of the chief sources of iron in the country until the 16th century The Cotswolds became famous for their sheep flocks and wool in the 15th century, which witnessed the expansion of such interesting towns as Chipping Campden which retains many interesting features Many of the forests had tanneries, and boat building was carried on thanks to the timber available Silk weaving was introduced in the 17th century and prospered in the Stroud valley These varied industrial developments promoted the building of an interesting type of stone house specially characteristic around the Cotswolds The abundance of clay on the edges of the plains promoted industries of bricks, tiles and potteries Accessory industries, such as the making of pins, buttons, lace, stockings, rope and sailcloth grew up in the 17th and 18th centuries and a good deal of flax was grown The advent of coal and steam machinery ended the modified and somewhat reduced woollen industry, but the presence of water power and of fullers' earth led the district (especially Stroud) to specialize in the manufacture of broadcloth Gloucester was a port of some consequence and Bristol (*q v*) very important The Cotswold area, especially Cheltenham, is become a residential area in modern times and the advent of the motor-car has contributed to this development

Antiquities.—At Chedworth, near Cirencester, there are well preserved remains of Roman baths The cathedrals of Gloucester and Bristol, the magnificent abbey church of Tewkesbury, and the church of Cirencester with its great Perpendicular porch, are described under their separate headings Of the abbey of Hayles near Winchcomb, founded in 1246, little more than the foundations are left Most of the old market towns have fine parish churches. At Deerhurst near Tewkesbury, and Cleeve near Cheltenham, there are churches of special interest on account of their pre-Norman work The Perpendicular church at Lechlade is unusually perfect; and that at Fairford built (*c* 1500), contains a remarkable series of stained glass windows The great decorated Calcot Barn is an interesting relic of the monastery of Kingswood near Tetbury The castle at Berkeley is a splendid example of feudal stronghold Thornbury castle is a fine Tudor ruin Near Cheltenham is a fine 15th century mansion of timber and stone, which contains a tiled floor from Hayles abbey Near Winchcomb is Sudeley castle, dating from the 15th century. At Great Badminton is the mansion and vast domain of the Beauforts

Agriculture, Industries and Communications.—About three-quarters of the total area is under cultivation, and of this about 42% is in permanent pasture Wheat is the chief grain crop, but oats and barley are also important In the vale, the deep rich black (Lias) or red (Trias) loamy soil is well adapted for pasturage, and a moist mild climate favours the growth of grasses and root crops The cattle, save on the frontier of Herefordshire, are mostly shorthorns, of which many are fed for distant markets, and many reared and kept for dairy purposes The rich grazing tract of the vale of Berkeley produces butter and the "double Gloucester" cheeses, and the vale of Gloucester is the chief grain growing district Turnips, etc , occupy about three-quarters of the green crop acreage, potatoes occupying only about a tenth A feature of the county is its apple and pear orchards, chiefly for the manufacture of cider and perry, which are attached to every farm The Cotswold district is comparatively barren except in the valleys, but it has been famous since the 15th century for the breed of sheep named after it. Oats and barley are here the chief crops

The most important industrial centre of the county is Bristol As a port and with an extensive trade with the West Indies, such industries as the manufacture of tobacco, cocoa and chocolate, sugar refining, soap and tanning have become important There are also iron foundries, chemical and engineering works, shipbuilding yards, breweries and factories making glass, earthenware and furniture The district around Stroud has long been, and still is, famous for the manufacture of woollen cloth, a type known as broadcloth Hardware is also made in this neighbourhood Gloucester manufactures cutlery, agricultural implements, and being a port has foundries, ship building yards, chemical works and rope factories In other scattered parts of the county, gloves and silk manufactures and engineering are carried on Coal is mined in the Forest of Dean and the Bristol coal-fields, limestone and freestone are quarried in the Cotswolds, bricks and tiles manufactured from the Lias clays, and haematite in the Forest of Dean Strontianite and barytes are also obtained in the county There are a number of important public schools and colleges in the county and Bristol is the seat of a university

Railway communications are provided by the G W and L M S companies Of the G W railway, the main line serves Bristol from London. It divides at Bristol, one section serving the south-western counties, another via the Severn Tunnel, south Wales A more direct route by this tunnel, between London and south Wales, is provided by a line from Wootton Bassett on the main line, running north of Bristol by Badminton and Chipping Sodbury Other G W lines are that from Swindon on the main line, by the Stroud valley to Gloucester, crossing the Severn there, and continuing into Wales, with branches into Herefordshire, the Oxford and Worcester trunk line, crossing the north-east of the county, connected with Cheltenham and Gloucester by a branch through the Cotswolds from Chipping Norton junction and also by a branch from Andoversford with Cirencester A line from Cheltenham runs by Broadway to Honeybourne The East Gloucester line of the G W railway from Oxford terminates at Fairford The west-and-north line of the L M S railway follows the vale from Bristol by Gloucester and Cheltenham with a branch into the Forest of Dean by Berkeley, crossing the Severn at Sharpness by a great bridge 1,387 yd in length, with 22 arches The coal-field of the Forest of Dean is served by several branch

lines In the north Tewkesbury is served by a L M S. branch from Ashchurch to Malvern The Thames and Severn canal, rising to a summit level in the tunnel through the Cotswolds at Sapperton, is continued from Wallbridge (Stroud) by the Stroudwater canal, and gives communication between the two great rivers. The Berkeley Ship canal (16½ m) connects the port of Gloucester with its outport of Sharpness on Severn

Population and Administration.—The area of the ancient county is 795,709 ac. and the administrative county 805,842 acres The population in 1901 was 634,729 and in 1921 was 757,651 The county contains 28 hundreds; is divided into four parliamentary divisions; contains two cities, Bristol and Gloucester; four municipal boroughs, Bristol (county borough) Gloucester (county borough), Cheltenham and Tewkesbury; and 11 urban districts, Cirencester, Stow-on-the-Wold, Tetbury, Awre, Coleford, Newnham, Westbury-on-Severn, Charlton Kings, Nailsworth, Stroud and Kingswood There are many small ancient market towns Gloucestershire is principally in the diocese of Gloucester, but part is in that of Bristol and small parts in those of Worcester and Oxford It has one court of quarter sessions and there are 27 petty sessional divisions Bristol, Gloucester and Tewkesbury have separate courts of quarter sessions and Bristol has a separate police force

Gloucestershire was represented in parliament in 1290 and returned two members. Bristol and Gloucester acquired representation in 1295, Cirencester in 1572 and Tewkesbury in 1620 In 1832 the county returned four members in two divisions; Bristol, Gloucester, Cirencester, Stroud and Tewkesbury returned two members each, and Cheltenham returned one member The act of 1868 reduced the representation of Cirencester and Tewkesbury to one member each By the act of 1918, the county was divided into four divisions, viz, those of Cirencester and Tewkesbury, the forest of Dean, Stroud and Thornbury divisions each returning one member Bristol returns five members, Cheltenham and Gloucester one each

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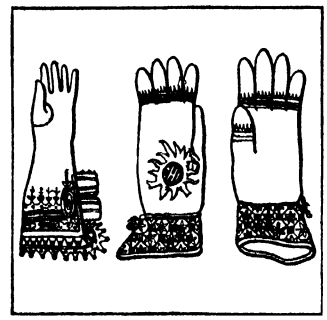
GLOVE, a covering for the hand, commonly with a separate sheath for each finger

The use of gloves is of high antiquity, and apparently was known even to the pre-historic cave dwellers In Homer Laërtes is described as wearing gloves in his garden Herodotus tells how Leotychides filled a glove with money received as a bribe, and Xenophon records that the Persians wore fur gloves having separate sheaths for the fingers Among the Romans also there are occasional references to the use of gloves Varro remarks that olives gathered with the bare fingers are better than those gathered with gloves In the northern countries the general use of gloves would be more natural than in the south, and it is not without significance that the most common mediaeval Latin word for glove (*guantus* or *wantus*, Mod Fr *gant*) is of Teutonic origin (O H G *want*). Among the Germans and Scandinavians, in the 8th and 9th centuries, the use of gloves, fingerless at first, would seem to have been but universal, and in the case of kings, prelates and nobles they were often elaborately embroidered and bejewelled This was more particularly the case with the gloves which formed part of the pontifical vestments In war and in the chase gloves of leather, or with the backs armoured with articulated iron plates, were early worn; yet in the Bayeux tapestry the warriors on either side fight ungloved So far as the records go, there is no evidence to prove that gloves were in general use in England until the 13th century. It was in this century that ladies began to wear gloves as ornaments; they were of linen and sometimes reached to the elbow. It was, however, not till the 16th century that Queen Elizabeth set the fashion for wearing them richly embroidered and jewelled.

Symbolical Uses.—Of the symbolical uses of the glove one of the most widespread during the middle ages was the practice of tendering a folded glove as a gage for waging one's law The origin of this custom is probably not far to seek The promise to fulfil a judgment of a court of law, a promise secured by the delivery of a *wed* or gage, is one of the oldest of all enforceable contracts. This gage was originally a chattel of value, which had to be deposited at once by the defendant as security into his adversary's hand; and that the glove became the formal symbol of such deposit is doubtless due to its being the most convenient loose object for the purpose.



FROM PLANCHE, "CYCLOPAEDIA OF COSTUME"
LEFT, A GLOVE OF MARY QUEEN OF SCOTS, 1542–1587. RIGHT, GLOVES OF WILLIAM OF WYKEHAM, BISHOP OF WINCHESTER, 1367-1404

Associated with this custom was the use of the glove in the wager of battle The glove here was thrown down by the defendant in open court as security that he would defend his cause in arms; the accuser by picking it up accepted the challenge (*see* WAGER) This form is still prescribed for the challenge of the king's champion at the coronation of English sovereigns, and was actually followed at that of George IV (*see* CHAMPION).

The use of the glove as a pledge of fulfilment is exemplified also by the not infrequent practice of enfeoffing vassals by investing them with the glove, similarly the emperors symbolized by the bestowal of a glove the concession of the right to found a town or to establish markets, mints and the like. Conversely, fiefs were held by the render of presenting gloves to the sovereign The most notable instance in England, however, is the grand serjeanty of finding for the king a glove for his right hand on coronation day, and supporting his right arm as long as he holds the sceptre.

Pontifical Gloves are liturgical ornaments peculiar to the Western Church and proper only to the pope, the cardinals and bishops, though the right to wear them is often granted by the Holy See to abbots, cathedral dignitaries and other prelates. According to the present use the gloves are of silk and of the liturgical colour of the day, the edge of the opening ornamented with a narrow band of embroidery or the like, and the middle of the back with a cross They may be worn only at the celebration of mass (except masses for the dead) and only until the ablution before the canon of the mass

During the middle ages the occasions on which pontifical gloves were worn were not so carefully defined as now, the use varying in different churches Nor were the liturgical colours prescribed. Liturgical gloves have not been worn by Anglican bishops since the Reformation, though they are occasionally represented as wearing them on their effigies.

Gloves made of thin indiarubber or of white cotton, which may be thoroughly and easily sterilized, are worn by many surgeons while performing operations.

GLOVE MANUFACTURE. Modern gloves fall naturally into two main groups: (1) leather gloves, (2) fabric and knitted gloves The character of a leather glove depends partly upon the type of skin used, but more particularly upon the processes by which the leather is produced

Glove Skins.—A large variety of skins are used by the trade; but the humble sheep supplies the bulk of the raw material. Apart from sheepskin, the principal skins used for grain (or *glacé*) glove leathers (*i e*, those finished on the hair side of the skin) are kid, goat (chevrette) and lamb. French "national" skins from milk-fed kids are used extensively for ladies' high grade gloves; Tuscany, French "regord" and Kasan (Russia) lambskins are of high repute In the grain group, also, the genuine Cape or South African hairy sheep furnish a strong, pliant leather for men's gloves. Many so-called "Capes," however, are made

GLOVE MANUFACTURE



SIX PROCESSES IN THE MANUFACTURE OF GLOVES

1. Unhairing, or removing hair from raw skins. Skins are first soaked in slaked lime or treated with depilatory paste, then scraped with a dull curved blade to remove hair and wool
2. Cleansing skins. Skins are again soaked in slaked lime to loosen sweat glands and hair roots, to separate animal grease so that it can be removed, to plump skins and separate fibres so that the tan liquors may penetrate
3. Cutting the trank, an oblong piece of leather just large enough to fit the glove pattern. After this is done, thumbs and other small parts are stamped out with steel dies
4. Die cutting the gloves by a pattern. Three pairs of tranks are laid in the machine and a lever is pressed which forces sharp steel die through them
5. Sewing gloves. Decorative lines on back are made first, thumb is then inserted and strips and triangles which shape fingers are attached, fingers are closed and cuffs or bindings sewn in place
6. Laying off, or smoothing, gloves. Gloves are first dampened in wet cloths and then fitted on steam heated brass forms. Grain finished gloves are polished on a soft felt wheel, while velvet finished are brushed

rom Spanish, oriental or domestic sheepskins Pig-skin and colt-kin are used for gloves to some extent in America, and dog-skins re occasionally made into glove leather.

For velvet finished gloves, reindeer and buckskins yield the inest leathers, but they are expensive. The diminutive North frican gazelle (a tiny creature, so small that three skins barely uffice for a single pair of gloves), the Arabian (or Mocha) sheep, nd Sudanese sheep also furnish capital leather for velvet finishes. uede leathers (*i e*, those finished on the flesh side of the skin) re produced from kid, lamb and sheep-skins. Sheep-skins, again, urnish most of the raw material for so-called "chamois," or washleather gloves, and also for what in the trade are called doeskins "

Many glove manufacturers dress and dye skins for their own se; others purchase glove leather ready dressed The skins are irst partly cleansed in tanks or pits filled with water They are hen de-haired, the flesh side of the skins being painted with a olution of slaked lime and sodium sulphide or lime and red rsenic, which loosens the hair or wool and facilitates its removal y hand or machine Any flesh adhering to the skin is next re-noved by "beaming" or "fleshing " Beaming is a hand operation, he skin being laid across a sloping beam let into the floor and the perative shaving away the flesh with a beaming knife In the leshing machine, which performs the same operation, the knives re mounted spirally upon a revolving cylinder, under which the kins are passed as through a mangle The cleansed skins are teeped for some weeks in pits or vats containing a solution of laked lime to loosen the sweatglands and hair cells and to re-nove grease, dirt, etc. Liming also makes the skins plumper More washing follows, and the hides are then placed in a "puer" or "bate") consisting either of a solution of dog manure, or a hemical solution of pancreatic extracts in combination with immonium salts "Drenching" is the next stage, wherein the aw material of the glove is immersed in vats containing a fer-nenting infusion of flour, pea-meal or bran, in which the skins well or "rise" still more Alternatively skins are pickled in a veak solution of sulphuric acid and salt "Puering" and "drench-ng" or "pickling" complete the reduction of the hides to a soft, porous, pulpy, gelatinous condition which facilitates the entry f the dressing ingredients into the fibres of the skins Further insings and cleansings follow, and the skins are then gently craped with a scudding knife to remove the last vestige of hair r scum

Dressing.—Dressing proper follows There are several proc-sses which may be adopted, according to the type of leather re-uired and the practice of the factory Different factories use lifferent methods to produce the same kind of leather

The "tawing" method, or white dressing, is very commonly ised A typical tawing mixture consists of 4 parts alum, 2 parts alt, 1 part egg-yolk and 5 parts flour Sometimes a little vege-able oil is added The mixture is dissolved in water (about 12 b to 2 gal) and is applied by means of a drum-tumbler—a vessel shaped like a drum, the inner sides of which are fitted with egs The drum rotates on its own axis, and the pegs knead the nixture into the skins Subsequently the skins are "stoved," or ried in heated chambers and emerge in the "crust" stage, re-embling a piece of damp washleather which has dried hard in he sun They are softened by "staking," a process in which the ides are drawn (flesh side downwards) over a blunt metal tool, fixed to a short stake or post set in the floor. Machine staking is now much used, especially for strong skins The skins are later pared to an even thickness and usually stored for long periods before dyeing Colour is applied either by brushing the dye on the outer surface of the leather, or by immersion in a drum tumbler. Vegetable or bark dyes are much used; but aniline and coal tar colours are suitable

The foregoing process is much used for dressing *glacé* leathers, such as kid, lamb, nappa (a German term used to distinguish a drum-dyed article from a brush-dyed), and many so-called "Capes " *Glacé* or grain leathers are finished by polishing the grain side with a lamb's wool pad, a glass slicker or a revolving felt wheel Suede (named after Sweden, the country of its origin) is tanned by an alum and salt process, but it is finished by buffing the flesh surface on an emery wheel. Real "mochas" are dressed with lactic acid, alum and egg yolk; but the grain is first frized (raised with a frizing knife) and the grain side finished by buffing with emery and pumice

Bark tanning (in which oak, chestnut, gambier, sumach and other barks are used) is adopted for leathers like genuine "Cape," goat, colt, pig and similar heavy-weight skins

An oil tannage is used to produce so-called "chamois" leather and washleather. For these, "fleshers" (the flesh section of the split sheep-skins) are dressed with cod-oil in a "stocking" machine, which pummels the oil into the leather The process is sometimes termed "samming," and it involves repeated applications of oil, each dressing being followed by stove drying Reindeer and buckskins are often oil-dressed, as are some "degrains"—leather with the grain "frized" or shaved off These are then dyed as required White washable leather is tanned by drumming skins in a solution of sodium carbonate and formaldehyde, later treating them with an emolient of egg-yolk and neat-foot or olive-oil Much progress has been made since 1920 with chrome dressing, and an entirely new range of coloured washable gloves is available in consequence This process is much used for washable grain leathers, particularly in America, but velvet finished, especially "degrains" made from frized gazelle or Cape, Spanish and Sudanese sheep are successfully treated in this way The tannage is effected by drumming in a solution of chrome salts, after which the skins are treated with an oil emulsion "Doe-skins" are usually oil-dressed sheep-skins or lamb-skins dyed with a liquid clay dye In America, they are dressed by the formaldehyde process Gazelle, antelope and the various deer-skins are often "degrained" (or frized) and dressed with a velvet finish Sometimes the white tannage is used and sometimes the formaldehyde or chrome process

Glove-cutting.—Glove-cutting is a twofold operation The cutters first stretch and manipulate the skins, and then cut them into oblong "tranks" of leather Several tranks are placed together in a punching press fitted with a "calibre" (knives shaped like a double thumbless hand) and the shaped glove is punched out at one operation "Fourchettes" (pieces for the sides of the fingers) and thumb pieces are punched out separately

The work of sewing is principally a cottage industry Hand sewing is preferred for the highest class of work, but machine sewing is general Three special types of stitch are used —(1) "round seam" (for light-weight gloves), in which the edges of the leather are brought together, back to back, and each stitch goes through the leather, and over the edge, (2) "prix-seam" (for heavy-weight gloves), in which the edges are brought together and the stitching goes through and through, parallel to the edge, and (3) "pique," in which one edge is lapped over the other, and the stitches sewn through When sewn, the gloves are dressed on heated metal "hands" and ironed and polished ready for boxing Fur gloves are made in much the same way, except that the fur is cut by hand

The annual production of leather gloves fluctuates considerably; fashion and the severity of winter weather have an important bearing on demand The principal centres of manufacture are France, the United States, Italy, Germany, Czechoslovakia, England, Belgium, Luxemburg and Canada

The French industry dates from the 11th century It is carried on at Grenoble, Millau, St Junien and Niort, and there are large dressing yards at Annonay in the Ardeche Though France is the largest glove manufacturing country in the world, no figures of the annual production are available The output is chiefly in kids, lambs and light-weight suedes and washables, and more than 75% of the output is exported

The glove industry of the United States dates from 1760, when Sir William Johnson introduced a colony of Scottish glovers from Perth These founded the town of Gloversville, Fulton county (N Y.), the chief seat of the industry Production (chiefly of heavier types) has increased very rapidly since the World War, and has reached 3,500,000 dozen pairs annually The majority are sold in the home market.

of this nature should be completely free from doubt in order that their value as keys to accurate knowledge may be utilised

The authenticity of these discoveries was criticised by the Abbé Breuil in *Anthropologie* xxxvi. 1926, pp 543–558 Reinach contributed an article to *The Antiquary's Journal* supporting his views In June, 1927, Mr. O G S Crawford, the editor of *Antiquity* published an article in which, profiting by a visit to Glozel, he concluded that the majority of the objects were certainly forgeries Some there were which, in his opinion, were genuine antiquities though not prehistoric and his emphatic opinion is that the inscriptions, engravings and the majority of the other finds are forgeries and that those who believe in their authenticity have been the victims of a hoax (*Antiquity* March and June, 1927). In September 1927 the International Institute of Anthropology at its meeting in Amsterdam appointed a Commission to visit Glozel to examine the site and the objects found therein and to pronounce their opinion upon the authenticity of the discoveries

By this time the French government had taken official action to recognize the site as one of scientific importance meriting the protection of the law The Commission consisted of eight members from Spain, France, Alsace, Great Britain, Belgium, Switzerland and Czecho Slovakia, one of whom was unable to take part in its investigations and deliberations In November 1927 the Commission visited Glozel, examined and tested the site and the objects already found and reported unanimously the antiquity of the material discovered at Glozel had not been proved It was admitted that authentic material of an early date may have been introduced by natural methods In a series of articles in the *Mercure de France* Dr Morlet maintained the authenticity of the discoveries, hotly repudiated the suggestion that the scientific world had been hoaxed, and vigorously criticized the methods and findings of the Commission A remarkable degree of acrimony characterizes the controversy which has arisen and reference to the Law Courts has been made

See *Revue Anthropologique*, Supplement No 10–12, 1927

GLUCINUM, an alternative name for the metal beryllium (*q v*) When L N Vauquelin in 1798 published in the *Annales de chimie* an account of a new earth obtained by him from beryl he refrained from giving the substance a name, but in a note to his paper the editors suggested glucine, from γλυκύς, sweet, in reference to the alleged taste of its salts, whence the name glucinum or glucinium (symbol Gl or sometimes G).

GLUCK, CHRISTOPH WILLIBALD (1714–1787), operatic composer, German by birth, French by his place in art, was born at Weidenwang, near Neumarkt, in the upper Palatinate, on July 2, 1714 His father was gamekeeper to Prince Lobkowitz, and from his 12th to his 18th year he received a good general education, including music lessons, at the Jesuit school of Kommatan, near Prince Lobkowitz's estate in Bohemia At the age of 18 he went to Prague, where he studied under Czernohorsky, and maintained himself by hand-to-mouth musical jobs, sometimes at village fairs and dances Prince Lobkowitz introduced him to the best families of the Austrian nobility, and when in 1736 he proceeded to Vienna he was hospitably received at his protector's palace Here he met Prince Melzi, an ardent lover of music, whom he accompanied to Milan, continuing his education under Giovanni Battista San Martini (or Sammartini), a great musical historian and contrapuntist, whose al fresco style of chamber-music was an important if unconscious step towards the dramatic orchestration of the future Gluck soon becomes a fluent writer, producing nine operas at various Italian theatres between 1741 and 1745 Unimportant as they are in the light of his mature art, they were so well received that in 1745 he was invited to London to compose for the Haymarket, where he produced *La Caduta dei giganti* and followed it by a revised version of an earlier opera He also appeared in London as a performer on the musical glasses (*see* HARMONICA).

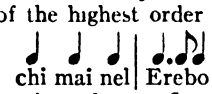
The poor success of his two operas, as well as that of a *pasticcio* entitled *Piramo e Tisbe*, shortened his London visit. But his stay in England was not without important consequences for his future. Gluck at this time was rather less than an ordinary producer of Italian opera Handel said that Gluck "knows no more counterpoint than my cook," which was probably true, seeing that that cook was an excellent bass singer who performed in many of Handel's own operas Musical cookery demands more counterpoint than Gluck ever mastered; and, if Gluck did not as yet see any connection between counterpoint and drama, he learnt much from the surprising discovery that arias which in their original setting had been much applauded lost all effect when adapted to new words in the *pasticcio* Handel's criticism was by no means irrelevant The use of counterpoint is independent of contrapuntal display; its real and final cause is a certain depth of harmonic expression which Gluck attained only in his most inspired moments, and for want of which many of his subtle details are dangerously like oversights And in later years his own mature view of the importance of harmony, which he upheld in long arguments with Grétry, who believed only in melody, shows that he knew that the dramatic expression of music must strike below the surface At this early period he was simply producing operas on Handel's, or rather Hasse's lines without a sign of mastery Yet the failure of his *pasticcio* is profoundly significant, since it shows that already the effect of his music depended upon its characteristic treatment of dramatic situations. This characterizing power was as yet only thus indirectly evident, and the art of music needed all the new resources of the rising sonata-forms (*q v*) before it could break through its architectural and decorative restraints and enter into dramatic regions at all

The chamber music of Sammartini had already indicated to Gluck a style incompatible with the older art, and a short trip to Paris brought him into contact with the classic traditions and the declamatory style of the French opera—things which an intelligent prophet might have foreseen to be of immense importance to a pupil of Sammartini Little change, however, is to be found in the works produced by Gluck with varying success during the 15 years after his return from England His first opera written for Vienna, *La Semiramide riconosciuta,* is again fashionable opera seria, and little more can be said of *Telemacco,* although 30 years later Gluck was able to use most of its overture and an energetic duet in one of his greatest works, *Armide,* and to adapt another number to the sublime purposes of a still greater work, *Iphigénie en Tauride*

Gluck settled permanently at Vienna in 1756, having two years previously been appointed court chapel-master, with a salary of 2,000 florins, by the empress Maria Theresa He had already received the order of knighthood from the pope after the success of two of his works in Rome During the long interval from 1756 to 1762 Gluck seems to have been meditating his plans for the reform of the opera, producing little more than the ballet *Don Giovanni* and some French *airs nouveaux* with pianoforte Several later *pieces d'occasion,* such as *Il Trionfo di Clelia* (1763), are still written in the old manner But already in 1762 *Orfeo ed Euridice* had revolutionized the whole art of music Gluck had for the first time deserted Metastasio for Raniero Calzabigi, who, as Vernon Lee suggests, was in all probability the immediate cause of the formation of Gluck's new ideas He was a hot-headed dramatic theorist with a violent dislike for Metastasio, who had hitherto dominated the whole sphere of operatic libretto Calzabigi reduced the operatic scheme from a complicated plot designed for working in three arias in each act for each of seven expensive singers, to the simplest possible means of expressing and concentrating the obvious emotions aroused by a classical myth

In *Orfeo* there are only three characters besides the chorus The chorus itself has to play a different part in each scene, human mourners in the first act, Furies in the first part of the second act, Elysian shades in the second part, and a rejoicing human crowd when, as in Monteverde's pioneer work of 150 years earlier, the pathos of the story becomes intolerable to the poet, the composer, and the audience, so that Eurydice has to be galvanized back into life and received with Orpheus and the thaumaturgic Amor by a triumphant chorus and a long series of ballets For the rest, the pathos of the music is among the

greater experiences of the art Even in the first act, which is occupied, until the sudden entry of Eros (Amor), entirely with the chorus of mourners and the lament of Orpheus at Eurydice's tomb, there is no feeling of monotony, no lack of dramatic power, and no lapse from the highest activity of the composer's imagination Nothing like it had been dreamt of before, and one of its most interesting features is that it is neither histrionic nor realistic The echoes of Orpheus's cadences by a cor anglais behind the scene are sheer gratuitous poetry as far transcending real echoes as Shelley's skylark transcends a real bird The central feature of *Orfeo* is, of course, his conquest of the Furies who would bar his way to Eurydice Gluck lived to master more complex situations, but neither he nor anyone else ever achieved, even with Wagner's resources, a more perfect and touching piece of music-drama From the cavernous reverberations of the first chords of the orchestra, interrupted by the approaching sounds of Orpheus's harp, to the last subdued assent of the vanquished Furies, the dramatic and musical power are of the highest order

The Furies sing throughout in the rhythm 

until they are reduced to interrupting Orpheus's gathering flow of melody by "No —No," at first thunderous, then softer For the later productions in Paris, Gluck had to rewrite the castrato-alto part of Orpheus for a tenor, with transpositions ruinous to the key-system of the whole, but this did not impair the wonderful power of Orpheus's declamation The inspiration is fully maintained in the following Elysian scene, an even greater test of the composer's depth of feeling

No surprise should be felt that Orpheus was followed by work of no importance Even reformers of opera must live; and Gluck's five great reform-operas were enough to occupy him but not enough to support him for the remaining 25 years of his life Besides, he constantly drew upon his inferior works for whole movements in his greatest In 1767 Gluck and Calzabigi followed up *Orfeo* by a similar work on a larger scale Gluck's dedication of the score to the grand-duke of Tuscany is the Magna Charta of opera "I have tried," he wrote, "to reduce music to its real function, that of seconding poetry by intensifying the expression of sentiments and the interest of situations without interrupting the action by needless ornament I have accordingly taken care not to interrupt the singer in the heat of the dialogue, to wait for a tedious ritornel, nor do I allow him to stop on a sonorous vowel, in the middle of a phrase, in order to show the nimbleness of a beautiful voice in a long cadenza" Less obvious and far more important is his principle that the orchestral instruments shall be "combined in accordance with the passions represented," an epitome of the whole difference between symphonic (or dramatic) orchestration and the decorative schemes of the continuo period (*See* CHAMBER MUSIC and INSTRUMENTATION)

Vienna was no easy town to conquer by principles apparently so hostile to music for music's sake, and neither *Alceste* nor *Paris and Helena* (1769) was received as cordially as Gluck had hoped He therefore eagerly accepted the chance of bringing his art into contact with the encyclopaedists and dramaturgists of Paris, where his enthusiastic admirer, the *bailli* Le Blanc du Roullet, attaché of the French embassy at Vienna, set in motion the project of an opera for the Paris stage Racine's *Iphigénie en Aulide* was the subject chosen Obstacles, usual and unusual, were removed chiefly by the intervention of Gluck's former pupil, the dauphiness Marie Antoinette, and the opera was eventually performed at the Académie de Musique, on April 19, 1774

Heated controversy immediately emphasized the importance of the new work, both in its musical and in its literary aspects At first the upholders of French music were no more favourable to Gluck than the connoisseurs of Italian singing; they forgot that Lulli was no more a Frenchman than Gluck, and they could see only that Gluck was no Rameau Marmontel, La Harpe and D'Alembert were his opponents, the Abbé Arnaud and others his enthusiastic friends Rousseau had the sense to change his mind Beginning as a violent partisan of Italian music, when Gluck himself asserted the merits and possibilities of French music, he acknowledged his genius, although he did not always understand it, as for example when he suggested that in *Alceste,* "Divinités du Styx," perhaps the most majestic of all Gluck's arias, ought to have been set as a rondo. But in a letter, written shortly before his death, to Dr Burney, Rousseau gives a close and appreciative analysis of *Alceste,* the first Italian version of which Gluck had submitted to him for suggestions, and when after the first performance of the French version the composer exclaimed, *"Alceste est tombée,"* Rousseau replied, *"Oui, mais elle est tombée du ciel"*

The contest turned to fresh issues when Piccinni, a celebrated and by no means incapable composer, came to Paris as the champion of the Italian party at the invitation of Madame du Barry, who held a rival court to that of the young princess (*see* OPERA) It is a mistake to see in the war of Gluckists and Piccinnists a foreshadowing of the Wagnerian controversy, the issues were merely those of cliques, and anybody who has the patience to read Piccinni's music will be amused at his pathetic attempts to copy Gluck in every point where public applause had justified the shocking risks Gluck was always taking Gluck was by far the better musician, but contemporaries could see the weaknesses of his technique as easily as they could see the vaguely different weaknesses of Piccinni's Gluck's gift of melody was sublime, and Piccinni's was by no means contemptible, and both composers had the gift of making incorrect music sound agreeable Gluck's indisputable dramatic power did not concern upholders of music for music's sake, and was no ground of opposition to the Piccinnists as far as they could understand it The rivalry between the two composers was soon skilfully engineered into a quarrel In 1777 Piccinni was given a libretto by Marmontel on the subject of *Roland,* to Gluck's intense disgust, as he had already begun an opera on that subject himself This, and the failure of attempts in a lighter style furbished up from earlier works at the instigation of Marie Antoinette, inspired Gluck to produce his *Armide,* which appeared four months before Piccinni's *Roland* was ready, and raised a storm of controversy, admiration and abuse Gluck did not anticipate Wagner more clearly in his dramatic reforms than in his caustic temper, and, as in Gluck's own estimation, the difference between *Armide* and *Alceste* is that "l'un (Alceste) doit faire pleurer et l'autre faire éprouver une voluptueuse sensation," it was extremely annoying for him to be told by Laharpe that he had made Armide a sorceress instead of an enchantress, and that her part was "une criaillerie monotone et fatiguante" He replied to Laharpe in a long public letter worthy of Wagner in its venom and its effect in immortalizing its recipient

Gluck's next work was *Iphigénie en Tauride,* the success of which finally disposed of Piccinni, who produced a work on the same subject at the same time and who is said to have acknowledged Gluck's victory It was followed by *Echo et Narcisse,* the comparative failure of which greatly disappointed Gluck, and during the composition of another opera, *Les Danaïdes,* an attack of apoplexy compelled him to give up work He left Paris for Vienna, where he lived for several years in dignified leisure, disturbed only by failing health which ended in his death on Nov 15, 1787 Burney gives a charming account of a day with Gluck, whom he visited in the same week as he visited Metastasio

The dramatic importance of Gluck's reforms is apt both to overshadow and to idealize his merit as a musician Where Gluck differs from the greatest musicians is in his absolute dependence on literature for his inspiration Where his librettist failed him (as often in his last complete work, *Écho et Narcisse*), he had no first-rate routine to lean upon; and, even in the finest works of his French period, the less emotional situations are sometimes set to music which has little but historic interest A mere inability to set a bad text to good music might be a sign rather of good literary sense than of poor musicianship But it points to a certain weakness as a musician that Gluck could not be inspired except by the more emotional features of his libretti. When he was inspired he was unquestionably the first and only essen-

tially dramatic composer before Mozart, except the miraculous and untimely born Purcell.

To begin with, he could invent sublime melodies; and his power of producing great musical effects by the simplest means was nothing short of Handelian. Moreover, if Haydn is the father of modern orchestration, the writer of the preface to *Alceste* is its godfather. He was by no means the first to use the timbre of instruments with a sense of emotional effect, for Bach and Handel well knew how to give a whole aria or whole chorus an appropriate tone by means of a definite scheme of instrumentation But it is just such definite schemes that impeded the progress of music-drama Gluck did not treat instruments as part of a decorative design, any more than he so treated musical forms His instrumentation changes with every shade of feeling in the dramatic situation Strings, oboes and flutes were an ordinary accompaniment for an aria, nor was there anything unusual in making the wind instruments play in unison with the strings for the first part of the aria, and writing a passage for one or more of them in the middle section But it was an unheard-of thing to make this passage consist of isolated long appoggiaturas once every two bars in rising sequence on the first oboe, answered by deep pizzicato bass notes, while Agamemnon in despair cries. "J'entends retentir dans mon sein le cri plaintif de la nature" Gluck is a master of tragic irony and subconscious confession when, for instance, in *Iphigénie en Tauride,* Orestes gasps "Le calme rentre dans mon coeur," the agitated rhythms of the strings belie him Again, the power of orchestral climax shown in the oracle scene in *Alceste* was a thing inconceivable in older music and on that plane of absolute masterpieces that no later music can supersede Its influence in Mozart's *Idomeneo* is obvious at a first glance

The capacity for broad melody always implies a true sense of form, whether that be developed by skill or not, and Gluck's form is inspired not merely by melody but by a magnificent sense of free phrase-rhythm, worthy of the mature sonata-style of Mozart And his power in persistent quantitative rhythms is Wagnerian Hence he had plenty of resource for replacing by better things the civilization he destroyed Moreover he, in consultation with his librettist, achieved great skill in holding together entire scenes, or even entire acts, by dramatically apposite repetitions of short arias and choruses And thus in large portions of his finest works the music, in spite of frequent full closes, seems to move *pari passu* with the drama in a manner which for naturalness and continuity is surpassed only by the finales of Mozart and the entire operas of Wagner This continuity is most impressive in both scenes of the second act of *Orfeo* The damage done to the key-system of these perfectly unified scenes by the Parisian transposition of Orpheus's part is, as previously noted, dreadful, but easily remedied by transposing Orpheus's part back again, and in a suitable compromise between the two versions *Orfeo* remains Gluck's most perfect and inspired work The emotional power of the music is such that the ruin of the story by a happy ending is a real relief from tension, it is like the gesture of Shakespeare's last works, where we know all about the tragic issues and may as well dismiss them with fairy-tales Moreover, Gluck's genius was of that high order which is as great in happiness as in grief He failed only in the business capacities of artistic technique, and there is less business in *Orfeo* than in any other music-drama It was Gluck's first great inspiration, and his theories had not had time to become doctrinaire, though Calzabigi was disposed to magnify his office

Alceste contains Gluck's grandest music and is also very free from weak pages, but in its original Italian version the third act had no adequate climax, a defect wholly inadmissible in Paris, where, after continual retouchings a part for Hercules was, in Gluck's absence, added by Gossec; and three pages of Gluck's music, dealing with the supreme crisis where Alceste is rescued from Hades (either by Apollo or by Hercules) were no longer required in performance and have been lost The Italian version cannot help us to restore this passage, in which Gluck's music now stops short just where we realize the full height of his power. The stiffness of Gossec's rhythm reveals the immense distance Gluck had travelled from all contemporaries as well as from the old ways, and the comparison between the Italian and French *Alceste* measures the pace of Gluck's development between 1767 and 1775. It would have been far easier for Gluck to write a new opera if he had not been so justly attached to his second Italian masterpiece So radical are the differences that in retranslating the French libretto into Italian for performance with the French music not one line of Calzabigi's original text can be retained.

In *Iphigénie en Aulide* and *Iphigénie en Tauride,* Gluck shows signs that the doctrinaire is beginning to gain on the spontaneous artist This, at least, is the general impression left in a reflective memory, though one indignantly denies it on renewing acquaintance with the works in performance Gluck had not, in *Orfeo,* gone out of his way to avoid rondos, or we should have had no "Che farò senza Euridice" We read with a respectful smile his assurance to the *bailli* Le Blanc du Roullet that "you would not believe *Armide* to be by the same composer" as *Alceste.* But there is no question that *Armide* is a very great work, full of melody, colour and dramatic point; and that Gluck has availed himself of every suggestion that his libretto afforded for orchestral and emotional effects of type almost entirely new to him. He has been absurdly blamed for his inability to write erotic music The intention of the work is no more erotic than that of Tasso's *Gierusalemme liberata* Love is a baleful enchantment, viewed through the eyes of crusading knights Even so, the conflict of passions, where Armide summons the demons of Hate to exorcise love from her heart, and her courage fails her as soon as they begin, has never, even in *Alceste,* been treated with more dramatic musical power The work as a whole is unequal, partly because Quinault's 90-year-old poem had far too much action in it to suit Gluck's methods, but it shows, as does no other opera until Mozart's *Don Giovanni,* a sense of the *development* of characters, as distinguished from the mere presentation of them as fixed types

In *Iphigénie en Aulide* and *Iphigénie en Tauride,* the very subtlety of the finest features reveals a self-consciousness which, when inspiration is lacking, becomes mannerism Moreover, in both cases the libretti, though skilfully derived from Racine and Corneille, are more complicated than those of Gluck's first masterpieces; and where inspiration fails, the awkward technique has lost its earlier naiveté Still, these works are immortal, and their greatest passages are equal to anything in *Alceste* and *Orfeo. Iphigénie en Tauride* is indeed, as realized by Gluck, an amazingly spiritual work to find its way to the operatic stage and prove itself so effective there We must agree with Gluck's contemporaries to call *Echo et Narcisse* a failure As in *Orfeo,* the pathetic story is ruined by a violent happy ending, but here this artistic disaster takes place before the pathos has begun to move us. Prettiness was the highest possibility of the subject, and with Gluck beauty, without emotional impulses, was less than skin-deep The great Pelletan-Damcke *édition de luxe* of Gluck's French operas includes this work, gives only the French version of *Orphée,* and excludes *Paride e Elena* which was never given in Paris A modern full score of *Paride e Elena* is a desideratum to complete the study of Gluck's work with Calzabigi, to whom he owed more than he owed to France Perhaps this may be given in the miniature scores inaugurated in 1927 by that of *Iphigénie en Tauride* with an excellent preface and critical revision by H Abert (Eulenburg). (D. F T)

GLÜCKSBURG, a town of Germany, in the Prussian province of Schleswig-Holstein, on the Flensburg Fjord, 6 m NE. from Flensburg by rail Pop (1925) 1,788 It is a sea-bathing resort The castle occupies the site of a former Cistercian monastery.

GLÜCKSTADT, a town of Germany, in the Prussian province of Schleswig-Holstein, on the right bank of the Elbe, 28 m NW of Altona, by rail Pop (1925) 6,830 It was founded by Christian IV of Denmark in 1617, fortified in 1620, and soon became an important trading centre. In 1627–28 it was besieged unsuccessfully by the Imperialists under Tilly In 1814 it was

blockaded and its fortifications were demolished. In 1830 it was made a free port. It came into the possession of Prussia with the rest of Schleswig-Holstein in 1866

The inhabitants are chiefly engaged in herring fishery, but have suffered frequent losses from inundations

GLUCOSE occurs abundantly in animals and plants, either alone or in combination, combined with fructose (fruit-sugar or laevulose) as sucrose (cane-sugar), with galactose as lactose (milk-sugar), with itself as maltose (malt-sugar), and so on It is an aldose (aldehyde-alcohol) of the hexose class, having the formula $C_6H_{12}O_6$, and is also known as grape sugar or dextrose The latter name refers to the fact that its solutions rotate the plane of polarized light to the right (*See* CARBOHYDRATES) When pure, it is a white, crystalline powder, but it is more often seen as a yellowish, highly concentrated syrup of a sickly sweet taste, it is also obtainable as warty masses of its hydrate, $C_6H_{12}O_6\,H_2O$. Glucose is readily prepared from starch or from cane sugar by the action of dilute acids, and is easily fermented by yeast to give alcohol. It is excreted in considerable quantities by persons suffering from diabetes mellitus It has very many uses in the food industries, as a sweetening agent and as a substitute for cane-sugar in various processes where fermentation plays an essential rôle, and to a lesser extent in pharmacy (*See* DEXTRIN)

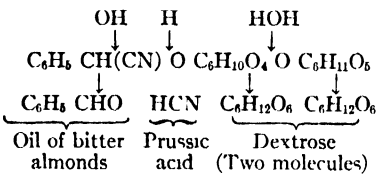
GLUCOSIDES, NATURAL. The term glucoside is applied to a large number of substances present in plants, which on hydrolysis by acids furnish a sugar and a second product. The sugar is usually dextrose, alone or mixed with other sugars such as rhamnose The second product may be anything which can occur in a plant, from methyl alcohol to a complex alkaloid, so long as it contains a hydroxyl group capable of forming an ether linkage (*see* CHEMISTRY *Organic*) with either a simple or a complex sugar The complex sugars (polysaccharides) may themselves be regarded as glucosides since they consist of ethers formed from two or more simple sugars

It is probable that the formation of glucosides provides the plant with a means of storing in a harmless form, materials such as prussic acid and reactive aldehydes, required for future use and capable by means of enzymes of liberation in small quantities as required Further, glucosides are usually at least sparingly soluble in water, and since only soluble substances are transportable in a plant, by movements of sap, it is at least a useful working hypothesis to assume that the plant converts into glucosides (*a*) harmful or useless substances, which must be transported to the barks, fruit rinds, seed coats, etc , where they can do no harm and will eventually be shed, (*b*) necessary but harmful substances, which may be useful later on, (*c*) decorative substances, such as floral pigments, formed in the leaves and transported at the proper season to the flowers, fruits, etc.

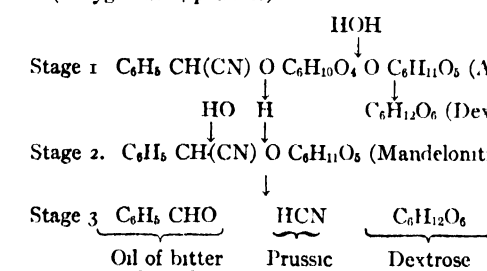
This hypothesis at least accounts for the extraordinary variety of the second, non-saccharine, hydrolytic products of glucosides Among them are to be found a large number of phenolic glucosides, such as arbutin and phloridzin, yielding on hydrolysis the phenols, hydroquinone and phloretin, aromatic alcohol glucosides, like salicin, a much-valued analgesic in medicine, which on hydrolysis furnishes dextrose and saligenin (*o*-hydroxybenzyl alcohol), an interesting group of acid-glucosides represented by gaultherin, the form in which winter-green oil (methyl salicylate) is stored in the plant from which this popular American flavouring agent was formerly drawn, though now largely replaced by synthetic methyl salicylate. Less popular, but probably more useful are convolvulin and jalapin, the active principles of the purgative drugs, scammony and jalap (*q v*) These on hydrolysis yield acids somewhat similar to those found in castor oil, where they are combined with glycerine instead of dextrose Mention must also be made of the saponins, an extensive and widely distributed series of glucosides, which subserve the purposes of man in such diverse ways as providing beer with a good "head" when it is not of the quality to acquire one naturally, forming the basis of detergent materials for delicate fabrics, assisting the suspension of oily fluids so that they become "miscible" with water, as in many well-known disinfectants, and finally in the manufacture of "foaming" fire extinguishers. Another class of glucosides, the mustard-oil group, found in something like a thousand genera of the natural order cruciferae, supply Englishmen with their national condiment, mustard (*q.v*). Nor can the highly toxic glucosides, digitoxin, digitalin, strophanthin and ouabain, which with other similar substances form the group of "cardiac glucosides," be omitted, since they are indispensable in medicine whether used as such, or as the drugs digitalis (*q v.*), strophanthus (*q v.*) or acokanthera. The two latter also retain a certain amount of anthropological interest, being still popular as arrow poisons in some of the more remote parts of Africa Glucosides also minister to man's aesthetic needs, since most of the yellow, red, and blue floral and other pigments occur in plants in the form of "flavonol" and "anthocyan" glucosides, thus the beautiful blue tint of the pansy is due to a rhamnoside of the pigment delphinidin, and the red of the scarlet geranium to a diglucoside of the pigment pelargonidin. (*See* ANTHOCYANINS AND ANTHOXANTHINS)

Much light has been thrown on the structure of natural glucosides by the study of the synthetic α and β-methyl glucosides, that is, the monomethyl ethers of dextrose (*see* CHEMISTRY *Organic* and SUGARS) particularly in their specific relationship to enzymes (*q v*), and it is now known that most natural glucosides can be regarded as β-glucosides, and that the enzymes, such as emulsin, which accompany them in plants and are capable of either decomposing or recomposing the glucosides, depending upon the conditions obtaining at the moment, are β-enzymes This reversible activity of the enzymes towards glucosides consists in the addition or withdrawal of the elements of water at vulnerable points Thus, using the conventional signs and symbols of the chemist, the decomposition of amygdalin, one of the oldest and best known of the glucosides, can be represented thus —

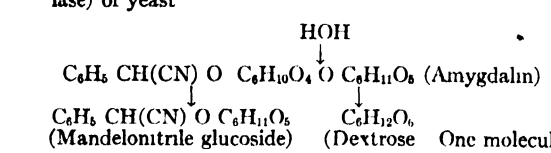
1 Unregulated decomposition of amygdalin by acids or emulsin



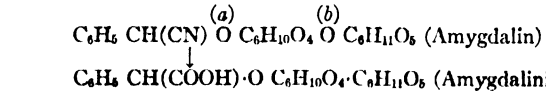
2. Regulated decomposition of amygdalin by acids or emulsin (Amygdalase+prunase)



3. Decomposition of amygdalin by a cold aqueous extract (amygdalase) of yeast



4 Action of alkalis or strong acids on amygdalin



(*a*) = ether linkage (mandelonitrile to the biose of amygdalin)
(*b*) = ether linkage of dextrose to dextrose to form the biose of amygdalin

In this diagram, line 1 represents the complex unregulated action of acids or emulsin upon amygdalin, the latter being decomposed into one molecule each of benzaldehyde and prussic

acid, which together constitute oil of bitter almonds, and two molecules of dextrose.

Line 2 shows that the apparently simple reaction represented by line 1 really consists of two reactions, the complex sugar (biose) of amygdalin being split up first, yielding one molecule each of dextrose and a new and simpler substance, dextromandelonitrile glucoside, found in the form of prunasin in the wild cherry bark (*Prunus serotina*) and in *Cerasus padus* In the second stage, dextromandelonitrile glucoside is decomposed into one molecule each of dextrose, benzaldehyde and prussic acid The demonstration of these two stages is possible because the two reactions progress at different rates and by stopping at a certain point *d*-mandelonitrile glucoside can be isolated So far as the action of enzymes is concerned, the first stage alone is brought about by a cold water extract of yeast, which contains amygdalase, and the second by an enzyme, prunase, which appropriately occurs with prunasin Prunase has no action on amygdalin itself This demonstration also shows that emulsin must be a mixture of at least two enzymes, amygdalase and prunase Line 3 is the first stage of line 2 repeated to represent the action of amygdalase alone. Line 4 is interesting as showing what happens when amygdalin is treated with alkalis or strong acids, the molecule remains intact and only the nitrile group (·CN) is hydrolysed producing a carboxyl group (·COOH) and liberating ammonia, in accordance with the general behaviour of such groups (*See* CHEMISTRY. *Organic.*)

The laevorotatory isomeride of mandelonitrile glucoside, and the racemic isomeride, also occur in nature in the form of the glucosides sambunigrin in the young branches of the elder, and prulaurasin in the leaves of the cherry laurel These are all called "cyanogenetic glucosides" because on hydrolysis they yield prussic acid; other examples are dhurrin from the tropical grass, which yields the food-grain, called "dhurra," and linamarin or phaseolunatin, which yields acetone, prussic acid and dextrose on hydrolysis and is widely distributed in nature Both these have on several occasions been the cause of poisoning cases in man or animals

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(T. A H)

GLUE, a valuable agglutinant, consisting of impure gelatin and widely used as an adhesive medium for wood, leather, paper and similar substances Glues and gelatins merge into one another by imperceptible degrees The difference is conditioned by the degree of purity, the more impure form is termed glue and is only used as an adhesive, the purer forms, termed gelatin, have other applications, especially in culinary operations and confectionery (*See* GELATIN) It is only necessary to state here that gelatigenous or glue-forming tissues occur in the bones, skins and intestines of all animals, and that by extraction with hot water these agglutinating materials are removed, and the solution on evaporating and cooling yields a jelly-like substance—gelatin or glue

Glues may be most conveniently classified according to their sources bone glue, skin glue and fish glue; these may be regarded as impure forms of bone gelatin, skin gelatin and isinglass

Bone Glue.—For the manufacture of glue the bones are supplied fresh or after having been used for making soups, Indian and South American bones are unsuitable, since, by reason of their previous treatment with steam, both their fatty and glue-forming constituents have been already removed (to a great extent) On the average, fresh bones contain about 50% of mineral matter mainly calcium and magnesium phosphates, about 12% each of moisture and fat, the remainder being other organic matter The mineral matter reappears in commerce chiefly as artificial manure, the fat is employed in the candle, soap and glycerin industries, while the other organic matter supplies glue

The separation of the fat, or "de-greasing of the bones" is affected (1) by boiling the bones with water in open vessels; (2) by treatment with steam under pressure; or (3) by means of solvents The last process is superseding the first two, which give a poor return of fat—a valuable consideration—and also involve the loss of a certain amount of glue Many solvents have been proposed, the greatest commercial success appears to attend Scottish shale oil and natural petroleum (Russian or American) boiling at about 100° C The vessels in which the extraction is carried out consist of upright cylindrical boilers, provided with manholes for charging, a false bottom on which the bones rest; and with two steam coils—one for heating only, the other for leading in "live" steam There is a pipe from the top of the vessel leading to a condensing plant The vessels are arranged in batteries In the actual operation the boiler is charged with bones, solvent is run in, and the mixture gradually heated by means of the dry coil, the spirit distils over, carrying with it the water present in the bones, and after a time the extracted fat is run off from discharge cocks in the bottom of the extractor A fresh charge of solvent is introduced, and the cycle repeated, this is repeated a third and fourth time, after which the bones contain only about 0 2% of fat, and a little of the solvent, which is removed by blowing in live steam under 70 to 80 lb pressure The de-greased bones are now cleansed from all dirt and flesh by rotation in a horizontal cylindrical drum covered with stout wire gauze The attrition accompanying this motion suffices to remove the loosely adherent matter, which falls through the meshes of the gauze; this meal contains a certain amount of glue-forming matter, and is generally passed through a finer mesh, the residuum being worked up in the glue-house, and the flour which passes through being sold as a bone-meal, or used as a manure

The bones, which now contain 5 to 6% of glue-forming nitrogen and about 60% of calcium phosphate, are next treated for glue The most economical process consists in steaming the bones under pressure (15 lb to start with, afterwards 5 lb) in upright cylindrical boilers fitted with false bottoms The glue-liquors collect beneath the false bottoms, and when of a strength equal to about 20% dry glue they are run off to the clarifiers The first runnings contain about 65 to 70% of the total glue, a second steaming extracts another 25 to 30% For clarifying the solutions ordinary alum is used, one part being used for 200 parts of dry glue

The clear liquors are now concentrated to a strength of about 32% dry glue in winter and 35% in summer This is invariably effected in vacuum pans—open boiling yields a dark-coloured and inferior product Many types of vacuum plant are in use, the Yaryan form, invented by H T Yaryan, is perhaps the best, and the double effect system is the most efficient After concentration the liquors are bleached by blowing in sulphur dioxide, manufactured by burning sulphur, by this means the colour can be lightened to any desired degree The liquors are now run into galvanized sheet-iron troughs, 2ft long, 6in wide and 5in deep, where they congeal to a firm jelly, which is subsequently removed by cutting round the edges, or by warming with hot water, and turning the cake out The cake is sliced to sheets of convenient thickness, generally by means of a wire knife, *i e*, a piece of wire placed in a frame Mechanical slicers acting on this principle are in use Instead of allowing the solution to congeal in troughs, it may be "cast" on sheets of glass, the bottoms of which are cooled by running water After congealing, the tremulous jelly is dried, this is an operation of great nicety the desiccation must be slow and is generally effected by circulating a rapid current of air about the cakes supported on nets set in frames

Skin Glue.—In the preparation of skin glue the materials used are the parings and cuttings of hides from tan-yards, the ears of oxen and sheep, the skins of rabbits, hares, cats, dogs and other animals, the parings of tawed leather, parchment and old gloves, and many other miscellaneous scraps of animal matter Much experience is needed in order to prepare a good glue from such heterogeneous materials, one blending may be a success and another failure The raw material or "stock" is first steeped for from two to ten weeks, according to its nature, in wooden vats or pits with lime water, and afterwards carefully dried and stored The object of the lime steeping is to remove any blood and flesh which may be attached to the skin, and to form a lime soap with the fatty matter present The "screws" or glue pieces, which may be kept a long time without undergoing change, are washed with a dilute hydrochloric acid to remove all lime, and then very thoroughly with water, they are now allowed to drain and dry

The skins are then placed in hemp nets and introduced into an open boiler which has a false bottom, and a tap by which liquid may be run off. As the boiling proceeds test quantities of liquid are from time to time examined, and when a sample is found on cooling to form a stiff jelly, which happens when it contains about 32% dry glue, it is ready to draw off. The solution is then run to a clarifier, in which a temperature sufficient to keep it fluid is maintained, and in this way any impurity is permitted to subside. The glue solution is then run into wooden troughs or coolers in which it sets to a firm jelly. The cakes are removed as in the case of bone glue (*see* above), and, having been placed on nets, are, in the Scottish practice, dried by exposure to open air. This primitive method has many disadvantages: on a hot day the cake may become unshapely, or melt and slip through the net, or dry so rapidly as to crack; a frost may produce fissures, while a fog or mist may precipitate moisture on the surface and occasion a mouldy appearance. The surface of the cake, which is generally dull after drying, is polished by washing with water The practice of boiling, clarification, cooling and drying, which has been already described in the case of bone glue, has been also applied to the separation of skin glue

Fish Glue.—Whereas isinglass, a very pure gelatin, is yielded by the sounds of a limited number of fish, it is found that all fish offals yield a glue possessing considerable adhesive properties The manufacture consists in thoroughly washing the offal with water, and then discharging it into extractors with live steam After digestion, the liquid is run off, allowed to stand, the upper oily layer removed, and the lower gluey solution clarified with alum. The liquid is then filtered, concentrated in open vats, and bleached with sulphur dioxide. Fish glue is a light-brown viscous liquid which has a distinctly disagreeable odour and an acrid taste; these disadvantages to its use are avoided if it be boiled with a little water and 1% of sodium phosphate, and 0 025% of saccharine added

Properties of Glue.—A good quality of glue should be free from all specks and grit, have a uniform, light brownish-yellow, transparent appearance, and should break with a glassy fracture Steeped for some time in cold water it softens and swells up without dissolving, and when again dried it ought to resume its original properties Under the influence of heat it entirely dissolves in water, forming a thin syrupy fluid with a not disagreeable smell The adhesiveness of different qualities of glue varies considerably; the best adhesive is formed by steeping the glue, broken in small pieces, in water until they are quite soft, and then placing them with just sufficient water to effect solution in the glue-pot. The hotter the glue, the better the joint; remelted glue is not so strong as the freshly prepared, and newly manufactured glue is inferior to that which has been long in stock A well-prepared joint may withstand a pull of about 700 lb per sq in The following table, after Kilmarsch, shows the holding power of glued joints with various kinds of woods.

Wood	Lb per sq in With grain	Across grain
Beech	852	434 5
Maple	484	346
Oak	704	302
Fir	605	132

Special Glues, Cements, etc.—By virtue of the fact that the word "glue" is frequently used to denote many adhesives, which may or may not contain gelatin, there will now be given an account of some special preparations. These may be conveniently divided into: (1) liquid glues, mixtures containing gelatin which do not jelly at ordinary temperatures but still possess adhesive properties; (2) water-proof glues, including mixtures containing gelatin, and also the "marine glues," which contain no glue; (3) glues or cements for special purposes, *e g*, for cementing glass, pottery, leather, etc., for cementing dissimilar materials, such as paper or leather to iron.

Liquid Glues.—The demand for liquid glues is mainly due to the disadvantages—the necessity of dissolving and using while hot—of ordinary glue. They are generally prepared by adding to a warm glue solution reagent which destroys the property of gelatinizing The reagents in common use are acetic acid; magnesium chloride, used for a glue employed by printers; hydrochloric acid and zinc sulphate; nitric acid and lead sulphate; and phosphoric acid and ammonium carbonate.

Water-proof Glues.—Numerous recipes for water-proof glues have been published; glue, having been swollen by soaking in water, dissolved in four-fifths its weight of linseed oil, furnishes a good water-proof adhesive, linseed oil varnish and litharge, added to a glue solution, is also used; resin added to a hot glue solution in water, and afterwards diluted with turpentine, is another recipe The best glue is said to be obtained by dissolving one part of glue in one and a half parts of water, and then adding one-fiftieth part of potassium bichromate. Alcoholic solutions of various gums, and also tannic acid, confer the same property on glue solutions The "marine glues" are solutions of india-rubber, shellac or asphaltum, or mixtures of these substances, in benzene or naphtha Jeffrey's marine glue is formed by dissolving india-rubber in four parts of benzene and adding two parts of shellac; it is extensively used, being easily applied and drying rapidly and hard. Another water-proof glue which contains no gelatin is obtained by heating linseed oil with five parts of quicklime, when cold it forms a hard mass, which melts on heating.

There are innumerable recipes for adhesives specially applicable to certain substances and under certain conditions. For repairing glass, ivory, etc, isinglass (*q v*), which may be replaced by fine glue, yields valuable cements Bookbinders employ an elastic glue obtained from an ordinary glue solution and glycerin, the water being expelled by heating; an efficient cement for mounting photographs is obtained by dissolving glue in ten parts of alcohol and adding one part of glycerin; portable or mouth glue—so named because it melts in the mouth—is prepared by dissolving one part of sugar in a solution of four parts of glue An india-rubber substitute is obtained by adding sodium tungstate and hydrochloric acid to a strong glue solution

See Thomas Lambert, *Glue, Gelatine and their Allied Products* (1905), R L Fernbach, *Glues and Gelatine* (1907), H C Standage, *Agglutinants of all Kinds for all Purposes* (1907)

GLUTARIC ACID is found in the wash water from sheep's wool and in the unripe sap of sugar beet It crystallizes in large monoclinic prisms which melt at 97 5° C, and distils between 302° and 304° C, practically without decomposition It is soluble in water, alcohol and ether Its chemical composition is $CO_2H\,CH_2\,CH_2\,CH_2\,CO_2H$, and it is prepared synthetically by conversion of trimethylene bromide into cyanide and hydrolysis of the latter, or from acetoacetic ester (*q v*), which, in the form of its sodium derivative, condenses with β-iodopropionic ester to form acetoglutaric ester,

$$CH_3\,CO\,CH(CO_2C_2H_5)\,CH_2\,CH_2\,CO_2C_2H_5,$$

from which glutaric acid is obtained by hydrolysis It is also obtained when sebacic, stearic and oleic acids are oxidized with nitric acid By long heating the acid is converted into its anhydride, and glutarimide is obtained by distillation of ammonium glutarate

GLUTATHIONE, in physiological chemistry, a compound of glutamic acid and cysteine, which, by its catalytic action, promotes oxidation in living tissues. The energy required for the processes of life is mainly supplied by oxidations which occur in every living cell or tissue The materials concerned in such oxidations are not directly attacked by the molecular oxygen with which they are in contact. Living tissues contain however certain agents which "activate" the molecules either of the oxygen or of the materials to be burnt, and by so raising the chemical potential of the systems involved induce oxidations.

For the most part such results are brought about in the living cell by substances which partake of the nature of enzymes (*q v*), being easily destroyed by heat at relatively low critical temperatures Certain oxidations in the cell are however secured by a chemical mechanism which cannot in any accepted sense be classed as enzymic. It involves the properties of certain sulphur compounds which contain the *thiol*, or –SH, group. The hydrogen of this structural group is susceptible of easy oxidation, and its oxidative removal results in the formation of a *disulphide* group, –S–S– Two molecules of the thiol compound are thus concerned in

the change as shown in the following simplified scheme.

$$2\cdot X-SH + \tfrac{1}{2}O_2 \rightarrow X-S-S-X + H_2O$$

The disulphide form under suitable conditions may be again reduced to the thiol form, and the two forms may co-exist in adjustable equilibrium with a variety of oxidizing and reducing substances.

Most living cells and tissues contain a substance displaying the properties thus described Its molecule contains linked together two of the amino-acid groupings which are present in proteins It is a dipeptide composed of glutamic acid and cysteine (*see* PROTEINS), and has received the name of glutathione The cysteine moiety carries the thiol (-SH) group through which the biological influence of the substance is exerted (*see* CYSTINE). It is clear from what has been already said that such a substance may assume—when respectively reduced or oxidized—two related forms which, since in what follows we have only to think of the sulphur groupings, may for simplicity's sake be written as GSH and GSSG In the living cell the substance (whether oxidized or reduced) is present in very low concentration, but it is not there as a source of energy It is a permanent constituent of the cell promoting by its presence the oxidation of other substances

The nature of the influence of glutathione in the cell is sufficiently indicated by the following considerations Its reduced form, GSH, is, in the presence of traces of iron (which are always available in the living cell), readily oxidized by molecular oxygen The oxidized form, GSSG, which then results is itself however freely reduced by certain other constituents in the living cell capable of yielding the necessary hydrogen If for convenience we denote such tissue constituents by the expression $T-H_2$, the process involved may be thus represented

$$(a)\quad 2GSH + \tfrac{1}{2}O_2 \rightarrow GSSG + H_2O,$$
$$(b)\quad GSSG + T-H_2 \rightarrow 2GSH + T$$

The significance of the events thus symbolized resides in the circumstances that cell materials which are not oxidized directly by molecular oxygen (or oxidized with extreme slowness) are freely, though indirectly, oxidized through the progress of the above reactions The glutathione acts, so to speak, as a carrier of hydrogen from tissue materials to oxygen. It will be clear that by acting in this way as an intermediary a very small amount of the substance may promote the oxidation of an unlimited amount of material Incidentally it may be noted that the mobilization of hydrogen on such lines promotes other aspects of oxidation in the cell Its removal may convert a saturated molecule into one less saturated, rendering it more prone to oxidation in general Moreover, during the spontaneous oxidation of the SH group hydrogen peroxide may arise, and this, in the presence of cell agencies known as peroxidases, may bring about secondary oxidations

Glutathione when separated from the tissues and purified is obtained as a snow-white amorphous powder Alike in its oxidized and reduced form it is exceedingly soluble in water It resists the action of the hydrolytic enzymes of the tissues, but on boiling with mineral acids it is resolved into its constituent amino-acids

(F G H)

GLUTEN, a tough, tenacious, ductile, somewhat elastic, nearly tasteless, and greyish-yellow albuminous substance, obtained from the flour of wheat by washing in water, in which it is insoluble Gluten, when dried, loses about two-thirds of its weight, becoming brittle and semi-transparent, when strongly heated it crackles and swells, and burns like feather or horn It is soluble in strong acetic acid, and in caustic alkalis, which latter may be used for the purification of starch in which it is present When treated with ·1 to 2% solution of hydrochloric acid it swells up, and at length forms a liquid resembling a solution of albumin, and *laevorotatory* as regards polarized light Moistened with water and exposed to the air, gluten putrefies and evolves carbon dioxide, hydrogen, and sulphuretted hydrogen, and in the end is almost entirely resolved into a liquid, which contains *leucin* and ammonium phosphate and acetate On analysis, gluten shows a composition of about 53% of carbon, 7% of hydrogen, and nitrogen 15 to 18%, besides oxygen, and about 1% of sulphur, and a small quantity of inorganic matter According to H Ritthausen, it is a mixture of *glutencasein* (Liebig's vegetable fibrin), *glutenfibrin, gliadin* (Pflanzenleim), *glutin* or vegetable gelatin, and *mucedin,* which are all closely allied to one another in chemical composition It is the gliadin which confers upon gluten its capacity of cohering to form elastic masses, and of separating readily from associated starch. In the so-called gluten of the flour of barley, rye, and maize, this body is absent (H Ritthausen and U Kreusler) The gluten yielded by wheat which has undergone fermentation or has begun to sprout is devoid of toughness and elasticity These qualities can be restored to it by kneading with salt, lime water, or alum Gluten is employed in the manufacture of gluten bread and biscuits for the diabetic, and of chocolate, and also in the adulteration of tea and coffee For making bread it must be used fresh, as otherwise it decomposes and does not knead well Granulated gluten is a kind of vermicelli, made in some starch manufactories by mixing fresh gluten with twice its weight of flour

GLUTTON or **WOLVERINE** (*Gulo luscus*), a carnivorous mammal of the weasel family, *Mustelidae* (*see* CARNIVORA) The legs are short, the feet large, the claws sharp and curved, and the tail thick and bushy The fur, blackish-brown, with a broad band of chestnut on the sides of the body, consists of an undergrowth of short woolly hair, mixed with long, straight hairs, the latter giving it a shaggy appearance Like all *Mustelidae,* the glutton possesses anal glands secreting a foetid-smelling, yellowish fluid It inhabits the northern regions of the world, but is most abundant in arctic North America A voracious animal, it feeds on small mammals, birds and carrion, and causes great annoyance to the trapper by robbing his traps of both bait and captives Although inquisitive, the wolverine is both cunning and cautious It has the habit of stealing and hiding all sorts of articles. The rutting season is in March, and the female brings forth four or five young in June or July, in defence of which she is exceedingly bold It is nocturnal in habits, spending the day in its burrow The fur is of some commercial value



FUR-BEARING GLUTTON OR WOLVERINE (GULO LUSCUS), IT BELONGS TO THE WEASEL FAMILY, AND IS PLENTIFUL IN CANADA, WHERE IT OBSTRUCTS FUR TRAPPERS BY STEALING FROM THEIR TRAPS

GLYCAS, MICHAEL, Byzantine historian (according to some a Sicilian, according to others a Corfiote), flourished during the 12th century AD His chief work is his *Chronicle* of events from the creation of the world to the death of Alexius I Comnenus (1118) Glycas was also the author of a treatise and a number of letters on theological questions A poem of some 600 "political" verses, written during his imprisonment on a charge of slandering a neighbour and containing an appeal to the emperor Manuel, is still extant The exact nature of his offence is not known, but the answer to his appeal was that he was deprived of his eye-sight by the emperor's orders

Editions "Chronicle and Letters," in J P Migne, *Patrologia Graeca,* clvii , poem in E Legrand, *Bibliothèque grecque vulgaire,* 1 , *see* also F Hirsch, *Byzantinische Studien* (1876) , C Krumbacher in *Sitzungsberichte bayer Acad ,* 1894 , C F Bahr in Ersch and Gruber's *Allgemeine Encyklopadie.*

GLYCERIDES are one of Nature's usual modes of storing up reserves, in the vegetable or animal realms, in the form of stable compounds containing carbon, hydrogen, and oxygen They constitute, in fact, over 90% of the substances present in vegetable and animal oils, fats, and waxes (*qq v*), and the terms glyceride and fat are frequently, but not quite correctly, used interchangeably All naturally occurring glycerides appear to be associated with a small amount (½–2%) of non-glyceridic substances called non-saponifiable or unsaponifiable matter, which have little direct industrial importance, but probably a very profound physiological significance, since they include the sterols and the fat-soluble vitamins (*q v*).

In order to understand the modern uses of fats (*see* OILS AND FATS, WAX) it is necessary to have some knowledge of the chemi-

cal structure of the glycerides This is fortunately very simple in general outline, although complicated in detail Glycerides belong to the class of compounds called "esters" by the chemist In simple terms, an ester is the salt of an acid with an alcohol, just as sodium chloride is the salt formed by the union of sodium hydroxide and hydrochloric acid, a simple example of an ester is ethyl acetate, from ordinary alcohol and acetic acid, a volatile liquid with a fruity smell The glycerides are built up from the alcohol, glycerol $C_3H_5(OH)_3$, and fatty acids (*q v*) of which for the moment we may take the most common, oleic acid, $C_{17}H_{33}COOH$, as an example The essential nature of a glyceride glycerol ester may therefore be grasped by the following comparison

Sodium hydroxide, NaOH Hydrochloric acid, HCl Sodium chloride, NaCl (*salt*)

Ethyl alcohol, C_2H_5OH Acetic acid, CH_3COOH. Ethyl acetate, $CH_3{\cdot}COO\,C_2H_5$ (*ester*)

Glycerol, $C_3H_5(OH)_3$ Oleic acid, $C_{17}H_{33}{\cdot}COOH$. Tri-olein $(C_{17}H_{33}{\cdot}COO){\cdot}C_3H_5$ (*fat*)

Complications set in when it is recollected (a) that glycerol has three points at which an acid group may enter (just as, for example, iron hydroxide $Fe(OH)_3$ unites with three acidic groups whilst sodium hydroxide NaOH only combines with one, *i e*, is "monobasic") and (b) that at least 20 different fatty acids are common in nature, of which from about five to 15 are generally present in any single natural fat Even if, in a hypothetical case, we assume the presence of only three acids X, Y, Z in a glyceride, we can envisage the possibility of the formation of no less than 18 distinct triglycerides, of which the following are examples

$CH_2{\cdot}OX$	$CH_2\,OY$	$CH_2{\cdot}OX$	$CH_2{\cdot}OX$	$CH_2\,OY$	$CH_2{\cdot}OX$
$CH{\cdot}OX$	$CH\,OY$	$CH\,OY$	$CH{\cdot}OZ$	$CH\,OX$	$CH\,OX$
$CH_2{\cdot}OX$	$CH_2{\cdot}OY$	$CH_2{\cdot}OZ$	$CH_2\,OY$	$CH_2{\cdot}OZ$	$CH_2\,OY$

When, as in actual fact, the number of acids present is greater, the number of possible variations becomes enormous

Very little is, indeed, yet known definitely as to the actual structure of different fats, although the occurrence of any one simple triglyceride, *e g*, tri-olein, or tri-palmitin, is now known to be much less common than was formerly supposed The properties (consistency, melting-point, "drying" or "non-drying" character, etc) of any fat are determined partly by the manner in which the different fatty acids are linked up with the glycerol, and partly, indeed mainly, by the nature of the fatty acids (*q v*) (*see* also OILS AND FATS, WAX, GLYCERINE, SOAP, and articles on individual oils, fats and waxes)

GLYCERINE (GLYCEROL), $C_3H_5(OH)_3$, in pharmacy *Glycerinum,* was discovered by Scheele in olive oil in 1779 and named *olsuss* Chevreul studied it more fully in connection with his work on the fats about 1813 and gave it its present name (Gr. γλυκύς, sweet); whilst Pelouze (1836), Berthelot and others established its formula as a trihydric alcohol, $C_3H_5(OH)_3$, and its connection with the fats and oils, which are formed by the replacement of the hydrogen of the OH groups in glycerine by radicals of the higher fatty acids (*see* GLYCERIDES) In addition to the fatty oils, which are the largest source of glycerine, the latter is combined, partly with fatty acids and at the same time with derivatives of phosphoric acid (as glycerophosphatides), in certain substances characteristic of specific animal structures, such as lecithin (eggs, various organs) and kephalin (brain, liver and other organs)

Glycerine is also a normal product (about 3%) of the alcoholic fermentation of sugar by yeast, and is therefore present in wine and beer, as was originally shown by Pasteur in 1858 Neuberg (1912) and others have shown that, if the fermentation be carried out in presence of certain salts such as sodium sulphite, sugar can be made to yield as much as 25% of its weight of glycerine, and this observation was utilised on a large technical scale by the Central Powers in the World War In effect this process means that, if the supply of glycerine from fats falls short of the demand, it may in future be supplemented by fermentation glycerine from molasses or other cheap sugar material

Properties—Glycerol (pure glycerine) is a colourless, odourless, viscous liquid with an insipid sweet taste (sp gr 1 2647 at 15°C., refractive index n_D 1·4758 at 12·5°C.). It boils at 290°C with some decomposition at atmospheric pressure, and is unchanged under diminished pressure (*e g.*, 182°/20mm and 155°/5mm). Its melting-point is 20°C., but owing to the ease with which it exists in the supercooled state, it is rarely seen in the solid state. It is exceedingly hygroscopic, miscible with water or alcohol in all proportions, but less soluble in ether.

The bacterial fermentation of many fats, especially those of marine animals, in presence of water not infrequently causes some of the glycerine to be transformed into a related dihydric alcohol or glycol known as *trimethylene glycol,* $CH_2(OH){\cdot}CH_2{\cdot}CH_2(OH)$; this substance can be separated from glycerine during refining and finds application for certain of the purposes for which glycerine itself is used It may be added that a simpler glycol, *ethylene glycol,* $CH_2(OH)\,CH_2(OH)$, which can be produced from ethylene (in coke-oven or other gas) or alcohol, is coming to the fore as a potential competitor with glycerine

Manufacture—Practically the whole of the glycerine of commerce is still derived from the fatty oils, and most of this comes into the hands of the glycerine refiner in the form of soap-lyes (*see* SOAP) In the ordinary soap-pan the fats have been saponified by means of aqueous caustic soda and the resulting soap salted out by brine, the clear aqueous (saline) liquors contain the whole of the glycerine from the fat and the latter forms about 3 to 5% of the soap-lye (as it is termed) whilst all the added salt is also present Other means of splitting the fats are also employed, for example, by heating them in presence of a little lime with a current of steam at about 140°C (120 lbs per sq in steam-pressure) in autoclaves, by heating them with water and a special chemical known as the Twitchell agent, or by fermentation with an enzyme (lipase) in presence of water The aqueous lyes from the autoclave, Twitchell, or lipase processes will contain up to 15% of glycerine and but little saline matter

Crude glycerine is made by simple concentration of the lyes or sweet waters without distillation of the glycerine The lyes (especially if from the soap-pan) are first of all treated with oxide of iron and/or lime to coagulate and remove traces of soap and other impurities, and the clarified liquor is then heated under a vacuum of 25–28 inches of mercury (usually in a double-effect evaporator) until the glycerine content of the residue reaches at least 80% After removal of any solid salts which have separated from the liquor, the product forms what is technically known as "crude glycerine" *Soap-lye crude* contains about 10% of salt and 80% of glycerine, *autoclave, etc, crudes* contain about 86% of glycerine and less than 1% of saline matter But economic considerations on the fat-splitting side make saponification in the open soap-pan the more usual procedure Most of the soap-lye crude is distilled to give the more refined qualities of glycerine, but some of the other type finds use in printer's inks, in "anti-freeze" compositions, plastic clays, etc

Dynamite Glycerine—The most important single outlet for glycerine is probably its use, after nitration, in blasting and other explosives such as dynamite, cordite, etc (*see* NITROGLYCERINE) To this end it is necessary to have glycerine free from solid impurities and containing about 95% of glycerol This is secured by distillation of crude glycerine under much reduced pressure (28–29 inches of mercury) by the aid of a current of superheated steam Several systems of glycerine stills are in operation, the favourite being that designed by van Ruymbeke, in which, by means of an "expansion chamber" heated by the same steam as that which heats the centre of the still, the injected steam regains the temperature lost by its expansion under vacuum and enters (in fine jets) into the heated crude glycerine in the still at exactly the same temperature as that of the latter The mixed glycerine and steam vapours pass over into condensers in which they are fractionally separated and the dynamite glycerine is collected In later systems, such as those of Wood or Garrigue, multiple stills are arranged in series and the distillation process made continuous; the superheated steam may be made to pass through a pre-heated spray of the crude glycerine

Dynamite glycerine should have a sp gr. 1 261–1·262 and contain not more than 0 05% of mineral ash It is usually pale yel-

low in colour, but can be converted into an almost white product (*"industrial white glycerine"*) by treatment with charcoal.

Finally, chemically pure glycerine is produced by a further distillation of the once-distilled dynamite glycerine, followed by treatment with charcoal. *Chemically pure* (*C P*) *glycerine* should contain no impurity other than moisture, its sp gr is 1 26 (97–98% glycerol) but for trade purposes it is also supplied at, for example, sp gr. 1·25 (93%) or 1·24 (90%). Arsenic, lead and copper must be completely absent, the mineral ash should not exceed 0 01%, and the total non-volatile residue, 0 05%

Technical Uses—C P. glycerine is used very largely for medicinal and pharmaceutical purposes as a solvent for drugs, a component of emollient solutions, ointments and plasters, and in some purgative remedies; it also finds use as a preservative against fermentation and is thus employed in preserving meat and flesh products, in anatomical preparations, in vaccine lymph, etc It is also used in the tobacco, snuff and spirit trades. In addition to its use in the manufacture of explosives dynamite glycerine (or the industrial white variety) is employed in various ways, for example, in the textile industries, as a lubricant where mineral or other oils are inadmissible, in hydraulic presses, for filling gas meters, in the preparation of plastic materials, in the paper, ink, soap and leather industries. (T P H)

GLYCOGEN (IN RELATION TO MUSCULAR CONTRACTION): *see* MUSCLE

GLYCOLS, the generic name applied to dihydric alcohols on account of their sweet taste (*see* CHEMISTRY: *Organic*) The simplest member of the series, ethylene glycol, $HO\,CH_2\,CH_2\,OH$, is a colourless, fragrant, oily liquid boiling at 197 4° C, melting at −17 4° C and having a specific gravity of 1 125 at 0° C It resembles glycerine (glycerol) in sweetness and in being completely miscible with water Its importance lies mainly in the fact that it serves as a substitute for glycerine in the production of a high explosive, ethylene dinitrate, $NO_2\,O\,CH_2\,CH_2\,O\,NO_2$, the successive processes of manufacture being as follows —Ethylene gas, produced by passing alcohol vapour over charcoal impregnated with phosphoric acid at 400° C, is treated with chlorine water so that the ethylene is always in excess In these circumstances ethylene chlorohydrin, $HO\,CH_2\,CH_2\,Cl$, is produced as a liquid miscible with water (boiling point 128–132° C) When warmed with milk of lime the chlorohydrin is converted into ethylene glycol and this dihydric alcohol on treatment with nitric and sulphuric acids, as in the preparation of nitroglycerine (*q v*) from glycerine, is converted into ethylene dinitrate, an oily explosive liquid (boiling point 114–116° C, specific gravity, 1 496/15° C), which has the advantage over nitroglycerine of not freezing in cold weather (*see* EXPLOSIVES) A more complex nitro explosive may be prepared by nitrating a solution of a carbohydrate (*q v*) in ethylene glycol (Hibbert, U S Patent 1216367 1917)

Higher glycols, *e g*, α-propylene glycol, $CH_3\,CH(OH)\,CH_2OH$, and 2 3-butylene glycol, $CH_3\,CH(OH)\,CH(CH_3)\,OH$, are also syrupy liquids of comparatively high boiling points They are prepared from the corresponding propylene, $CH_3CH\,CH_2$, or symmetrical butylene, $CH_3\,CH\,CH\,CH_3$, through their chlorohydrins by treating these substances with milk of lime Certain complex glycols, termed pinacones or more appropriately pinacols, are produced by the reduction of ketones (*q v*) For example, acetone when reduced either electrolytically or with sodium and water furnishes the simplest pinacol, 2·3-dimethyl-2 3-butanediol, $HO\,C(CH_3)_2\,C(CH_3)_2\,OH$, a crystalline solid melting at 38° C and boiling at 172° C When distilled with dilute sulphuric acid this pinacol is transformed by loss of water into pinacoline, methyl tertiary butyl ketone, $(CH_3)_3C\,CO\,CH_3$, a liquid boiling at 106° C, insoluble in water and having an odour of peppermint

GLYCONIC, a form of Aeolic verse, which may be described as a combination of one or more dactyls (or perhaps choriambi) with shorter feet.

It has many forms, as ⏑⏑–◡◡–◡◡–◡◡

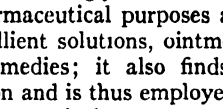
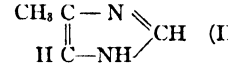
or ⏑–◡◡–◡⏓ (acephalous glyconic)

or grato Pyrrha sub antro (Pherecratic)

But the commonest is ⏑⏑–◡◡–◡⏑, often called simply a glyconic; this is a great favourite of Catullus and Horace, as *sic te diva potens Cypri;* it may be imitated in English by *immemorial harmonies* The name is from Glycon, a lyric poet.

GLYCOSE: *see* SUGAR

GLYOXALINES owe their interest to the fact that they are degradation products of certain alkaloids (*q v*), and that a member of the group arises from the decomposition of sugars such as glucose with ammonia They are organic compounds of carbon, hydrogen and nitrogen, and contain the ring system shown in I They are also called iminazoles

(I)  (II) 

The glyoxalines are generally colourless, crystalline bases, and can be produced synthetically by the condensation of glyoxal and similar *ortho*-diketones with ammonia and aldehydes.

Glyoxaline itself (formula I) is obtained by condensing together glyoxal, ammonia and formaldehyde; it melts at 90° C and boils at 263° C, 4(or 5)-*Methylglyoxaline* (formula II) is formed by the action of zinc hydroxide and ammonia on grape sugar (glucose) and other hexoses and pentoses The methylation of 4-methylglyoxaline with dimethyl sulphate and alkali gives rise simultaneously to 1 4- and 1 5-dimethylglyoxalines indicating that methylglyoxaline behaves during methylation as a tautomeric substance (*see* ISOMERISM)

Glyoxaline has a marked physiological activity—substitution of methyl for hydrogen in the imino-group increases the toxic action The pilocarpine alkaloids, which contain the glyoxaline or iminazole nucleus and yield glyoxaline derivatives on distillation with soda lime, are substances of therapeutic interest (*see* PILOCARPINE) (G T M)

GLYPH, a vertical channel in a frieze (*see* TRIGLYPH)

GLYPTODON, a gigantic extinct South American genus of edentate mammals, the type of a group, the Glyptodontia or tortoise-armadillos, in which the carapace is all in one piece, composed wholly of polygonal bony plates united together without any of the movable rings of the armadillos The skull is short, with deep jaw and fluted teeth (whence the name), the backbone is welded into a rigid tube, and a complex joint in the neck permits the head to be retracted within the shell as in tortoises The limb bones are stout and the feet short, rounded, with hoofs instead of claws on the toes In *Glyptodon* and the related *Glyptotherium* of North America there are four toes on each foot in front and five behind, and the tail is encased in a series of movable rings *Doedicurus*, of the South American Pleistocene, the largest known glyptodont, has three toes on each foot in front and four behind, and a tail-tube covered by horny spikes The pattern of the plates composing the carapace differs in each genus

The glyptodonts originated in South America where they are represented during the middle and later Tertiary by smaller and more primitive genera In the Upper Pliocene and Pleistocene they invaded North America as far north as the Southern United States, but are now extinct everywhere (W D M)

GLYPTOTHEK, a gallery for the exhibition of sculpture, a term first employed at Munich, where a museum so called was built to exhibit the sculptures from the temple of Aegina

GMELIN, the name of several distinguished German scientists of a Tubingen family The first of any consequence was Johann Georg Gmelin (1674–1728), an apothecary and an accomplished chemist for the times in which he lived The best-known member of the family is Leopold Gmelin (1788–1853), great-grandson of Johann Georg Leopold studied medicine and chemistry at Göttingen, Tubingen and Vienna, and in 1813 began to lecture on chemistry at Heidelberg, where he was first appointed (1814) as extraordinary and later (1817) ordinary professor of chemistry and medicine He is remembered for his discovery of potassium ferrocyanide in 1822, and for his important work *Handbuch der Chemie* (1st ed 1817–19, 4th ed 1843–55), which was translated into English for the Cavendish society (1848–59). He resigned his chair in 1852 and died in the following year His

father's cousin, Christian Gottlob Gmelin (1792–1860), was one of the first to devise a process for the artificial manufacture of ultramarine (1828), he also observed the red colouration given to a flame by lithium salts.

GMUND, a town of Germany, in the republic of Württemberg,[1] on the Rems, 31 m. E N E. of Stuttgart by rail. Pop. (1925) 20,438 It was surrounded by walls early in the 12th century. It received town rights from Frederick Barbarossa, and after the extinction of the Hohenstaufen became a free imperial town In 1803 it passed to Wurttemberg The church of the Holy Cross, St John's church, dating from the time of the Hohenstaufen, and the pilgrimage church of the Saviour are notable Clocks and watches, optical instruments and gold and silver work are the chief manufactures Trade is in precious stones

GMUNDEN, an old town in Upper Austria at the issue of the river Traun from the lake of that name It is a favourite summer health resort, for it lies about 1,400 ft above sea-level amidst delightful scenery and has a variety of lake, brine, pine-cone and other baths, and is an excellent centre for excursions to the Traun fall and other features of scenic interest in Salzkammergut It shares, also, in the salt industry of this region Pop (1923) 7,800

See F Krackowizer, *Geschichte der Stadt Gmunden in Oberosterreich* (1898–1901)

GNAT, the common English name for various kinds of smaller flies (*see* DIPTERA), including more especially mosquitoes (*q v*) and other forms with piercing mouth-parts, *e g.*, buffalo gnats (fam *Simuludae*).

GNATCATCHER, the name given to birds of the American subfamily *Polioptilinae* of the warblers (*Sylviidae*) Some 15 species are recognized Gnatcatchers are small, slender, greyish birds, and build beautiful lichen-covered nests The best known species is the blue-grey gnatcatcher, *Polioptila caerula,* of the eastern United States, in which the male has a black forehead

GNATIA (also GNATHIA, EGNATIA or IGNATIA), near Fasano, an ancient city of the Pevcetii, and their frontier town towards the Sallentini (*i e*, of Apulia towards Calabria), a port on the Via Traiana when a short cut from Butunti (mod Bitonto) joined it, 38 m S E of Barium Roman remains include part of the city walls and objects now in museums at Fasano and at Bari

See Ashby and Gardner, *Papers Brit School at Rome,* viii, 161, 166, *sqq*

GNEISENAU, AUGUST WILHELM ANTON, COUNT NEITHARDT VON (1760–1831), Prussian field marshal, son of a Saxon officer named Neithardt, was born on Oct 27, 1760, at Schildau, near Torgau He assumed the name of Gneisenau from the lost estates of the family in Austria After two years' study at Erfurt he entered the Austrian army in 1779, and transferred in 1782 to the service of the margrave of Baireuth-Anspach With one of that prince's mercenary regiments in English pay he fought in the War of American Independence, and returning in 1786, applied for Prussian service Gneisenau served in Poland, 1793–1794, and in the next ten years devoted himself to military study, for which a quiet garrison life at Jauer gave him opportunity In 1796 he married Caroline von Kottwitz In 1806 he was one of Hohenlohe's staff-officers, fought at Jena, and commanded a provisional infantry brigade which fought under Lestocq in the Lithuanian campaign Early in 1807 Gneisenau was commandant at Colberg, which, small and ill-protected as it was, succeeded in holding out until the peace of Tilsit For this service he received the much-prized order *"pour le mérite,"* and was promoted lieutenant-colonel

A wider sphere of work was now opened to him As chief of engineers, and a member of the reorganizing committee, he played a great part, with Scharnhorst, in the reorganization of the Prussian army His energy aroused the suspicion of the dominant French, and Stein's fall was followed by Gneisenau's retirement But, after visiting Russia, Sweden and England, he returned to Berlin and resumed his place as a leader of the patriotic party In open military work and secret machinations his energy and patriotism were equally tested, and with the outbreak of the War of Liberation, Gneisenau, now a major-general, became Blücher's quartermaster-general. With Blücher, Gneisenau served to the capture of Paris; his military character was the exact complement of Blucher's, and under this happy guidance the young troops of Prussia, often defeated but never discouraged, fought their way into the heart of France The plan of the march on Paris was specifically the work of the chief-of-staff In reward for his distinguished service he was made a count

In 1815, once more chief of Blucher's staff, Gneisenau played a conspicuous part in the Waterloo campaign (*q v*) When the old field marshal was disabled at Ligny, Gneisenau assumed the control of the Prussian army

The precise part taken by Gneisenau in the events which followed is much debated Gneisenau distrusted Wellington, who, he considered, had left the Prussians in the lurch at Ligny, and even considered falling back on the Rhine Blucher, however, soon recovered from his injuries, and, with Grolmann, the quartermaster-general, he managed to convince Gneisenau The relations of the two may be illustrated by Brigadier-General Hardinge's report Blucher burst into Hardinge's room at Wavre, saying *"Gneisenau has given way,* and we are to march at once to your chief" On the field of Waterloo, however, Gneisenau was quick to realize the magnitude of the victory, and he carried out the pursuit with relentless vigour In 1816 he was appointed to command the VIII Prussian Corps, but soon retired In 1818 he was made governor of Berlin and member of the *Staatsrat* In 1825 he became general field-marshal In 1831 he was appointed to the command of the Army of Observation on the Polish frontier, with Clausewitz as his chief-of-staff At Posen he was struck down by cholera and died on Aug 24, 1831

See his *Briefe 1809–15,* ed Pflugk-Harttung (1913), also G H Pertz, *Das Leben des Feldmarschalls Grafen Neithardt von Gneisenau,* vols 1–3 (1864–69), vols 4 and 5, H Delbruck, *Das Leben des G F M Grafen von Gneisenau* (2 vols, 3rd ed, 1907), based on Pertz's work, but containing much new material, W von Unger, *Gneisenau* (1914)

GNEISS, in geology a term originally used by the miners of the Erzgebirge to designate the country rock in which the mineral veins occur The word is of Slavonic origin meaning "rotted," or "decomposed," in allusion to the altered character of the country rock in the immediate vicinity of the ore veins It has gradually passed into acceptance as a generic term signifying a large and varied series of rocks with a banded and usually foliated structure in which layers of minerals with a granular texture alternate with thin layers composed of lamellar or fibrous minerals, usually in parallel arrangement The foliation may be frequently interrupted and the ease of splitting of the rock is usually much less in evidence than in the case of schists (*q v*) Gneisses, however, may also be built up wholly of granular minerals, the gneissose structure being given by the alternation of bands of different mineral composition, *e g*, pyroxene-gneiss

As used in its widest sense, gneiss is a structural term rather than a name applied to rocks of a particular mineral composition or genesis Thus gneisses may be of igneous or metamorphic origin, and have a great range of chemical composition The minerals of the granular bands usually consist of quartz, felspar (orthoclase, microcline, plagioclase) or both, and the lamellar or fibrous bands are usually composed of chlorite, mica (muscovite, biotite), graphite, amphibole, sillimanite, etc

According to their origin, gneisses are sub-divided broadly into three groups. (*a*) Primary gneisses, (*b*) Ortho-gneisses and (*c*) Para-gneisses

Primary gneisses are plutonic igneous rocks possessing a banded structure, in which a parallel arrangement of the lamellar or fibrous minerals (if present) is evident These rocks owe their structures to a flow movement in a magma in which crystallization has already progressed Primary gneisses are often of granitic composition and build up great areas of Archaean terranes Much of the Lewisian gneiss of Scotland, the Laurentian gneiss of Canada and the igneous gneisses of other Continental shields are rocks of this character The setting up of gneissic banding in a fluid magma by flow movement pre-supposes a magmatic hetero-

[1] There are two places of this name in Austria (1) Gmund, a town in Lower Austria, (2) a town in Carinthia, with a Gothic church.

geneity which in nature arises either by imperfect differentiation or by the incorporation of foreign material within the magma In many Archaean shields the granite-gneisses are characterized by containing numerous bands of rock, usually of the nature of amphibolites or hornblende-schists, representing basic igneous rocks of earlier date incorporated in the magma during intrusion These basic bands become injected *lit par lit* by the granitic material and ultimately in places become so intimately intermingled with the magma as to produce a gneiss of hybrid origin Less advanced stages of this process where injection takes place along the foliation planes of inclusions or of the country rock adjacent give rise to injection gneisses

While gneisses are most prevalent in Archaean tracts, they are by no means absent from later formations Some of the best known primary gneisses have been described from the Inner Hebrides (Skye and Rum). These are of Tertiary age The banded gabbros of Druim an Eidhne, Skye, illustrate gneisses arising from imperfect differentiation, and the gneisses of central Rum, also of Tertiary age, have been produced by an intimate commingling of eucrite and granite

The term ortho-gneiss refers strictly to igneous rocks in which a gneissic structure has been superimposed by metamorphism, but the name is loosely used by some writers to include also primary gneisses Criteria for the distinction of ortho-gneisses from primary gneisses are sometimes difficult to establish, and are chiefly provided in the textural and structural relations of the rocks They may be evidenced by signs of crushing (cataclastic structure), relict textures, or where the whole rock has been totally recrystallized by the textural relations of the minerals In primary gneisses the form-development of the crystals is largely dependent on the order in which the minerals have crystallized from the magma, while in totally recrystallized ortho-gneisses the growth of the minerals has taken place in an essentially solid environment, and the form-development is dependent on the crystallizing power of the several minerals (crystalloblastic texture, *see* METAMORPHISM) Some of the best known ortho-gneisses are those of the granulite districts of Saxony and the Austrian Waldviertel near Krems

Many gneisses are undoubtedly sedimentary rocks brought to their present state by such agents of metamorphism as heat, movement, crushing and recrystallization This may be demonstrated partly by their mode of occurrence, they accompany limestones, graphite-schists, quartzites and other rocks whose sedimentary origin is never in doubt In many cases bulk chemical composition is a certain clue to their origin, since they correspond in this particular to normal sediments and not to any known igneous rocks Structural or textural criteria, such as bedding, evidence of original pebbly or clastic character are not infrequently to be found The chemical composition of para-gneisses is reflected in their mineralogical constitution Gneisses derived from argillites may be rich in biotite, muscovite, cordierite, almandine-garnet, staurolite, chloritoid, kyanite and sillimanite, some of which minerals are practically unknown in metamorphosed igneous rocks, while gneisses derived from limestones or dolomites carry such characteristic minerals as grossularite, idocrase, wollastonite, scapolite or forsterite Some para-gneisses are rich in felspar (orthoclase, microcline and plagioclase) and quartz and may show so close a resemblance to gneisses of igneous origin that by no single character, chemical or mineralogical, can their original nature be definitely established (C E T)

GNEIST, HEINRICH RUDOLF HERMANN FRIEDRICH VON (1816–1895), German jurist and politician, was born at Berlin on Aug 13, 1816, the son of a judge attached to the "Kammergericht" (court of appeal) in that city After receiving his school education at the gymnasium at Eisleben in Prussian Saxony, he entered the University of Berlin in 1833 as a student of jurisprudence, and became a pupil of Savigny (*q v*) Proceeding to the degree of *doctor juris* in 1838, young Gneist chose the judicial branch of the legal profession, and was admitted *Assessor* in 1841 He spent the next few years in Italy, France and England On his return in 1844 he was appointed extraordinary professor of Roman law in Berlin university, and thus began a professorial connection which ended only with his death He continued his judicial career, and became successively assistant judge of the superior court and of the supreme tribunal But to a mind constituted like his, the want of elasticity in the procedure of the courts was galling Feeling the necessity for fundamental reforms in legal procedure, he published, in 1849, his *Trial by Jury*.

In 1848 Gneist threw himself with ardour into the constitutional struggles of Prussia, and in 1850 resigned his judgeship Entering the National Liberal party, he began both in writing and speeches actively to champion their cause, now busying himself pre-eminently with the study of constitutional law and history In 1853 appeared his *Adel und Ritterschaft in England*, and in 1857 the *Geschichte und heutige Gestalt der Amter in England*, a pamphlet primarily written to combat the Prussian abuses of administration, but for which the author also claimed that it had not been without its effect in modifying certain views that had until then ruled in England itself In 1858 Gneist was appointed ordinary professor of Roman law, and entered the Abgeordnetenhaus of the Prussian Landtag, in which assembly he sat thenceforward until 1893. He at once became one of the leading spokesmen of the Left His chief oratorical triumphs are associated with the early period of his membership of the House, two noteworthy occasions being his violent attack (Sept 1862) upon the Government budget in connection with the reorganization of the Prussian army, and his defence (1864) of the Polish chiefs of the (then) grand-duchy of Posen, who were accused of high treason In 1857–63 was published *Das heutige englische Verfassungs und Verwaltungsrecht*, a work which, contrasting English and German constitutional law and administration, aimed at exercising political pressure upon the Government of the day In 1868 Gneist became a member of the North German parliament On the establishment of German unity his mandate was renewed for the Reichstag, and he was an active and prominent member until 1884 In the Kulturkampf he sided with the Government against the attacks of the Clericals In 1879, together with his colleague, von Hanel, he successfully attacked the motion for the prosecution of certain Socialist members He was parliamentary reporter for the committees on all great financial and administrative questions, and his advice was frequently sought, not only in his own but also in other countries In Prussia he largely influenced legislation, the reform of the judicial and penal systems and the new constitution of the Evangelical Church being largely his work He was also consulted by the Japanese Government when a constitution was being introduced into that country In 1875–77 he was a member of the supreme administrative court (*Oberverwaltungsgericht*) of Prussia In 1882 was published his *Englische Verfassungsgeschichte* (trans *History of the English Constitution*, 1886), a standard work In 1888 one of the first acts of Frederick III, who had always, as crown prince, shown great admiration for him, was to ennoble Gneist, and attach him as instructor in constitutional law to his son He died in Berlin on July 22, 1895

Gneist was a jurist of a special type To him law was not mere theory, but living force, and this conception of its power animates all his schemes of practical reform As a teacher he exercised a magnetic influence over his pupils He was a man of noble bearing, religious, and imbued with a stern sense of duty He was proud of being a "Preussischer Junker" (a member of the Prussian squirearchy), and he clung loyally to monarchial institutions A great admirer and a true friend of England, to which country he was attached by many personal ties, he surpassed all other Germans in his efforts to make her free institutions, in which he found his ideal, the common heritage of the two great nations of the Teutonic race

Gneist's other works include *Budget und Gesetz nach dem constitutionellen Staatsrecht Englands* (1867), *Freie Advocatur* (1867); *Der Rechtsstaat* (1872, 2nd ed, 1879), *Zur Verwaltungsreform in Preussen* (Leipzig, 1880), *Das englische Parlament* (1886, Eng trans *The English Parliament*, 1886, 3rd ed 1889), *Die Militar-Vorlage von 1892 und der preussische Verfassungsconflikt von 1862 bis 1866* (1893); *Die nationale Rechtsidee von den Standen und das preussische Dreiklassenwahlsystem* (1895), *Die verfassungsmassige Stellung des preussischen*

Gesammtminsteriums (1895).

See O. Gierke, *Rudolph von Gneist, Gedachtnisrede* (1895), an In Memoriam address delivered in Berlin.

GNESEN (Polish, *Gniezno*), a town of Poland in the province of Poznan, on the Wrzesnia, 30 m E N E of Posen by rail to Thorn. Pop. (1921) 25,900 Besides the cathedral, a handsome Gothic edifice, there are eight Roman Catholic churches, a Protestant church, a synagogue, a clerical seminary and a convent of the Franciscan nuns Among the industries are cloth and linen weaving, brewing and distilling A great horse and cattle market is held here annually Gnesen is one of the oldest towns in the former kingdom of Poland Its name, *Gniezno*, signifies "nest," and points to early Polish traditions. The cathedral is believed to have been founded towards the close of the 9th century, and, having received the bones of St Adalbert, it was visited in 1000 by the emperor Otto III , who made it the seat of an archbishop Here, until 1320, the kings of Poland were crowned, and the archbishop, since 1416 primate of Poland, acted as protector pending the appointment of a new king In 1821 the see of Posen was founded and the archbishop removed his residence thither, though its cathedral chapter still remains at Gnesen After a long period of decay the town revived after 1815

See S Karwowski, *Gniezno* (Posen, 1892)

GNOME, AND GNOMIC POETRY. Sententious maxims, put into verse for the better aid of the memory, were known by the Greeks as gnomes, γνῶμαι, from γνώμη, an opinion A gnome is defined by the Elizabethan critic Henry Peacham (1576?–1643?) as "a saying pertaining to the manners and common practices of men, which declareth, with an apt brevity, what in this our life ought to be done, or not done " The Gnomic Poets of Greece, who flourished in the 6th century B C , were those who arranged series of sententious maxims in verse. These were collected in the 4th century, by Lobon of Argos, an orator, but his collection has disappeared The chief gnomic poets were Theognis, Solon, Phocylides, Simonides of Amorgos, Demodocus, Xenophanes, and Euenus With the exception of Theognis, whose gnomes were fortunately preserved by some schoolmaster about 300 B C., only fragments of the Gnomic Poets have come down to us. Of the gnomic movement typified by the moral works of the poets named above, Prof Gilbert Murray has remarked that it receives its special expression in the conception of the Seven Wise Men, to whom such proverbs as "Know thyself" and "Nothing too much" were popularly attributed. These gnomes or maxims were extended and put into literary shape by the poets Theognis enshrines his moral precepts in his elegies, and this was probably the custom of the rest, it is improbable that there ever existed a species of poetry made up entirely of successive gnomes But the title "gnomic" came to be given to all poetry which dealt in a sententious way with questions of ethics It was, unquestionably, the source from which moral philosophy was directly developed, and theorists upon life and infinity, such as Pythagoras and Xenophanes, seem to have begun their career as gnomic poets By the very nature of things, gnomes, in their literary sense, belong exclusively to the dawn of literature, their naïveté and their simplicity in moralizing betray it But it has been observed that many of the ethical reflections of the great dramatists, and in particular of Sophocles and Euripides, are gnomic distiches expanded It would be an error to suppose that the ancient Greek gnomes are all of a solemn character, some are voluptuous and some chivalrous; those of Demodocus of Leros had the reputation of being droll In modern times, the gnomic spirit has occasionally been displayed by poets of a homely philosophy, such as Francis Quarles (1592–1644) in England and Gui de Pibrac (1529–1584) in France. The once-celebrated *Quatrains* of the latter, published in 1574, enjoyed an immense success throughout Europe, they were composed in deliberate imitation of the Greek gnomic writers of the 6th century B C These modern effusions are rarely literature and perhaps never poetry With the gnomic writings of Pibrac it was long customary to bind up those of Antoine Favre (or Faber) (1557–1624) and of Pierre Mathieu (1563–1621) Gnomes are frequently to be found in the ancient literatures of Arabia, Persia and India, and in the Icelandic staves (E G)

GNOMES, in folk-lore, the name given to the earth and mountain spirits, usually pictured as bearded dwarfs clad in brown garments with hoods, who are supposed to guard veins of precious metals and hidden treasures. The word "gnome" as applied to these is said to have been coined by Paracelsus.

GNOMON, a term originally used to mean an instrument for allowing one to know the time (γνώμων, *gnōmōn*, from γιγνώσκειν, *gignōskein*, to know) In its simple and primitive form it seems to have been a stick placed vertically on a plane surface, and later upon the concave surface of a hemisphere. This second form is seen in pocket sundials still used in certain parts of the world That the term was at one time substantially synonymous with "vertical line" is seen in an expression of Oenopides of Chios (*c* 465 B C), for Proclus (*c* 460) says that he called "the perpendicular in the archaic manner 'gnomon-wise' (κατὰ γνώμονα), because the gnomon is also at right angles to the horizon " From this early use it came to represent a figure like a carpenter's square, but usually with equal arms. Seeking, as the Pythagoreans especially did, to relate number to geometric forms, the early Greek mathematicians imagined squares as built up of gnomons added to unity For example, they saw that 1+3, 1+3+5, 1+3+5+7, and so on, are squares, and that the odd numbers in a figure like this were related to the geometric gnomon Such numbers were, therefore, themselves called *gnomons* The early idea of a geometric gnomon was extended by Euclid (*q.v ; c* 300 B C) to include a figure consisting of two parallelograms forming an L Four or five centuries later Heron extended the term still farther, using it to mean that which, added to any number or figure, makes the whole similar to that to which it is added This usage is also found in the writings of Theon of Smyrna (*c* 125) in connection with figurate numbers (*q v*). For example, the pentagonal numbers are 1+4, 1+4+7, 1+4+7+10, , and the gnomons in this case are 4, 7, 10, , *i e*, they constitute an arithmetical series with a common difference of 3 In the same way gnomons are developed with respect to hexagonal and higher polygons The gnomon with respect to the square was used by early writers in the finding of square roots, and may still be seen in various elementary arithmetics and algebras

As to the sundial, with a gnomon as a vertical needle, this is said to have been introduced into Greece by Anaximander (*q.v.; c* 575 B C), and Herodotus states that it came from the Babylonians

Bibliography —A brief historical treatment of the subject may be found in Sir Thomas Heath, *A History of Greek Mathematics*, vol 1 , pp 77–83 (Oxford, 1921), Pauly-Wissowa, *Realencyclopadie der Classischen Altertumswissenschaft* (Stuttgart, 1894 *seq*), D E Smith, *History of Mathematics*, vol II , pp 601, 603, 669, 671 (Boston, 1925), and various other histories (D E S)

GNOSTICISM, a movement of religious syncratism (or fusion of different and previously independent beliefs), which maintained itself side by side with genuine Christianity as the latter was gradually crystallizing into the ancient Catholic Church, and which bore the strong impress of Christian influences The movement first came into prominence in the opening years of the 2nd century; it reached its height in the 3rd quarter of that century, after which it began to wane, and from the 2nd half of the 3rd century was replaced by the closely-related and more powerful Manichaean movement Offshoots of it, however, continued on into the 4th and 5th centuries and many of its ideas survived among later mystics

Gnosis as Revelation.—If we wish to grasp the peculiar character of the great Gnostic movement, we must take care not to be led astray by the catchword "Gnosis." It is a mistake to regard the Gnostics as pre-eminently the representatives of intellect among Christians, and Gnosticism as an intellectual tendency chiefly concerned with philosophical speculation, the reconciliation of religion with philosophy and theology. It is true that when Gnosticism was at its height it numbered amongst its followers both theologians and men of science, but that is not its main characteristic Among the majority of the followers of the movement "Gnosis" was understood not as meaning "knowledge" or "understanding," in our sense of the word, but "revelation."

These little Gnostic sects and groups all lived in the conviction that they possessed a secret and mysterious knowledge, in no way accessible to those outside, and not based on reflection, on scientific inquiry and proof, but on revelation. It was derived directly from the times of primitive Christianity, from the Saviour himself and his disciples and friends, with whom they claimed to be connected by a secret tradition, or else from later prophets, of whom many sects boasted It was laid down in wonderful mystic writings, which were in the possession of the various circles (Liechtenhahn, *Die Offenbarung im Gnosticismus*

In short, Gnosticism, in all its various sections, its form and its character, falls under the great category of mystic religions, which were so characteristic of the religious life of decadent antiquity All alike boast a mystic revelation and a deeply-veiled wisdom As in many mystical religions, so in Gnosticism, the ultimate object is individual salvation, the assurance of a fortunate destiny for the soul after death As in the others, so in this the central object of worship is a redeemer-deity who has already trodden the difficult way which the faithful have to follow

Symbols.—And as in all mystical religions, so here too, holy rites and formulas, acts of initiation and consecration, all those things which we call sacraments, play a very prominent part The Gnostic religion is full of such sacraments Indeed, sacred formulas, names and symbols are of the highest importance among the Gnostic sects We constantly meet with the idea that the soul, on leaving the body, finds its path to the highest heaven opposed by the deities and demons of the lower realms of heaven, and only when it is in possession of the names of these demons, and can repeat the proper holy formula, or is prepared with the right symbol, or has been anointed with the holy oil, finds its way unhindered to the heavenly home. Hence the Gnostic must above all things learn the names of the demons, and equip himself with the sacred formulas and symbols, in order to be certain of a good destiny after death The exposition of the system of the Ophites given by Celsus (in Origen vi 25 *seq*), and, in connection with Celsus, by Origen, is particularly instructive on this point. It was taught that even the redeemer-god, when he once descended on to this earth, to rise from it again, availed himself of these names and formulas on his descent and ascent through the world of demons Traces of ideas of this kind are to be met with almost everywhere They have been most carefully collected by Anz (*Ursprung des Gnosticismus, Texte und Untersuchungen* xv 4 *passim*) who sees in them the central doctrine of Gnosticism

Evil and the Emanations.—The basis of the Gnostic religion and world-philosophy lies in a decided Oriental dualism In sharp contrast are opposed the two worlds of the good and of the evil, the divine world and the material world (ὕλη), the worlds of light and of darkness The material world is believed to be the true seat of evil, full of active energies and hostile powers Even when there is an attempt at reconciliation, it is still quite clear how strong was the original dualism which has to be overcome A characteristic attempt is set forth in the so-called "system of emanations" in which it is assumed that from the supreme divinity emanated a somewhat lesser world, from this world a second, and so on, until the divine element (of life) became so far weakened and attenuated, that the genesis of a partly, or even wholly, evil world appears both possible and comprehensible A system of emanations of this kind, in its purest form, is set forth in the expositions coming from the school of Basilides, which are handed down by Irenaeus All these efforts at reconciliation show how clearly the problem of evil was realized in these Gnostic and half-Gnostic sects, and how deeply they meditated on the subject

Another characteristic feature of the Gnostic conception of the universe is the rôle played in almost all Gnostic systems by the seven world-creating powers There are indeed certain exceptions, for instance, in the systems of the Valentinian schools there is the figure of the one Demiurge who takes the place of the Seven But how widespread was the idea of seven powers, who created this lower material world and rule over it, has been clearly proved, especially by the systematic examination of the subject by Anz (*Ursprung des Gnosticismus*) These Seven, then, are in most systems half-evil, half-hostile powers; they are frequently characterized as "angels," and are reckoned as the last and lowest emanations of the Godhead, below them—and frequently considered as derived from them—comes the world of the actually devilish powers There can scarcely be any doubt as to the origin of these seven powers, they are the seven planetary divinities, the sun, moon and five planets They imply a fusion of Babylonian and Persian beliefs, resulting in a degradation of the Babylonian planetary deities into half-angelic, half-demonic beings, infinitely remote from the supreme God of light

The Way to Heaven.—With this fundamental doctrine of Gnosticism is connected, as Anz has shown, a side of their religious practices to which we have already alluded Gnosticism is to a great extent dominated by the idea that it is in the highest degree important for the Gnostic's soul to be enabled to find its way back through the lower worlds and spheres of heaven ruled by the Seven to the kingdom of light, of the supreme deity of heaven Hence, a principal item in their religious practice consisted in communications about the being, nature and names of the Seven (or of any other hostile daemons barring the way to heaven), the formulas with which they must be addressed, and the symbols which must be shown to them But names, symbols and formulas are not efficacious by themselves. the Gnostic must lead a life having no part in the lower world ruled by these spirits, and by his knowledge he must raise himself above them to the God of the world of light Throughout this mystic religious world it was above all the influence of the late Greek religion, derived from Plato, that also continued to operate, it is filled with the echo of the song, the first note of which was sounded by the Platonists, about the heavenly home of the soul and the homeward journey of the wise to the higher world of light

The Great Mother.—We cannot here undertake to set forth and explain in detail all the complex varieties of the Gnostic systems, but it will be useful to take a nearer view of certain principal figures which have had an influence upon at least one series of Gnostic systems In almost all systems an important part is played by the Great Mother (μήτηρ) who appears under the most varied forms

The origin of this figure is not far to seek It is certainly not derived from the Persian religious system, to the spirit of which it is entirely opposed Neither would it be correct to identify her entirely with the great goddess Ishtar of the old Babylonian religion But there can hardly be any doubt that the figure of the great mother-goddess or goddess of heaven, who was worshipped throughout Asia under various forms and names (Astarte, Beltis, Atargatis, Cybele, the Syrian Aphrodite), was the prototype of the μήτηρ of the Gnostics The character of the great goddess of heaven is still in many places fairly exactly preserved in the Gnostic speculations Hence we are able to understand how the Gnostic μήτηρ, the Sophia, appears as the mother of the Hebdomas. The great goddess of heaven is the mother of the stars

Primal Man.—Another characteristic figure of Gnosticism is that of the Primal Man (πρῶτος ἄνθρωπος), the man who existed before the world, the prophet who goes through the world in various forms, and finally reveals himself in Christ This figure can particularly be compared with that of the Gnostic Sophia It represents that divine power which, whether simply owing to a fall, or as the hero who makes war on and is partly vanquished by darkness, descends into the darkness of the material world, and with whose descent begins the great drama of the world's development From this power are derived those portions of light existing and held prisoner in this lower world And as he has raised himself again out of the material world, or has been set free by higher powers, so also shall the portions of light still imprisoned in matter be set free

A parallel myth to that of the Primal Man are the accounts to be found in most of the Gnostic systems of the creation of the first man In all these accounts the idea is expressed that so far as his body is concerned man is the work of the beings who created the world And as the man thus formed was unable to move, but could only crawl like a worm, the supreme Power put into him a spark of life, and man came into existence

The Myth of Salvation.—Of the fundamental ideas of

Gnosticism of which we have so far treated, it can with some certainty be assumed that they were in existence before the rise of Christianity and the influence of Christian ideas on the development of Gnosticism The main question with which we have now to deal is that of whether the dominant figure of the Saviour (Σωτήρ) in Gnosticism is of specifically Christian derivation, or whether this can also be explained apart from the assumption of Christian influence. And here it must be premised that, intimately as the conception of salvation is bound up with the Gnostic religion, the idea of salvation accomplished in a definite historical moment to a certain extent remained foreign to it. Indeed, nearly all the Christian Gnostic systems clearly exhibit the great difficulty with which they had to contend in order to reconcile the idea of an historical redeemer, actually occurring in the form of a definite person, with their conceptions of salvation In Gnosticism salvation always lies at the root of all existence and all history In fact salvation, as conceived in Gnosticism, is always a myth, a history of bygone events, an allegory or figure, but not an historical event This explains the laborious and artificial way in which the person of Jesus is connected in many Gnostic systems with the original Gnostic conception of redemption In this patchwork the joins are everywhere still clearly to be recognized

Thus the essential part of most of the conceptions of what we call Gnosticism was already in existence and fully developed before the rise of Christianity But the fundamental ideas of Gnosticism and of early Christianity had a kind of magnetic attraction for each other What drew these two forces together was the energy exerted by the universal idea of salvation in both systems Christian Gnosticism actually introduced only one new figure into the already existing Gnostic theories, namely that of the historical Saviour Jesus Christ This figure afforded, as it were, a new point of crystallization for the existing Gnostic ideas, which now grouped themselves round this point in all their manifold diversity Thus there came into the fluctuating mass a strong movement and formative impulse, and the individual systems and sects sprang up like mushrooms from this soil Above all the Gnostics represented and developed the distinctly anti-Jewish tendency in Christianity Paul was the apostle whom they reverenced, and his spiritual influence on them is quite unmistakable The Gnostic Marcion has been rightly characterized as a direct disciple of Paul Paul's battle against the law and the narrow national conception of Christianity found a willing following in a movement, the syncretic origin of which directed it towards a universal religion. St. Paul's ideas were here developed to their extremest consequences, and in an entirely one-sided fashion such as was far from his intention In approximately all the Gnostic systems the doctrine of the seven world-creating spirits is given an anti-Jewish tendency, the god of the Jews and of the Old Testament appearing as the highest of the seven The Demiurge of the Valentinians always clearly bears the features of the Old Testament creator-God

The attitude of Gnosticism to the Old Testament and to the creator-God proclaimed in it had its deeper roots, as we have already seen, in the dualism by which it was dominated With this dualism and the recognition of the worthlessness and absolutely vicious nature of the material world is combined a decided spiritualism The conception of a resurrection of the *body,* of a further existence *for the body* after death, was unattainable by almost all of the Gnostics, with the possible exception of a few Gnostic sects dominated by Judaeo-Christian tendencies With the dualistic philosophy is further connected an attitude of absolute indifference towards this lower and material world, and the practice of asceticism Marriage and sexual propagation are considered either as absolute Evil or as altogether worthless, and carnal pleasure is frequently looked upon as forbidden Then again asceticism sometimes changes into wild libertinism Here again Gnosticism has exercised an influence on the development of the Church by way of contrast and opposition If here a return was made to the old material view of the resurrection (the apostolic ἀνάστασις τῆς σαρκός), entirely abandoning the more spiritual conception which had been arrived at as a compromise by Paul, this is probably the result of a reaction from the views of Gnosticism. It was just at this point, too, that Gnosticism started a development which was followed later by the Catholic Church. In spite of the rejection of the ascetic attitude of the Gnostics, as a blasphemy against the Creator, a part of this ascetic principle became at a later date dominant throughout all Christendom And it is interesting to observe how, *e g*, St Augustine, though desperately combating the dualism of the Manichaeans, yet afterwards introduced a number of dualistic ideas into Christianity, which are distinguishable from those of Manichaeism only by a very keen eye, and even then with difficulty.

Gnosticism and the Church.—The Gnostic religion also anticipated other tendencies As we have seen, it is above all things a religion of sacraments and mysteries. Through its syncretic origin Gnosticism introduced for the first time into Christianity a whole mass of sacramental, mystical ideas, which had hitherto existed in it only in its earliest phases Gnosticism was also the pioneer of the Christian Church in the strong emphasis laid on the idea of salvation in religion

Finally, it was Gnosticism which gave the most decided impulse to the consolidation of the Christian Church as a church Gnosticism itself is a free, naturally-growing religion, the religion of isolated minds, of separate little circles and minute sects The homogeneity of wide circles, the sense of responsibility engendered by it, and continuity with the past are almost entirely lacking in it It is based upon revelation, which even at the present time is imparted to the individual, upon the more or less convincing force of the religious imagination and speculations of a few leaders, upon the voluntary and unstable grouping of the schools round the master Its adherents feel themselves to be the isolated, the few, the free and the enlightened, as opposed to the sluggish and inert masses of mankind degraded in matter, or the initiated as opposed to the uninitiated, the Gnostics as opposed to the "Hylici" (ὑλικοί); at most in the later and more moderate schools a middle place was given to the adherents of the Church as Psychici (ψυχικοί)

This freely-growing Gnostic religiosity aroused in the Church an increasingly strong movement towards unity and a firm and inelastic organization, towards authority and tradition An organized hierarchy, a definitive canon of the Holy Scriptures, a confession of faith and rule of faith, and unbending doctrinal discipline, these were the means employed A part was also played in this movement by a free theology which arose within the Church itself, a kind of Gnosticism which aimed at holding fast whatever was good in the Gnostic movement, and obtaining its recognition within the limits of the Church (Clement of Alexandria, Origen)

It must be considered as an unqualified advantage for the further development of Christianity, as a universal religion, that at its very outset it prevailed against the great movement of Gnosticism In spite of the fact that in a few of its later representatives Gnosticism assumed a more refined and spiritual aspect, and even produced blossoms of a true and beautiful piety, it is fundamentally and essentially an unstable religious syncretism, a religion in which the determining forces were a fantastic oriental imagination and a sacramentalism which degenerated into the wildest superstitions, a weak dualism fluctuating unsteadily between asceticism and libertinism.

Sects and Leaders.—For descriptions of the various sects and leaders reference must be made to the works mentioned below. Only the briefest indication can here be given The earlier sects are not associated with the name of any personal founders or leading teachers In the controversial writings of the Fathers we can distinguish the "Ophites," "Naasenes," "Peratae," "Sethians," "Cainites," "Archontics," "Severians," "Barbelo-gnostics," "Justinians," "Nicolaitans," and other more obscure sects In these, the element of imaginative and fantastic mythology predominates over Christian or philosophical speculation. On the other hand, the sects or systems connected with the names of personal teachers reflect the main development of Gnosticism in its alliance with Christianity, which first appears definitely in *Cerinthus* (*q v*), towards the end of the first century, then in *Satornilos* and (with extreme antinomianism) in *Carpocrates*

and above all in the two great masters of Gnosticism, *Basilides* (*q v.*) and *Valentinus* (*q v*). Both of these founded influential schools of followers who developed and altered their doctrines Irenaeus connects with Valentinus the doctrines of *Ptolemaeus, Heracleon, Bardesanes,* and others Bardesanes, however, is an independent and original thinker and has been called the last of the great Gnostic teachers Apart from all other Gnostics stands *Marcion* With him, the manifold Gnostic speculations are reduced to the one problem of the contrast of justice and love, of the God of the Old Testament and the God of the Christians Between these Marcion affirms an irreconcilable opposition which with him rests on a speculative basis. Through the noble simplicity and intensely religious character of his teaching, Marcion was able to found not only schools of followers, but a religious community which gave trouble to the Church longer than any other Gnostic movement.

BIBLIOGRAPHY —Of the actual writings of the Gnostics, which were extraordinarily numerous, very little has survived, they were sacrificed to the destructive zeal of their ecclesiastical opponents Numerous fragments and extracts from Gnostic writings are to be found in the works of the Fathers who attacked Gnosticism Most valuable of all are the long extracts in the 5th and 6th books of the *Philosophumena* of Hippolytus The most accessible and best critical edition of the fragments which have been preserved word for word is to be found in Hilgenfeld's *Ketzergeschichte des Urchristentums* One of the most important of these fragments is the letter of Ptolemaeus to Flora, preserved in Epiphanius, *Haeres* xxxiii 3–7 (*see* on this point Harnack in the *Sitzungsberichte der Berliner Akademie,* 1902, pp 507–545) Gnostic fragments are certainly also preserved for us in the *Acts of Thomas* Here we should especially mention the beautiful and much-discussed *Song of the Pearl,* or *Song of the Soul,* which is generally, though without absolute clear proof, attributed to Bardesanes (till lately it was known only in the Syrian text, edited and translated by Bevan, *Texts and Studies,* v 3, 1897, Hofmann, *Zeitschrift fur neutestamentliche Wissenschaft,* iv , for the newly-found Greek text see *Acta apostolorum,* ed Bonnet, ii 2, c 108, p 219) Generally also much Gnostic matter is contained in the apocryphal histories of the Apostles We should also mention in this connection the text on which are based the pseudo-Clementine *Homilies* and *Recognitiones* (beginning of the 3rd century) It is, of course, already permeated with the Catholic spirit, but has drawn so largely upon sources of a Judaeo-Christian Gnostic character that it comes to a great extent within the category of sources for Gnosticism Complete original Gnostic works have unfortunately survived to us only from the period of the decadence of Gnosticism Of these we should mention the comprehensive work called the *Pistis Sophia,* probably belonging to the 2nd half of the 3rd century, translated by C Schmidt, *Koptisch-gnostische Schriften,* i (1905), in the series *Die griechischen christlichen Schriftsteller der ersten drei Jahrhunderte* The Egyptian Gnostic texts edited by C Schmidt, *Texte u Untersuchungen,* vol viii (1892) and *Koptische-gnostische Schriften,* vol i, probably represent an advanced stage in the decadence of Gnosticism (but *see* also the same writer in *Sitzungsberichte der Berl Akad* for 1896, p 839 ff)

On the whole, then, for an exposition of Gnosticism we are thrown back upon the polemical writings of the Fathers in their controversy with heresy The most ancient of these is Justin, who according to his *Apol* i 26 wrote a *Syntagma* against all heresies (*c* AD 150), and also, probably, a special polemic against Marcion (fragment in Irenaeus iv 6 2) Both these writings are lost He was followed by Irenaeus, who, especially in the first book of his treatise *Adversus haereses* (ἐλέγχου καὶ ἀνατροπῆς τῆς ψευδωνύμου γνώσεως βιβλία ἔπτνε, *c* AD 180), gives a detailed account of the Gnostic heresies He founds his work upon that of his master Justin, but adds from his own knowledge among many other things, notably the detailed account of Valentinianism at the beginning of the book On Irenaeus, and probably also on Justin, Hippolytus drew for his *Syntagma* (beginning of the 3rd century), a work which is also lost, but can, with great certainty, be reconstructed from three recensions of it in the *Panarion* of Epiphanius (after 374), in Philaster of Brescia, *Adversus haereses,* and the Pseudo-Tertullian, *Liber adversus omnes haereses* A second work of Hippolytus (Κατὰ πασῶν αἱρέσεων ἔλεγχος) is preserved in the so-called *Philosophumena* which survives under the name of Origen Here Hippolytus gave a second exposition supplemented by fresh Gnostic original sources with which he had become acquainted in the meanwhile These sources quoted in Hippolytus have lately met with very unfavourable criticisms Very noteworthy references to Gnosticism are also to be found scattered up and down the *Stromateis* of Clement of Alexandria Especially important are the *Excerpta ex Theodoto,* the author of which is certainly Clement, which are verbally extracted from Gnostic writings, and have almost the value of original sources The writings of Origen also contain a wealth of material In the first place should be mentioned the treatise *Contra Celsum,* in which the expositions of Gnosticism by both Origen and Celsus are of interest (*see* especially v. 61 *seq* and vi. 25 *seq*) Of Tertullian's works should be mentioned *De praescriptione haereticorum, Adversus Marcionem, Adversus Hermogenem,* and finally *Adversus Valentinianos* (entirely founded on Irenaeus). Here must also be mentioned the dialogue of Adamantius with the Gnostics, *De recta in deum fide* (beginning of 4th century) Among the followers of Hippolytus, Epiphanius in his *Panarion* gives much independent and valuable information from his own knowledge of contemporary Gnosticism But Theodoret of Cyrus (d 455) is already entirely dependent on previous works and has nothing new to add With the 4th century both Gnosticism and the polemical literature directed against it die out. The modern literature of the subject is extensive Here references are given to a few modern contributions where guidance to further study can be obtained *See* E F Scott, articles "Gnosticism" and "Valentinianism" in Hastings, *Encyclopaedia of Religion and Ethics,* and A. S. Peake, articles "Basilides," "Cerinthus" and "Marcion," *ibid ;* Harnack, *Dogmengeschichte,* 4th ed (where the account of Gnosticism differs from that of the 3rd ed from which the English translation was made), Kruger, article "Gnosticismus" in Herzog-Hauck, *Realencyklopadie,* Liechtenhan, *Die Offenbarung im Gnosticismus,* 1901, E de Faye, *Introd à l'étude du Gnosticisme,* 1903, W Bousset, *Hauptprobleme der Gnosis,* 1911, and the works of Anz and others mentioned above.

(S H M)

GNU, the large white-tailed South African antelope (*q v*), known to the Boers as the black wildebeest and to naturalists as *Connochaetes gnu.* A second and larger species is the brindled gnu or blue wildebeest (*Gorgon taurinus*), and there are several East African forms related to the latter.

GOA, the name of the past and present capitals of Portuguese India, and of the surrounding territory more exactly described as Goa settlement, on the western coast between 15° 44′ and 14° 53′ N , and between 73° 45′ and 74° 26′ E Pop (1921) 508,058, area 1,301 sq m

Goa Settlement.—With Damaun and Diu (*q v*) Goa settlement forms a single administrative province ruled by a governor-general, and a single ecclesiastical province subject to the archbishop of Goa, who is primate of the East and patriarch of the East Indies For judicial purposes the province includes Macao in China, and Timor in the Malay Archipelago There are legislative and executive councils which work in collaboration with the governor It is bounded on the north by the river Terakhul or Araundem, which divides it from the Savantwadi state, east by the Western Ghats, south by Kanara district, and west by the Arabian sea It comprises the four districts conquered early in the 16th century and therefore known as the Velhas Conquistas (Old Conquests), seven districts acquired later and known as the Novas (New) Conquistas, and the island of Anjidiv or Anjadiva The settlement, which has a coast-line of 62 m , is hilly, especially in the Novas Conquistas, including a portion of the Western Ghats rising nearly to 4,000 ft The two largest rivers are the Mandavi and the Juari, which together encircle the island of Goa (Ilhas), being connected on the landward side by a creek The island is triangular, the apex, called the *cabo* or cape, being a rocky headland separating the harbour of Goa into two anchorages—Agoada or Aguada at the mouth of the Mandavi, on the north, and Mormagao at the mouth of the Juari, on the south The southern, sheltered by the promontory of Salsette is the more important Its trade is mostly transit trade, manganese and cotton being exported A breakwater and quay have recently been built A railway, managed by the Madras and Southern Mahratta company connects Mormagao, south of the Juari estuary, with Castle Rock on the Western Ghats Goa exports coconuts, fruit, spices, fish and salt, but its trade is small, and its manufactures few Rice is the staple product, with fruit, salt, coconuts and betelnut The population of the Velhas Conquistas is largely Christian, and that of the Novas Conquistas Hindu The Christians are mostly Roman Catholics The native population speak Konkani Iron and manganese occur, but have been little worked recently

Cities of Goa.—1 The ancient Hindu city of Goa, of which hardly a fragment survives, was built at the southernmost point of the island, and was famous in early Hindu legend and history In the Puranas and certain inscriptions its name appears as Gove, Govapuri, Gomant, etc ; the mediaeval Arabian geographers knew it as Sindabur or Sandabur, and the Portuguese as Goa Velha It was ruled by the Kadamba dynasty from the 2nd century AD to 1312, and by Mohammedan invaders of the Deccan from 1312 until about 1370 It was then annexed to the

Hindu kingdom of Vijayanagar

2 Old Goa, founded in 1440, is, for the most part, a city of ruins The chief surviving buildings are the cathedral, founded by Albuquerque in 1511, rebuilt in 1623, and still used for public worship, the convent of St Francis (1517), a converted mosque rebuilt in 1661, with a portal of carved black stone, the only relic of Portuguese architecture in India dating from the first quarter of the 16th century, the chapel of St Catherine (1551), the fine church of Bom Jesus (1594–1603), containing the shrine of St. Francis Xavier (*see* XAVIER, FRANCISCO DE), and the 17th century convents of St Monica and St Cajetan The college of St Paul is in ruins

3 Panjim, Pangim or New Goa originally a suburb of Old Goa, is built like the parent city, on the left bank of the Mandavi estuary, in 15° 30′ N and 73° 33′ E Pop (1921) 7,388 It is a modern port, containing the Archbishop's palace, government house, barracks, etc Panjim became the residence of the viceroy in 1759 and the capital of Portuguese India in 1843 It possesses a lyceum, commercial, medical and normal schools, and an experimental agricultural station

Political History.—With the subdivision of the Bahmani kingdom, after 1482, Goa passed into the power of Yusuf Adil Shah, king of Bijapur, who was its ruler when the Portuguese first reached India At this time Goa was important as the starting-point of pilgrims from India to Mecca, as a mart with no rival except Calicut on the west coast, and especially as the centre of the import trade in horses (Gulf Arabs) from Hormuz It was easily defensible by any power with command of the sea, and was attacked on the 10th of February 1510 by the Portuguese under Albuquerque As a Hindu ascetic had foretold its downfall and the garrison of Ottoman mercenaries was outnumbered, the city surrendered without a struggle, and Albuquerque entered it in triumph Three months later Yusuf Adil Shah returned with 60,000 troops, forced the passage of the ford, and blockaded the Portuguese in their ships from May to August, when the cessation of the monsoon enabled them to put to sea In November Albuquerque returned with a larger force and after overcoming a desperate resistance, recaptured the city and massacred the entire Mohammedan population

Goa was the first territorial possession of the Portuguese in Asia Albuquerque and his successors left almost untouched the customs and constitutions of the 30 village communities on the island, only abolishing the rite of suttee A register of these customs (*Foral de usos e costumes*) was published in 1526, and an abstract of it is given in R S Whiteway's *Rise of the Portuguese Empire in India* (London, 1898)

Goa became the capital of the whole Portuguese empire in the East It was granted the same civic privileges as Lisbon In 1542 St Francis Xavier mentions the architectural splendour of the city; but it reached the climax of its prosperity between 1575 and 1625 The appearance of the Dutch in Indian waters was followed by the gradual ruin of Goa In 1603 and 1639 the city was blockaded by Dutch fleets, though never captured, and in 1635 it was ravaged by an epidemic Its trade was gradually monopolized by the Jesuits Thevenot in 1666, Baldaeus in 1672, Fryer in 1675 describe its ever-increasing poverty and decay In 1683 only the timely appearance of a Mogul army saved it from capture by a horde of Mahratta raiders, and in 1739 the whole territory was attacked by the same enemies, and only saved by the unexpected arrival of a new viceroy with a fleet This peril was always imminent until 1759, when a peace with the Mahrattas was concluded In the same year the proposal to remove the seat of government to Panjim was carried out, it had been discussed as early as 1684 Between 1695 and 1775 the population dwindled from 20,000 to 1,600, and in 1835 Goa was only inhabited by a few priests, monks and nuns

Ecclesiastical History.—Some Dominican friars came out to Goa in 1510, but no large missionary enterprise was undertaken before the arrival of the Franciscans in 1517. From their headquarters in Goa the Franciscan preachers visited many parts of western India, and even journeyed to Ceylon, Pegu and the Malay Archipelago For nearly twenty-five years they carried on the work of evangelization almost alone, with such success that in 1534 Pope Paul III. made Goa a bishopric, with spiritual jurisdiction over all Portuguese possessions between China and the Cape of Good Hope, though itself suffragan to the archbishopric of Funchal in Madeira A Franciscan friar, João de Albuquerque, came to Goa as its first bishop in 1538 In 1542 St Francis Xavier came to Goa, and took over the Franciscan college of Santa Fé, for the training of native missionaries; this was renamed the College of St. Paul, and became the headquarters of all Jesuit missions in the East, where the Jesuits were commonly styled *Paulistas* By a Bull dated the 4th of February 1557 Goa was made an archbishopric, with jurisdiction over the sees of Malacca and Cochin, to which were added Macao (1575), Japan (1588), Angamale or Cranganore (1600), Meliapur (Mylapur) (1606), Peking and Nanking (1610), together with the bishopric of Mozambique, which included the entire coast of East Africa In 1606 the archbishop received the title of Primate of the East, and the king of Portugal was named Patron of the Catholic Missions in the East; his right of patronage was limited by the Concordat of 1857 to Goa, Malacca, Macao and certain parts of British India The Inquisition was introduced into Goa in 1560 a vivid account of its proceedings is given by C Dellon, *Relation de l'inquisition de Goa* (1688) Five ecclesiastical councils, which dealt with matters of discipline, were held at Goa—in 1567, 1575, 1585, 1592 and 1606, the archbishop of Goa also presided over the more important synod of Diamper (Udayamperur, about 12m S E of Cochin), which in 1599 condemned as heretical the tenets and liturgy of the Indian Nestorians (*q v*), or Christians of St Thomas In 1675 Fryer described Goa as "a Rome in India, both for absoluteness and fabrics" The Jesuits were expelled in 1759, the Inquisition was abolished in 1814 and the religious orders were secularized in 1835

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GOALPARA, a town and district of British India, in the Brahmaputra valley division of Assam The town (pop 6,212) overlooks the Brahmaputra It was the frontier outpost of the Mohammedan power, and has long been a flourishing seat of river trade The civil station is built on the summit of a small hill The town has declined in importance since the district headquarters were removed to Dhubri in 1879

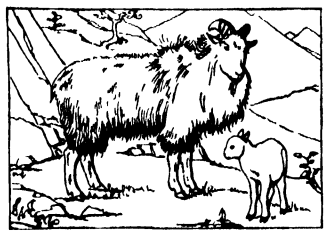
The area is 3,954 square miles. Pop (1921) 762,523 It is situated along the Brahmaputra, at the corner where the river takes its southerly course from Assam into Bengal. Along the banks of the river grow clumps of cane and reed, farther back stretch fields of rice cultivation, broken only by the fruit trees surrounding the villages, and in the background rise the forest-clad hills overtopped by the white peaks of the Himalayas The Brahmaputra annually inundates vast tracts of country. Extensive forests yield valuable timber, 900 sq m are reserved forest Wild elephants abound in the forests. Rice forms the staple crop. Mustard and jute are also largely grown The cultivation of tea has been introduced but is confined to 2,000 acres.

Dhubri (pop 6,707), the administrative headquarters of the district stands on the Brahmaputra where that river takes its great bend south, and has a station on the Eastern Bengal State railway.

GOAT, the ruminant of the genus *Capra*, closely allied to the sheep While usually easy to distinguish the two, certain hair breeds of sheep are, to the layman, only distinguishable from goats

by the direction of the tail, upward in goats, downward in sheep. Domesticated goats are descended from the pasang (*Capra aegagrus*). Probably the east was its original home, the earliest records being Persian *C aegagrus* is probably represented in Europe by the Cretan and Cyclades races, now crossed with the common goat (*C. hircus*). For other wild goats, *see* IBEX, MARKHOR, TAHR and ROCKY MOUNTAIN GOAT

In China, India, Egypt, Europe and North America the goat is primarily a milk-producer By good management its limited breeding season and the consequent difficulty of maintaining a level supply throughout the year can be largely overcome. For large scale milk-production goats are inferior to cattle The Angora and Cashmere goats produce "wool" or mohair The flesh is edible, that from young beasts being quite tender The goat, however, does not fatten easily Goats are also used to keep sheep spread out and on the move



BY COURTESY OF THE N Y ZOOLOGICAL SOCIETY

TAHR, OR HIMALAYAN WILD GOAT (HEMITRAGUS JEMLAICUS), LIVING IN HIGH ALTITUDES AND FREQUENTING THE MOST INACCESSIBLE GROUND OF ALL RUMINANTS

The chalky-white milk contains a higher proportion of solids than that of the cow, and is apparently more digestible. It is also free from tuberculosis germs In parts of Europe it is much used for cheese-making

Distribution and Kinds.—There are many breeds of goat, which may be roughly grouped the *prick-eared, e g*, Swiss goats, the *eastern* or *Nubian,* with long drooping ears; the *dwarf* and *wool* goat, *e g*, Angora

Of the Swiss goats, from which many of the best modern breeds are derived, the Toggenburg and Saanen are most important The French breeds have much Swiss blood On the Pyrenees the goats are of very mixed origin, big but disposing of much food without corresponding milk yield In Germany there are many varieties tracing to Swiss breeds The Hartz Mountain goat is probably native There are many goats of Swiss type throughout Scandinavia Holland goats, mostly white, hornless and of Saanen type, are in high esteem

The Maltese goat undoubtedly contains Eastern blood Its milk is important, but is probably flavoured by the garbage feed This goat is noteworthy as the carrier of Malta fever (*q v*) Many goats are found in Spain Mauretania appears to be the home of three good types, Murcian, Grenada and La Mancha In Italy and along the eastern Adriatic goats are fairly plentiful a recent edict of the Italian Government against goat-keeping, owing to damage to trees, may diminish their number

"Nubians" are eastern goats, chiefly Egyptian They are usually large, short-haired, somewhat bony goats with large lop ears and Roman noses Their colour, frequently black and tan, varies considerably. The goats in Palestine and Syria have long hair and large lop ears Black, with or without white, is the commonest colour The Mamber has the best reputation for milk Most Indian varieties have lop ears, the best coming from the Jumna river area They are like the Nubian The Surti (from Surat) is another popular Indian breed, usually white and lop-eared In proportion to the cultivated area, goats are more plentiful in Egypt than anywhere else Their main function is milk, but the meat is also valuable There are two distinct types, both of the lop-eared eastern variety

The dwarf goat or Guinea goat, of central and west Africa resembles a small English goat in appearance It is highly resistant to trypanosomiasis These goats are also found on the Nile and in Mauritius, Madagascar and Bourbon In South Africa the "Boer" goat, related to the Nubian, is principally used for meat Angora flocks are numerous, while Swiss and English milch goats have been imported.

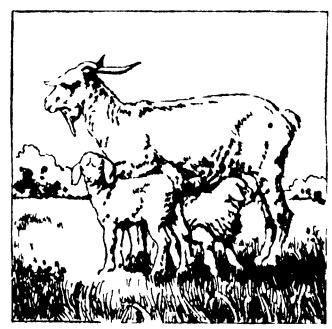
In Britain there are native goats of two types, though their purity may be questioned The original English type usually has tapering horns, short hair and colour commonly brown or fawn, often with large white patches The Irish goat is more thickset and has long, shaggy hair The colour is generally reddish black They are good milkers and foragers but with a short lactation period. The Welsh and Scottish goats are of the Irish type The British Goat society (founded 1879) represents some 1,500 goat-keepers It conducts a herd-book, and by the end of 1927, had registered over 11,000 animals The society publishes a monthly journal and a valuable *Year Book,* besides *Herd Books* Most of the improved British goats have much imported blood, but are developing into distinct types and improving in milk-yield The world's record (1928) for one day's milk-yield at a show is 18 lb 7 oz., from Didgemere Dream, a British Alpine, and for 365 days lactation is held by Wonderstrike, a Saanen, with a yield of 4,464 lb

In the United States and Canada, goats are valuable for wool, milk and as scrub removers. They are found principally in the Southern States, California and British Columbia. The wool type is the Angora, chiefly found in Texas, but also in California The milk goats are largely Toggenburgs, Saanens and Anglo-Nubians. The principal herd-book association is the American Milk Goat Record association of Vincennes, Indiana The Canadian Goat society is at Victoria, B C There are three journals published in the United States, *The Goat World* (monthly), *The National Bulletin of Milk Goats* (bi-monthly) and *The International Dairy Goat Journal*

Of the wool goats there are two main types. the *Angora* or *Mohair* and the *Cashmere* or *Shawl* goat The Angora, owing to its likeness to the sheep, has been held by many authorities to be descended from *Capra falconeri,* not from *C Aegagrus* Its original home was Tibet There are many varieties Angoras have been established in South Africa, Australia and the United States About three-quarters of the mohair produced in the United States comes from Texas The Angora is a poor milker The soft, silky hair covers the whole body and most of the legs with close matted ringlets If not shorn in spring the fleece drops off naturally as summer approaches There is an undergrowth of short hair The average weight of fleece is about 2½ lb, though good specimens yield up to 12 lb The Angora must have a dry climate and then stands cold well

In the Cashmere, which is more like the common goat than the Angora, it is the undergrowth which is valuable. The longer the hair, the more abundant the fine undergrowth These goats are rather small, with lop ears and twisted horns

Husbandry.—Goats are commonly supposed to be very hardy, but damp leads to many ills There are three main methods of raising goats, by free range, by tether and by stall-feeding In a civilised country, free range is disadvantageous, owing to the animal's propensity for forbidden places Unless they get a wide range, their pasture must be frequently changed, otherwise the land gets "goat-sick," due probably to worm-infestation Tethering is how the small man usually maintains his animals The animals are thus always getting fresh pastures If goats are stall-fed, they must have opportunity for exercise



BY COURTESY OF THE U S BUREAU OF RECLAMATION

ANGORA GOATS ON A STOCK FARM NEAR ALBANY, GEORGIA

The goat demands a varied, rather than rich, diet It is important that its food should not be soiled Pasturage of different types, with some coarse fodder and branches will keep a range or tethered goat in good condition, but the milkers are better for some additional concentrates Stall-fed animals should receive good hay and plenty of green foods, as varied as possible, besides roots Oats are a good grain Too much whole maize leads to inflammation of the stomach Peas and beans are good, but wheat and barley are not properly digested Brewers' and distillers' grains are good for milk goats Oil cakes and patent foods can be recommended Many milk goats do best if the concentrates are fed warm and wet It is important that goats should have access to clean water and to salt. No goat should be given more

food than can be readily consumed and feeding should be at regular hours

The female goat, variously called "Nanny" or "Doe," is ready for the male ("Billy" or "Buck") between October and December, during which time they come on "heat" every three weeks The gestation period is 21–22 weeks Goats are sexually mature at six months, but it is unwise to mate females before 18 months old and a male should be used sparingly till 12 months old

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(A D B S)

GOATSUCKER: *see* NIGHTJAR

GOB and **GOB FIRES.** Gob, goaf (pl Goaves), and waste are synonymous terms in coal mining, designating the worked out and abandoned portion of the underground workings

In coal mining, as practised prior to the 19th century, when the pillars left for the support of the surface were very small, and only about 45½% of the coal was extracted (*see* John Buddle on *Mining Records 1838*), the area of abandoned pillars was named the waste or goaf Under modern conditions of coal mining all the coal is extracted, except in the case of bad coal or coal which cannot be sold at a profit, so that the goaf or gob contains little or no coal, for which reason "gob fires" are not now, perhaps, as frequent as they used to be These fires, however, are not necessarily restricted to the goaf or gob, for they have been known to take place, though rarely, at the coal face, and they have been of frequent occurrence at the edge of shaft pillars (coal left unworked for the purpose of support in the neighbourhood of a shaft where it penetrates a coal seam)

A gob fire, or what is sometimes termed the "spontaneous heating" of coal, is due to the rapid absorption of oxygen by the coal substance which, causing heat to be generated, increases the rate of absorption until the coal bursts into flame It was for long thought that the iron pyrites which are in coal were the supreme cause of this heating, Dr Plott gave expression to this view in his *Natural History of Staffordshire* in 1686 It may be a contributory cause, but that it is the sole, or indeed the chief, cause was disproved by Dr E Richters about the year 1868 (*see* his paper published in *Dinglers Polytechniches Journal*, vol cxc , Dec 1868) and later by Henri Fayol in 1879 (*Études sur l' altération et la combustion spontanée de la houille exposé à l'air*) The two royal commissions on "Ships carrying Coals" (appointed in New South Wales, 1896 to 1900) arrived at similar conclusions

The report of the Oberschlesische Grubenbrand commission on spontaneous combustion in coal mines, issued in 1910, contains results which may be studied with interest and value The final report made by the British departmental committee on the subject (1921) decided "that some small amount of heat may be developed by the oxidation of pyrites in coal where it occurs as an amorphous form of marcasite, but that, as pyrites is present in coal in such small proportion as compared with the coal substance proper—which is a bad conductor of heat—the effect of this heat is negligible The chief part played by pyrites when present in an unstable form is that of a disintegrator of the coal, so rendering the latter more permeable by air and exposing a greater area of coal substance to oxidation . . . that the chemical process is mainly one of attachment of oxygen to molecules of high carbon content, but that subsidiary to this, and playing an important part in determining the actual spontaneous ignition of coal, is a chemical interaction between the oxygen thus loosely held by carbon-like molecules and other atoms in these molecules or other portions of the coal conglomerate " (R R)

GOBEL, JEAN BAPTISTE JOSEPH (1724–1794), French bishop, was born at Thann, Alsace, on Sept 1, 1727, and became suffragan bishop of the French part of the diocese of Basle As deputy to the states-general of 1789 he took the oath of the civil constitution of the clergy, and in 1791 was consecrated archbishop of Paris On the 17th Brumaire in the year II (Nov 7, 1793), he came before the bar of the Convention and resigned his episcopal functions, proclaiming that he did so for love of the people, and through respect for their wishes. The followers of Hébert, who were then pursuing their anti-Christian policy, claimed Gobel as one of themselves Robespierre found him an obstacle to his religious schemes, and involved him in the fate of the Hébertists Gobel was condemned to death, with Chaumette, Hébert and Anacharsis Cloots, and guillotined on April 12, 1794.

See "Episcopat de Gobel" in vol iii (1900) of M Tourneux's *Bibliographie de l'histoire de Paris pendant la rév. fr* for a bibliography of documents relating to his episcopate *See* also G Gautherot, *Gobel, évêque métropolitain constitutionnel de Paris* (1911)

GOBELIN, the name of a family of dyers, who probably came from Reims, and in the middle of the 15th century established themselves in the Faubourg Saint Marcel, Paris The first head of the firm, named Jehan (d 1476), discovered a scarlet dyestuff, and spent so much on his establishment that it was named *la folie Gobelin* To the dye-works there was added in the 16th century a manufactory of tapestry (*q v*) In the third or fourth generation some of the family purchased titles of nobility Balthasar Gobelin (d 1603), who became successively treasurer general of artillery, treasurer extraordinary of war, councillor secretary of the king, chancellor of the exchequer, councillor of State and president of the chamber of accounts, in 1601 received from Henry IV the lands and lordship of Briecomte-Robert The name of the Gobelins as dyers cannot be found later than the end of the 17th century In 1662 the works in the Faubourg Saint Marcel were purchased by Colbert on behalf of Louis XIV , and transformed into a general upholstery manufactory, in which designs were executed under the superintendence of the royal painter, Le Brun The establishment, closed in 1694, was reopened in 1697 for the manufacture of tapestry, chiefly for royal use and for presentation The industry, suspended during the Revolution, was revived by the Bourbons, and in 1826 the manufacture of carpets was added The manufacture is still carried on under the State

See Lacordaire, *Notice historique sur les manufactures impériales de tapisserie des Gobelin et de tapis de la Savonnerie, précédée du catalogue des tapisseries qui y sont exposés* (1853), Guiffrey, *Histoire de la tapisserie en France* (1878–85), Genspach, *Répertoire détaillé des tapisseries exécutées aux Gobelins, 1662–1892* (1893), M Fénaille, *Etat général des tapisseries de la manufacture des Gobelins, 1600–1900* (5 vols, 1903–23)

GOBI (for which the alternative Chinese names are Sha-mo, "sand desert" and Han-hai, "dry sea"), a term which in its widest significance includes the stretch of desert country extending from the foot of the Pamirs eastwards to the Great Khingan mountains, and from the foothills of the Altai, the Khangai and the Yablonoi mountains on the north to the Altyn Tagh and Nan-shan on the south The western portion of this desert belt, however, forms part of the well-defined physiographic unit of the Tarim basin and is considered separately under that head

The Gobi proper occupies a broad, shallow depression in the wide plateau between the northern chains of the Tibetan massif and the Altai It is approximately 600 miles from north to south and 1,000 miles from east to west. The average relief is slight There is an alternating succession of broad gravelly plains irregularly split up by low flat-topped ranges and detached residual hills The altitude varies from 3,000 ft in the east to about 5,000 ft in the south and west The relief features are chiefly the result of warping and uplift This sometimes gives rise to mountain structure on the borders, as in the case of the Altai, formed by a series of complex uplifted fault-blocks The less prominent hill masses mark areas of gentler warping and smaller vertical displacement, while some are older fault-blocks which have been more completely worn down Sometimes in the plains, the edges of the sedimentary strata are exposed to view, and these form the great fossil fields of Mongolia There are evidences of climatic changes in the Gobi desert in remote ages Dry river beds, and strand lines on lake shores marking former higher levels of the lake are reported Although the central portion of the desert can hardly have been attractive to primitive man, several culture-horizons have been distinguished in the Gobi area Finds have been made of relics representing Eolithic, Upper Palaeolithic, Azilian, Neolithic and Metallic cultures Curiously enough, no

relics of early Mongolian civilization have, as yet, been found

Although the name Sha-mo means "sand desert" this description by no means applies to the whole of the Gobi. The actual waterless desert of Gobi, including the Ordos country and the Ala-shan, is confined to the south-western portion of the plateau and covers barely one-quarter of its whole area The Ordos desert, a southern extension of the Gobi plateau is enclosed within the great northward bend of the Hwang-ho It furnishes scanty pasture to the flocks and herds of the Mongolian nomads who are scattered throughout the area

West of the Ordos, but separated from it by the mountain peninsula of the lofty Ala-shan range, which is enclosed in a northward extension of the province of Kansu, lies the Ala-shan desert This desert owes its existence to the interception of the rainfall by the high ranges along its southern border, the Ala-shan range rising to 10,000 and 11,000 ft on the south-east, and the Richthofen range with peaks reaching 20,000 ft on the south-west There are vast expanses of absolutely waterless desert in the Ala-shan country No oases relieve the unbroken stretches of sand which alternate with vast areas of saline clay, or, nearer the foot of the mountains, with barren gravel The only human inhabitants of Ala-shan are the Torgod Mongols

Trees are almost unknown in the Gobi The vegetation comprises grass, thorns and patches of scrub in a soil varying from fine gravel and sand to coarse loam Water in the Gobi is found only at wells or in occasional small lakes and is alkaline in taste On the south-eastern borders of the Gobi, the desert proper gives way to steppe-land Water can be found within fifteen or twenty-five feet of the surface and the country approximates to the type represented by the Canadian prairies Some of the moisture from the south-east monsoon reaches these borders in the summer and this eastern part of the Gobi area offers a field for agriculture and for sheep and cattle breeding Chinese influence is pushing out in a north-westerly direction and it is this south-eastern border-land (Inner Mongolia) which is being gradually formed into "provinces" The northern and north-western borders of the Gobi also merge into grass-land and, farther north, into forest The wide stretch of undulating land along the northern border, which is drained by the Orkhon and its tributaries, supports many Chinese colonists who cultivate the rich soil to be found in many of the valleys These northern borders fall within the region of cyclonic rain the average annual rainfall at Urga being 9 7 inches

The Gobi desert is crossed by several caravan routes, some of which have been in use for thousands of years The most important are those from Kalgan on the Chinese frontier, to Urga, from Su-chow, in Kansu, to Hami, and from Kwei-hwa-cheng to Barkul

GOBINEAU, JOSEPH ARTHUR, Comte de (1816–1882) French diplomat and man of letters, was born at Ville d'Avray, near Paris, on July 14, 1816, son of an officer of the Royal Guard Alexis de Tocqueville (author of *La Démocratie en Amérique*), appointed Gobineau his *chef de cabinet* during his short term of office in 1848 Even after Tocqueville's fall, Gobineau persevered in his new profession, and, despite his legitimist convictions, served France loyally as a diplomat until 1877 After short sojourns in Berne and Hanover he was sent to Frankfort

In 1854 Gobineau went to Persia for four years Here he drank in with delight the wonders of the east, exchanged views with the leaders of learning and spiritual life, and acquired valuable knowledge After conducting a mission to Newfoundland, he returned to Teheran in 1861 In 1864 he moved to Athens, and in 1868 to Rio de Janeiro

During the war of 1870–71 Gobineau was in France The last diplomatic post he held 1872–77 was Stockholm He was forced in circumstances which wounded his pride, to retire, and left Stockholm for Rome to pass the rest of his days in writing and sculpture He died on Oct 13, 1882

Gobineau was the author of large volumes on ethnology, cuneiform writing, Persian history and literature, and also historical, political and philosophical essays, the history of his family, travel books, novels and short stories, a tragedy, a long epic, lyric verse, and finally *The Renaissance*

His earliest, strongest, and, despite many weaknesses, most characteristic work was the *Essai sur l'Inégalité des races humaines* (1853–55), propounding the doctrine that the different races of human-kind are innately unequal in talent, worth and ability to absorb and create culture, and change their innate character only through crossing with alien strains The genius of a race depends but little on conditions of climate, surroundings and period, it is therefore absurd to maintain that all men are capable of an equal degree of perfection Only the white races are creative of culture, but are exhausted today because their racial composition is no longer pure But Gobineau's masterpiece is his *Renaissance* (1877) This is a series of historical sketches and has been compared by the author himself to a fresco painting, it is divided into five sections, each of which is dominated by a single figure Savonarola, Caesar Borgia, Julius II, Leo X, Michelangelo These sketches attempt to interpret the political events of the time psychologically, and to give a living picture of the final motives and inward reality of the Renaissance by means of imaginary conversation

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GOBLET, RENE (1828–1905), French politician, was born at Aire-sur-la-Lys, Pas de Calais, Nov 26, 1828, and was educated for the law He held a minor government office in 1879, and in 1882 became minister of the interior in the Freycinet cabinet He was minister of education, fine arts and religion in Henri Brisson's first cabinet in 1885, and again under Freycinet in 1886 He sat in the Chamber on the extreme Left All through his life he was frequently in conflict with his political associates, from Gambetta downwards On the fall of the Freycinet cabinet in December he formed a cabinet in which he reserved for himself the portfolios of the interior and of religion The Goblet cabinet was unpopular from the outset, and it was with difficulty that anybody could be found to accept the ministry of foreign affairs, which was finally given to M Flourens Then came what is known as the Schnaebele incident, the arrest on the German frontier of a French official named Schnaebele, which caused immense excitement in France For some days Goblet took no definite decision, but left Flourens, who stood for peace, to fight it out with General Boulanger, then minister of war, who was for the dispatch of an ultimatum Although he finally intervened on the side of Flourens, and peace was preserved, his weakness in face of the Boulangist agitation became a national danger Defeated on the budget in May 1887, his government resigned In 1888 he was foreign minister in the radical administration of Charles Floquet He was defeated at the polls by a Boulangist candidate in 1889, and sat in the senate from 1891 to 1893, when he returned to the popular chamber He died in Paris on Sept. 13, 1905

GOBLET, a large type of drinking-vessel, particularly one shaped like a cup, without handles, and mounted on a shank with a foot (*See* Drinking Vessels)

GOBY. The gobies (*Gobius*) are small fishes recognized by their ventral fins being united into one, forming a suctorial disc by which these fishes are enabled to attach themselves They are essentially coastfishes, inhabiting nearly all seas but disappearing towards the Arctic and Antarctic Oceans Many live in fresh waters, not far from the sea Nearly 500 different kinds are known The largest British species, *Gobius capito,* occurring in the rock-pools of Cornwall, measures 10in. None of the other British species exceeds half this length The Californian *Gillichthys mirabilis,* which is marine, is locally known as mudfish from its habit of mak-

ing excavations in the mud at low tide. The males are usually more brilliantly coloured than the females, and guard the eggs, which are quite frequently attached to a dead bivalve's shell or to a crab's carapace, with the convexity turned upwards and covered with sand.

Close allies of the gobies are the walking fish (*Periophthalmus*) of which various species are found in great numbers on tropical mud flats, skipping about by means of the muscular, scaly base of their pectoral fins, with the head raised and bearing a pair of projecting eyes close together.

GOCH, a town of Germany, in the Prussian Rhine province, on the Niers, 8 m S of Cleves Pop (1925) 11,761 In the middle ages it was the seat of a large trade in linen It became a town in 1231, belonged to the dukes of Gelderland and later to the dukes of Cleves It has manufactures of plush-goods, margarine, oil and leather

GOD, the common Teutonic word for a personal object of religious worship It is thus, like Gr *θεός* and Lat *deus,* applied to all superhuman beings of heathen mythologies who exercise power over nature and man; and also to images of supernatural beings or trees, pillars, etc , used as symbols The word "god" on the conversion of the Teutonic races to Christianity, was applied to the one Supreme Being, and to the Persons of the Trinity

Popular etymology has connected the word with "good " This is exemplified by the corruption of "God be with you" into goodbye. In Gothic it is *Guth;* Dutch has the same form as English, Danish and Swedish have *Gud,* German *Gott* According to the *New English Dictionary,* the original may be found in two Aryan roots, both of the form *gheu,* one of which means "to invoke," the other "to pour"; the last is used of sacrificial offerings The word would thus mean the object either of religious invocation or of religious worship by sacrifice

See RELIGION, HEBREW RELIGION, THEISM, etc

GODALMING, a town in Surrey, England, 34 m S W of London by the S R Pop. (1921) 9,197

Godalming (Godelminge) belonged to King Alfred, and was a royal manor at the time of Domesday The manor was held by the see of Salisbury in the middle ages, but reverted to the crown in the time of Henry VIII Godalming was incorporated by Elizabeth in 1574, when the borough originated The charter was confirmed by James I in 1620, and a fresh charter was granted by Charles II in 1666 The bishop of Salisbury in 1300 received the grant of a weekly market which included a fair at the feast of St Peter and St Paul Another fair at Candlemas was granted by Elizabeth The market is still held The making of cloth, particularly Hampshire kerseys, was the staple industry of Godalming in the middle ages Tanning, introduced in the 15th century, survives The present manufacture of fleecy hosiery dates from the end of the 18th century It is on the Wey, and on the high road between London and Portsmouth The church of SS Peter and Paul is principally Early English and Perpendicular Charterhouse School, transferred from Charterhouse Square, London, to Godalming in 1872, has 92 ac of grounds and spacious buildings in Gothic style. (*See* CHARTERHOUSE) Godalming manufactures paper, leather, parchment and hosiery, and trades in corn, malt, bark, hoops and timber, Bargate stone, of which the parish church is built, is still quarried

GODARD, BENJAMIN (1849–1895), French composer, was born in Paris, on Aug 18, 1849 He studied at the Conservatoire, and had already published many works when in 1878 his dramatic cantata *Le Tasse* won a prize in a musical competition instituted by the city of Paris Godard was a prolific composer of operas, of which one of the best known is *La Vivandière,* left unfinished and partly scored by another hand Among his works the "Symphonie légendaire" may be singled out as being one of the most distinctive He wrote many charming songs, and his death, which occurred at Cannes Jan 10, 1895, was a real loss to French art.

GODAVARI, district, British India, in the north-east of the Madras presidency Part was transferred to Kistna district in 1908 Its present area is 2,545 sq m , mainly east of the Godavari river, including the entire delta, with a long narrow strip extending up its valley. Inland low hills, steep and forest-clad, enclose the valley. The delta is flat, and the north-eastern part known as the Agency tract and occupied by spurs of the eastern Ghats, has recently been formed into a separate division with part of Ganjam and Vizagapatam. The coast is low, sandy and swampy, so that vessels must lie 7 m. from Cocanada, the chief port The Sabari is the principal tributary of the Godavari within the district The Godavari often rises in destructive floods. The population (including the Agency tract) in 1921 was 1,470,863 The chief towns are Cocanada, the administrative headquarters, and Rajahmundry, the old capital. The population is principally occupied in agriculture, the principal crops being rice, other food grains, pulse, oil seeds, tobacco and sugar. A number of rice-cleaning mills have been established Sugar is refined, and fish is cured The district is traversed by the main line of the East Coast railway, with a branch to Cocanada.

The Godavari district formed part of the Andhra division of Dravida, the north-west portion being subject to the Orissa kings, and the south-western belonging to the Vengi kingdom In it various chiefs fought for independence with varying success till the beginning of the 16th century, when the whole country may be said to have passed under Mohammedan power At the conclusion of the struggle with the French in the Carnatic, Godavari with the Northern Circars was conquered by the English, and finally ceded in 1765

GODAVARI, a river of central and western India It flows across the Deccan from the Western to the Eastern Ghats; its total length is 900 m Its source is on the side of a hill behind the village of Trimbak in Nasik district, Bombay, where the water runs into a reservoir from the lips of an image Legend brings it from the same ultimate source as the Ganges, though underground Its course is generally south-easterly Through much of the upper part the channel varies 1 to 2 m in breadth, occasionally broken by alluvial islands Below the junction of the Sabari the channel begins to contract, and the river enters a magnificent gorge only 200 yd wide through which it flows into the delta, about 60 m from the sea The head of the delta is at the village of Dowlaishweram The river has seven mouths, the largest being the Gautami Godavari The Godavari is regarded as peculiarly sacred, and once every twelve years the great bathing festival called *Pushkaram* is held on its banks at Rajahmundry

The upper waters of the Godavari are scarcely utilized for irrigation, but the entire delta has been turned into a garden of perennial crops by means of the anicut or dam construction at Dowlaishweram, constructed by Sir Arthur Cotton, from which three main canals are drawn off The river channel here is 3½ m wide, and is spanned by a fine railway bridge Nearly a million acres were irrigated from the system in 1920 More recent works include a large reservoir at Lake Beale on a tributary of the Godavari, and two canals, irrigating a further 50,000 acres. In 1864 water communication was opened between the Godavari and Kistna deltas Rocky barriers and rapids obstruct navigation in the upper Godavari

GODEFROY (GOTHOFREDUS), a French noble family, which numbered among its members several distinguished jurists and historians The family claimed descent from Symon Godefroy, who was born at Mons about 1320 and was lord of Sapigneulx near Berry-au-bac, now in the department of Aisne

DENIS GODEFROY (Dionysius Gothofredus) (1549–1622), jurist, son of Léon Godefroy, lord of Guignecourt, was born in Paris on Oct 17, 1549, and died at Strasbourg on Sept 7, 1622 He studied law in the Low Countries and in Germany, and embraced Calvinism This change of faith led to his residence abroad, first at Geneva, where he was professor of law, and then at Heidelberg, where he was head of the faculty of law and was employed from time to time on diplomatic missions by the Elector Palatine His most important work was the *Corpus juris civilis,* originally published at Geneva in 1583, which went through some 20 editions, the most valuable of them being that printed by the Elzevirs at Amsterdam in 1633 and the Leipzig edition of 1740

Lists of his other learned works may be found in Senebier's *Hist. litt. de Genève* vol ii , and in Nicéron's *Mémoires,* vol. xvii. Some

of his correspondence with his learned friends, with his kinsman President de Thou, Isaac Casaubon, Jean Jacques Grynaeus and others, is preserved in the libraries of the British Museum, of Basle and Paris.

His eldest son, THEODORE GODEFROY (1580–1649), was born at Geneva on July 14, 1580. He abjured Calvinism, and was called to the bar in Paris. He became historiographer of France in 1613 and was employed from time to time on diplomatic missions He was employed at the congress of Munster, where he remained after the signing of peace in 1648 as chargé d'affaires until his death on Oct 5 of the next year His most important work is *Le Cérémonial de France . . .* (1619), a work which became a classic on the subject of royal ceremonial, and was re-edited by his son in an enlarged edition in 1649

He made vast collections of historical material which remains in ms and fills the greater part of the Godefroy collection of over 500 portfolios in the Library of the Institute in Paris These were catalogued by Ludovic Lalanne in the *Annuaire Bulletin* (1865–1866 and 1892) of the Société de l'histoire de France

The second son of Denis, JACQUES GODEFROY (1587–1652), jurist, was born at Geneva on Sept 13, 1587 He was educated in France but returned to Geneva, where he held various important public offices He died on June 23, 1652 He worked for 30 years on his edition of the *Codex Theodosianus* (Lyons, 4 vols 1665, and Leipzig, 6 vols 1736–45) This code formed the principal, though not the only, source of the legal systems of the countries formed from the Western Empire Godefroy's edition became a standard authority on the decadent period of the Western Empire Of his numerous other works the most important was the reconstruction of the 12 tables of early Roman law

See also the dictionary of Moreri, Nicéron's *Mémoires* (vol 17) and a notice in the *Bibliothèque universelle de Genève* (Dec 1837)

DENIS GODEFROY (1615–1681), eldest son of Théodore, succeeded his father as historiographer of France

For further details see *Les Savants Godefroy* (Paris, 1873) by the marquis de Godefroy-Ménilglaise, son of Denis Joseph Godefroy

GODESBERG, a spa in Rhenish Prussia on the left bank of the Rhine, 4 m S of Bonn, on the railway to Coblenz Pop (1925) 20,316 It is a summer resort and has chalybeate springs On a hill close by are the ruins of Godesberg castle Built by Archbishop Dietrich I of Cologne in the 13th century, it was destroyed by the Bavarians in 1583 Among its manufactures are electrical apparatus, agricultural machinery and toys

GODET, FRÉDÉRIC LOUIS (1812–1900), Swiss Protestant theologian, was born at Neuchâtel on Oct 25, 1812 In 1873 he became one of the founders of the free Evangelical Church of Neuchâtel, and professor in its theological faculty He died there on Oct 29, 1900

Godet's commentaries are on the Gospel of St John (2 vols, 1863–65, 3rd ed, 1881–88, Eng trans 1886, etc), St Luke (2 vols, 1871, 3rd ed, 1888, Eng trans. 1875, etc), the Epistle to the Romans (2 vols, 1879–80, 2nd ed, 1883–90, Eng. trans, 1880, etc), Corinthians (2 vols, 1886–87, Eng trans, 1886, etc) His other works include *Études bibliques* (2 vols, 1873–74, 4th ed, 1889; Eng trans, 1875 f), and *Introduction au Nouveau Testament* (1893 f; Eng trans, 1894, etc), *Lectures in Defence of the Christian Faith* (Eng trans, 4th ed, 1900).

GODFREY, SIR EDMUND BERRY (1621–1678), English magistrate and politician, younger son of Thomas Godfrey (1586–1664), was born on Dec 23, 1621, and educated at Westminster school and Christ Church, Oxford After entering Gray's Inn he became a prosperous dealer in wood He was made a justice of the peace for the city of Westminster, and in Sept 1666 was knighted as a reward for his services during the great plague. In Sept. 1678 Titus Oates and two other men appeared before him with written information about the Popish Plot, and swore to the truth of their statements During the excitement which followed the magistrate expressed a fear that his life was in danger, but took no precautions On Oct 12 he did not return home as usual, and on the 17th his body was found on Primrose Hill, Hampstead The evidence proved that he had been murdered, and the excited populace regarded the deed as the work of the Roman Catholics In Dec 1678 Miles Prance, under arrest for conspiracy, confessed to having murdered Godfrey, with the aid of Robert Green, Lawrence Hill and Henry Berry, at the instigation of Roman Catholic priests The three men were hanged in 1679, but Prance's confession was subsequently proved false, and he pleaded guilty to perjury The secret of Godfrey's death has never been solved

See OATES, TITUS, also R Tuke, *Memoirs of the Life and Death of Sir Edmondbury Godfrey* (1682), and G Burnet, *History of my Own Time, The Reign of Charles II*, ed O Airy (Oxford, 1900) On the question of responsibility for the murder, *see* J Pollock, *The Popish Plot* (1903), A Marks, *Who Killed Sir E B Godfrey?* (1905), Sir John Hall, *Four Famous Mysteries* (1922) and R. W. Postgate, *Murder, Piracy and Treason* (1928)

GODFREY OF BOUILLON (*c* 1060–1100), a leader in the first crusade, was the second son of Eustace II, count of Boulogne, by his marriage with Ida, daughter of Duke Godfrey II of Lower Lorraine He was designated by Duke Godfrey as his successor, but the emperor Henry IV gave him only the mark of Antwerp, in which the lordship of Bouillon was included (1076) He fought for Henry, however, both on the Elster and in the siege of Rome, and he was invested in 1082 with the duchy of Lower Lorraine Lorraine had been penetrated by Cluniac influences, and Godfrey would seem to have been a man of notable piety Accordingly, though he had himself served as an imperialist, and though the Germans in general had little sympathy with the crusaders, Godfrey, nevertheless, when the call came "to follow Christ," almost literally sold all that he had, and followed

Along with his brothers Eustace and Baldwin (the future Baldwin I of Jerusalem) Godfrey led a German contingent, some 40,000 strong, along "Charlemagne's road," through Hungary to Constantinople, starting in Aug 1096, and arriving at Constantinople in November He was the first of the crusading princes to arrive, and on him fell the duty of deciding what the relations of the princes to the eastern emperor Alexius were to be Eventually he did homage to Alexius in Jan 1097, and his example was followed by the other princes From this time until the beginning of 1099 Godfrey appears as one of the minor princes, while men like Bohemund and Raymund, Baldwin and Tancred were determining the course of events

In 1099 he came once more to the front The mass of the crusaders were weary of the political factions which divided some of their leaders, and Godfrey, who was more of a pilgrim than a politician, became the natural representative of this feeling He was thus able to force the reluctant Raymund to march southward to Jerusalem; and he took a prominent part in the siege, his division being the first to enter when the city was captured It was natural therefore that, when Raymund of Provence refused the offered dignity, Godfrey should be elected ruler of Jerusalem (July 22, 1099) The new dignity proved more onerous than honourable, and during his short reign of a year Godfrey had to combat the Arabs of Egypt, and the opposition of Raymund and the patriarch Dagobert He was successful in repelling the Egyptian attack at the battle of Ascalon (Aug 1099), but he failed, owing to Raymund's obstinacy and greed, to acquire the town of Ascalon after the battle

Left alone, at the end of the autumn, with an army of some 2,000 men, Godfrey was yet able, in the spring of 1100, probably with the aid of new pilgrims, to exact tribute from towns like Acre, Ascalon, Arsuf and Caesarea But already, at the end of 1099 Dagobert, archbishop of Pisa, had been substituted as patriarch for Arnulf (who had been acting as vicar) by the influence of Bohemund, and Dagobert, whose vassal Godfrey had at once piously acknowledged himself, seems to have forced him to an agreement in April 1100, by which he promised Jerusalem and Jaffa to the patriarch, in case he should acquire in their place Cairo or some other town, or should die without issue. Thus were the foundations of a theocracy laid in Jerusalem, and when Godfrey died (July 1100) he left the question to be decided, whether a theocracy or a monarchy should be the government of the Holy Land

Because he had been the first ruler in Jerusalem Godfrey was idolized in later saga He was depicted as the leader of the crusades, the king of Jerusalem, the legislator who laid down the assizes of Jerusalem He was none of these things Bohemund

was the leader of the crusades; Baldwin was first king; the assizes were the result of a gradual development. In reality he would seem to have been a quiet, pious, hard-fighting knight, who was chosen to rule in Jerusalem because he had no dangerous qualities, and no obvious defects

Godfrey was the principal hero of two French *chansons de geste* dealing with the crusade, the *Chanson d'Antioche* (ed. P Paris, 2 vols, 1848) and the *Chanson de Jérusalem* (ed C. Hippeau, 1868). In addition the parentage and early exploits of Godfrey were made the subject of legend. His grandfather was said to be Helias, knight of the Swan, one of the brothers whose adventures are well known, though with some variation, in the familiar fairy tale of "The Seven Swans" Helias, drawn by the swan, one day disembarked at Nijmwegen, and reconquered her territory for the duchess of Bouillon Marrying her daughter he exacted a promise that his wife should not enquire into his origin The tale, which is almost identical with the Lohengrin legend, belongs to the class of the Cupid and Psyche narratives *See* LOHENGRIN

See also C. Hippeau, *Le Chevalier au cygne* (2 vols, 1874–77), H Pigeonneau, *Le Cycle de la croisade et de la famille de Bouillon* (1877). The English romance of *Helyas, Knyghte of the Swanne* was printed by W. Copland about 1550.

GODFREY OF VITERBO (*c.* 1120–*c.* 1196), chronicler, probably an Italian by birth, passed some of his early life at Viterbo, where also he spent his concluding days, but he was educated at Bamberg About 1140 he became chaplain to the German king, Conrad III, but the greater part of his life was spent as secretary (*notarius*) in the service of the emperor Frederick I, who employed him on many diplomatic errands The only part of Godfrey's voluminous work which is valuable is the *Gesta Friderici I*, verses relating events in the emperor's career from 1155 to 1180 Concerned mainly with affairs in Italy, the poem tells of the sieges of Milan, of Frederick's flight to Pavia in 1167, of the treaty with Pope Alexander III at Venice, and of other episodes with which the author was intimately acquainted, and many of which he had witnessed Attached to the *Gesta Friderici* is the *Gesta Henrici VI*, a shorter poem which is often attributed to Godfrey, although W Wattenbach and other authorities think it was not written by him His other works are *Speculum Regum*, and the popular *Memoria saeculorum*, rewritten as *Pantheon*

Godfrey's works are found in the *Monumenta Germaniae historica*, Band xxii (Hanover, 1872) The *Gesta Friderici I et Henrici VI* is published separately with an introduction by G Waitz (Hanover, 1872) *See* also H Ulmann, *Gotfried von Viterbo* (Gottingen, 1863), and W. Wattenbach, *Deutschlands Geschichtsquellen*, Band ii (Berlin, 1894).

GODHRA, a town of British India, administrative headquarters of the Panch Mahals district of Bombay, and also of the Rewa Kantha political agency, 52 m NE of Baroda by rail, and on the line from Anand to Ratlam Pop (1921) 26,979 It has a trade in timber from the neighbouring forests, and tanneries

GODIN, JEAN BAPTISTE ANDRÉ (1817–1888), French socialist, was born on Jan 26, 1817 at Esquehéries (Aisne) In 1859 he made his castings manufactory at Guise into a Fourierist *familistère* or community settlement, which comprised, in addition to the workshops, buildings to house the work-people, crèches, hospital, refreshment rooms, recreation rooms, stores for the purchase of every necessity, and a large theatre In 1880 the whole was turned into a co-operative society, and eventually became the property of the workers

Godin was the author of *Solutions sociales* (1871), *Les Socialistes et les droits du travail* (1874), *Mutualité sociale* (1880), *La République du travail et la réforme parlementaire* (1889) *See* Bernardot, *Le Familistère de Guise et son fondateur* (1887), Fischer, *Die Familistere Godin's* (1890), Lestelle, *Étude sur le familistère de Guise* (1904), D F. P, *Le Familistère illustré, résultats de vingt ans d'association, 1880–1900* (Eng trans, *Twenty-eight years of co-partnership at Guise,* by A. Williams, 1908).

GODIVA (1040–1080), a Saxon lady, was the wife of Leofric, earl of Mercia and lord of Coventry. The people of that city suffering grievously under the earl's oppressive taxation, Lady Godiva appealed to her husband, who refused to remit the tolls. At last, says the legend, he said he would grant her request if she would ride naked through the streets of the town. After issuing a proclamation that all persons should keep within doors or shut their windows, she rode through Coventry, clothed only in her long hair One person disobeyed her proclamation, a tailor, ever afterwards known as Peeping Tom, who is said to have been struck blind. Her husband kept his word and abolished the obnoxious taxes.

The oldest form of the legend is given in *Flores historiarum* by Roger of Wendover, who quoted from an earlier writer. Godiva probably died a few years before the Domesday survey (1085–86), and was buried in one of the porches of the abbey church. The Godiva procession, instituted May 31, 1678, as part of Coventry fair, was celebrated at intervals until 1826. The "Peeping Tom" in Hertford street, Coventry, was perhaps an image of St. George

GODKIN, EDWIN LAWRENCE (1831–1902), American publicist, was born in Moyne, county Wicklow, Ireland, Oct. 2, 1831 His father, James Godkin, was a Presbyterian minister and a journalist, and the son, after graduating in 1851 at Queen's college, Belfast, and studying law in London, where he was also employed by the publishing house of Cassell, was special correspondent for the London *Daily News* in the Crimean War. After editorial work on the Belfast *Northern Whig*, late in 1856 he went to America, writing for the London *Daily News* letters descriptive of a southern tour. His connection with this journal he continued while studying law in New York He was admitted to the bar in 1858, and because of his impaired health he and his wife, Frances Elizabeth Foote, travelled in Europe 1860–62 At about this time Godkin was offered a partnership in the New York *Times* by Raymond, but although attracted by the offer, he in 1865 carried out a long-cherished dream by founding the *Nation* This quickly became the foremost review in the country—as Lowell put it, because of the "ability, information and unflinching integrity" of the editor Indeed, the periodical was so superior that Charles Dudley Warner styled it the "weekly judgment day" In 1881 Godkin sold the *Nation* to Henry Villard, owner of the New York *Evening Post,* of which paper the *Nation* became the weekly edition Godkin himself became associate editor of the *Post,* succeeding Carl Schurz as editor-in-chief, 1883–99, and shaping the policy of that journal Under his leadership the *Post* broke with the Republican Party in the presidential campaign of 1884, when Godkin's opposition to Blaine did much to create the so-called Mugwump party (*see* MUGWUMP), and his organ became completely independent He consistently advocated currency reform, the gold basis, a tariff for revenue only, and civil service reform, rendering the greatest aid to the last cause His attacks on Tammany Hall were so frequent and so fearless that he was several times sued for libel because of biographical sketches of certain leaders in that organization, but the cases were dismissed His opposition to "jingoism" and to imperialism was able and forcible. He retired from his editorial duties in 1899 Although he recovered from a cerebral haemorrhage early in 1900, his health was shattered, and he died in Greenway, Devonshire, England, May 21, 1902

BIBLIOGRAPHY—See *Life and Letters of Edwin Lawrence Godkin,* edited by Rollo Ogden (1907); accounts in W G Bleyer's *Main Currents in the History of American Journalism* (1927); and O G. Villard, *Some Newspapers and Newspaper-men* (1926); also Allan Nevins, *The Evening Post* (1922).

GODMANCHESTER, a municipal borough on the right bank of the Ouse, 1 m SSE of Huntingdon, on a branch of the LNE railway Pop (1921) 2,035 It has a beautiful Perpendicular church (St Mary's) and an agricultural trade, with flour mills The town is governed by a mayor, 4 aldermen and 12 councillors Area, 4,907 acres

A Romano-British village occupied the site of Godmanchester. The town (*Gumencestre, Gomecestre*) belonged to the king before the Conquest and at the time of the Domesday survey In 1213 King John granted the manor to the men of the town at a fee-farm of £120 yearly, and confirmation charters were granted by several succeeding kings, Richard II. in 1391–92 adding exemption from toll, pannage, etc James I granted an incorporation charter in 1605 under the title of bailiffs, assistants and common-

ılty, but under the Municipal Reform Act of 1835 the corporation was changed to a mayor, 4 aldermen and 12 councillors Godmanchester was formerly included for parliamentary purposes in he borough of Huntingdon, which has ceased to be separately epresented since 1885 The incorporation charter of 1605 recites hat the burgesses are chiefly engaged in agriculture, and grants hem a fair, which still continues every year on Tuesday in Easter week.

GÖDÖLLÖ is a growing market town in Hungary, 23 m. N E of Budapest, and a favourite summer resort from the capital Its royal castle and park, the latter stocked with stags and wild boars, was presented to Francis Joseph I in 1867 by the Hungarian nation Near the town lies Mária-Besnyo, a famous pilgrimage centre with a Franciscan monastery Pop (1920), 10,262

GODOLPHIN, SIDNEY GODOLPHIN, EARL OF (*c.* 1645–1712), English statesman was a cadet of an ancient family of Cornwall At the Restoration he was introduced into the royal household by Charles II, with whom he had become a favourite, and at the same period he entered the House of Commons as member for Helston Although he very seldom addressed the House, he gradually acquired a reputation as its chief financial authority In March 1679 he was appointed a member of the privy council, and in the September following he was promoted, with Hyde (afterwards earl of Rochester) and Sunderland, to the chief management of affairs Though he voted for the Exclusion bill in 1680, he was continued in office after the dismissal of Sunderland, and in September 1684 he was created Baron Godolphin of Rialton, and succeeded Rochester as first lord of the treasury. After the accession of James II he was made chamberlain to the queen, and, with Rochester and Sunderland, enjoyed the king's special confidence

In 1687 Godolphin was named commissioner of the treasury He was one of the council of five appointed by King James to represent him in London, when he went to join the army after the landing of William, prince of Orange, in England, and was afterwards appointed a commissioner to treat with the prince Under William III he became first lord of the treasury in 1690, and, while holding this office he maintained, in conjunction with Marlborough, a treacherous intercourse with James II Godolphin was not only a Tory by inheritance, but had a romantic admiration for the wife of James II After Fenwick's confession in 1696 regarding the attempted assassination of William III, Godolphin, who was compromised, resigned, but when the Tories came into power in 1700, he was again appointed lord treasurer and retained office for about a year Though not a favourite with Queen Anne, he was, after her accession, appointed to his old office, on the strong recommendation of Marlborough In 1704 he was knighted, and in 1706 he received an earldom The influence of the Marlboroughs with the queen was, however, gradually supplanted by that of Mrs Masham and Harley, earl of Oxford, and with the fortunes of the Marlboroughs those of Godolphin were indissolubly united After the Tory reaction which followed the impeachment of Dr Sacheverel, the queen abruptly dismissed Godolphin from office on Aug 7, 1710 He died on Sept. 15, 1712

Godolphin owed his rise to power and his continuance in it under four sovereigns chiefly to his exceptional mastery of financial matters He received Marlborough's support mainly because Marlborough recognized that for the prosecution of England's foreign wars his financial abilities were indispensable He was cool, reserved and cautious

Godolphin married Margaret Blagge, whose life was written by Evelyn, on May 16, 1675, and married again after her death in 1678

See Hon H. Elliott, *A Life of Godolphin* (1888).

GODOY, MANUEL DE (1767–1851), duke of Alcudia and Prince of the Peace, Spanish royal favourite and minister Born of a noble family of Estremadura at Badajoz on May 12, 1767, he entered the Guardia de Corps in 1784 His handsome, foolish face captivated Maria Luisa of Parma, and when King Charles III. died in 1788, Godoy's fortune was soon made By the influence of the queen, he was promoted in the army with scandalous rapidity, made duke of Alcudia, and in 1792 minister under the premiership of Aranda, whom he succeeded in displacing by the close of the year In 1798, his unpopularity and the intrigues of the French Government led to his temporary retirement, without, however, any diminution of the king's personal favour In 1801 he returned to office, and until 1807 he was the executant of the disastrous policy of the court. In the third period of his public life (1807–08), he was desperately striving for his place between the aggressive intervention of Napoleon on the one hand, and the growing hatred of the nation, organized around Ferdinand, the prince of Asturias, on the other. A popular outbreak at Aranjuez on March 17, 1808, led to his arrest Imprisoned by Ferdinand, he was released by order of Napoleon He joined the royal family at Bayonne and remained with them until Charles IV died at Rome in 1819, having survived his queen After the death of Ferdinand VII, in 1833, Godoy returned to Madrid, and failing to secure the restoration of his property confiscated in 1808, lived on a small pension granted him by Louis Philippe He died in Paris on Oct 4, 1851

As a favourite Godoy is remarkable for his hold on the affection of his sovereigns Latterly he was supported rather by the husband than by the wife He got rid of Aranda by adopting, in order to please the king, a policy which tended to bring on war with France When the war proved disastrous, he made the Peace of Basle, and was created Prince of the Peace for his services Then he helped to make war with England The disasters which followed only made him dearer to the king The queen endured his flagrant infidelities In his private life, Godoy was profligate, profuse and childishly ostentatious The policy of his Government was financially ruinous, and the best that can be said for him is that he was good-natured, and tried to restrain the Inquisition and the purely reactionary parties

See M Godoy, *Memorias críticas y apologéticas para la historia del Reynado de Carlos IV* (Madrid, 6 vols 1836–42) (French and English translations), Abbé de Pradt, *Mémoires sur la Révolution d'Espagne* (1816), *Una parte de la correspondencia de Godoy con la Reyna Maria Luisa,* ed V Z de V (Madrid, 1814)

GODUNOV, BORIS FEDOROVICH, tsar of Muscovy (*c* 1552–1605), the most famous member of an ancient, now extinct Russian family of Tatar origin, which migrated from the Horde to Muscovy in the 14th century Boris's career of service began at the court of Ivan the Terrible He is mentioned in 1570 as taking part in the Serpeisk campaign as one of the archers of the guard In 1571 he strengthened his position at court by his marriage with Maria, the daughter of Ivan's favourite, Malyuta Skuratov In 1580 the tsar chose Irene, the sister of Boris, to be the bride of the tsarevich Theodore, on which occasion Boris was promoted to the rank of *boyar* On his death-bed Ivan appointed Boris one of the guardians of his son and successor, Theodore, who was of somewhat weak intellect The reign of Theodore began with a rebellion in favour of the infant tsarevich Demetrius, the son of Ivan's fifth wife Marie Nagaya, a rebellion resulting in the banishment of Demetrius, with his mother and her relations, to their appanage at Uglich On the occasion of the tsar's coronation (May 31 1584), Boris was loaded with honours and riches, yet he held but the second place in the regency during the lifetime of his co-guardian Nikita Romanovich, on whose death, in 1585, he was left without any serious rival A conspiracy against him of all the other great *boyars* and the metropolitan Dionysy, which sought to break Boris's power by divorcing the tsar from Godunov's childless sister, only ended in the banishment or tonsuring of the malcontents

Henceforth Godunov was omnipotent The direction of affairs passed entirely into his hands, and he corresponded with foreign princes as their equal His policy was generally pacific, but always most prudent In 1595 he recovered from Sweden the towns lost during the former reign. Five years previously he had defeated a Tatar raid upon Moscow, for which service he received the title of *slugar,* an obsolete dignity even higher than that of *boyar.* Towards Turkey he maintained an independent attitude, supporting an anti-Turkish faction in the Crimea, and furnishing the emperor with subsidies in his war against the sultan Godunov encouraged English merchants to trade with Russia by exempting

them from tolls. He civilized the north-eastern and south-eastern borders of Muscovy by building numerous towns and fortresses to keep the Tatar and Finn tribes in order. Samara, Saratov, and Tsaritsyn and a whole series of lesser towns owe their existence to him He also re-colonized Siberia, which had been slipping from the grasp of Muscovy, and formed scores of new settlements, including Tobolsk and other large centres It was during his government that the Muscovite Church received its patriarchate, which placed it on an equality with other eastern churches and emancipated it from the influence of the metropolitan of Kiev. It was Boris's internal policy to support the middle classes at the expense of the old nobility and the peasants, hence the ukase (1587) forbidding the peasantry to transfer themselves from one landowner to another, thus binding them to the soil, and leading to the institution of serfdom in its most grinding form The sudden death of the tsarevich Demetrius at Uglich (May 15, 1591) has commonly been attributed to Boris

On the death of the childless tsar Theodore (Jan 7 1598), a *Zemsky Sobor,* or national assembly, unanimously elected Boris tsar on Feb 21 The Romanov family, who had been his chief rivals, were disgraced and banished Boris was the first tsar to import foreign teachers on a great scale, the first to send young Russians abroad to be educated, the first to allow Lutheran churches to be built in Russia He also felt the necessity of a Baltic seaboard, and attempted to obtain Livonia by diplomatic means That Boris was one of the greatest of the Muscovite tsars there can be no doubt But his great qualities were overbalanced by an incurable suspiciousness. He encouraged informers and persecuted suspects on their unsupported statements The Romanov family in especial suffered severely from these delations In 1603 a pretender appeared in Poland, who claimed to be the murdered tsarevich Demetrius, and, with the support of King Sigismund of Poland, he was leading a small army, reinforced by the Don Cossacks, into south-west Russia, when Boris died suddenly (April 13 1605), leaving one son, Theodore II, who succeeded him for a few months and then was foully murdered by the enemies of the Godunovs.

See Platon Vasilievich Pavlov, *On the Historical Significance of the Reign of Boris Godunov* (Rus), (1850), Sergyei Mikhailvich Soloviev, *History of Russia* (Rus), (2nd ed, vols VII–VIII, 1897)

(R. N. B.)

GODWIN, FRANCIS (1562–1633), English divine, son of Thomas Godwin, bishop of Bath and Wells, was born at Hannington, Northamptonshire, and studied at Christ Church, Oxford After holding two Somersetshire livings he was in 1587 appointed subdean of Exeter, bishop of Llandoff (1601) and of Hereford (1617). His *Catalogue of the Bishops of England since the first planting of the Christian Religion in this Island* (1601, 2nd ed, 1615; Latin ed, 1616) was republished, with a continuation by William Richardson, in 1743 In 1616 Godwin produced *Rerum Anglicarum, Henrico VIII, Edwardo VI et Maria regnantibus, Annales,* afterwards translated and published by his son Morgan under the title *Annales of England* (1630) His *The Man in the Moone, or a Discourse of a Voyage thither, by Domingo Gonsales,* written apparently between 1599 and 1603 and published posthumously in 1638, was imitated in several important particulars by Cyrano de Bergerac, from whom, if not from Godwin direct, Swift borrowed in writing of Gulliver's voyage to Laputa Another work of Godwin's, *Nuncius inanimatus Utopiae* (1629), seems to have been the prototype of John Wilkins's *Mercury, or the Secret and Swift Messenger,* which appeared in 1641

GODWIN, MARY WOLLSTONECRAFT (1759–1797), English miscellaneous writer, was born probably at Hoxton, London Her family was of Irish extraction Her father, Edward John Wollstonecraft, after dissipating the greater part of his patrimony, tried to earn a living by farming, which only plunged him into deeper difficulties, and he led a wandering, shifty life The family roamed from Hoxton to Edmonton, to Essex, to Beverley in Yorkshire, to Lougharne, Pembrokeshire, and back to London

After Mrs Wollstonecraft's death in 1780, soon followed by her husband's second marriage, the three daughters, Mary, Everina and Eliza, sought to earn their own livelihood. Mary, the eldest, went in the first instance to live with her friend Fanny Blood, a girl of her own age, whose father, like Wollstonecraft, was addicted to drink. Mary helped Mrs. Blood to earn money by taking in needlework, while Fanny painted in water-colours Everina went to live with her brother Edward, and Eliza made a hasty and, as it proved, unhappy marriage with a Mr Bishop A legal separation was afterwards obtained, and the sisters, together with Fanny Blood, took a house, first at Islington, afterwards at Newington Green, and opened a school, which was carried on with indifferent success for nearly two years. During their residence at Newington Green, Mary was introduced to Dr Johnson, who, as Godwin tells us, "treated her with particular kindness and attention"

In 1785 Fanny Blood married Hugh Skeys, a merchant, and went with him to Lisbon, where she died in childbed after sending for Mary to nurse her "The loss of Fanny," as she said in a letter to Mrs. Skeys' brother, George Blood, "was sufficient of itself to have cast a cloud over my brightest days. . . . I have lost all relish for pleasure, and life seems a burden almost too heavy to be endured" Her first novel, *Mary, a Fiction* (1788), was intended to commemorate her friendship with Fanny. After closing the school at Newington Green, Mary became governess in the family of Lord Kingsborough, in Ireland. Her pupils were much attached to her, especially Margaret King, afterwards Lady Mountcashel; and indeed, Lady Kingsborough gave the reason for dismissing her after one year's service that the children loved their governess better than their mother Mary now resolved to devote herself to literary work, and she was encouraged by Johnson, the publisher in St Paul's churchyard, for whom she acted as literary adviser She also undertook translations, chiefly from the French. *The Elements of Morality* (1790) from the German of Salzmann, illustrated by Blake, an old-fashioned book for children, and Lavater's *Physiognomy* were among her translations. Her *Original Stories from Real Life* were published in 1791, and, with illustrations by Blake, in 1796 In 1792 appeared *A Vindication of the Rights of Woman,* the work with which her name is always associated

It is not among the least oddities of this book that it is dedicated to M. Talleyrand Périgord, late bishop of Autun Mary Wollstonecraft still believed him to be sincere, and working in the same direction as herself In the dedication she states the "main argument" of the work, "built on this simple principle that, if woman be not prepared by education to become the companion of man, she will stop the progress of knowledge, for truth must be common to all, or it will be inefficacious with respect to its influence or general practice" In carrying out this argument she used great plainness of speech, and it was this that caused all, or nearly all, the outcry For she did not attack the institution of marriage, nor assail orthodox religion; her book was really a plea for equality of education, passing into one for State education and for the joint education of the sexes It was a protest against the assumption that woman was only the plaything of man, and she asserted that intellectual companionship was the chief, as it is the lasting, happiness of marriage She thus directly opposed the teaching of Rousseau, of whom she was in other respects an ardent disciple.

Mrs Wollstonecraft, as she now styled herself, desired to watch the progress of the Revolution in France, and went to Paris in 1792 Godwin, in his memoir of his wife, considers that the change of residence may have been prompted by the discovery that she was becoming attached to Henry Fuseli, but there is little to confirm this surmise; indeed, it was first proposed that she should go to Paris with Fuseli and his wife, nor was there any subsequent breach in their friendship. She remained in Paris during the Reign of Terror, when communication with England was difficult or almost impossible Some time in the spring or summer of 1793 Capt Gilbert Imlay, an American, became acquainted with Mary—an acquaintance which ended in a more intimate connection There was no legal ceremony of marriage, and it is doubtful whether such a marriage would have been valid at the time; but she passed as Imlay's wife, and Imlay himself terms her in a legal document, "Mary Imlay, my best

friend and wife." In Aug 1793 Imlay was called to Havre on business, and was absent for some months, during which time most of the letters published after her death by Godwin were written. Towards the end of the year she joined Imlay at Havre, and there in the spring of 1794 she gave birth to a girl, who received the name of Fanny, in memory of the dear friend of her youth. In this year she published the first volume of a never completed *Historical and Moral View of the French Revolution* Imlay became involved in a multitude of speculations, and his affection for Mary and their child was already waning He left Mary for some months at Havre In June 1795, after joining him in England, Mary left for Norway on business for Imlay Her letters from Norway, divested of all personal details, were afterwards published She returned to England late in 1795 and found letters awaiting her from Imlay, intimating his intention to separate from her, and offering to settle an annuity on her and her child. For herself she rejected this offer with scorn: "From you," she wrote, "I will not receive anything more I am not sufficiently humbled to depend on your beneficence." They met again, and for a short time lived together, until the discovery that he was carrying on an intrigue under her own roof drove her to despair, and she attempted to drown herself by leaping from Putney bridge, but was rescued by watermen Imlay now completely deserted her, although she continued to bear his name.

In 1796, when Mary Wollstonecraft was living in London, supporting herself and her child by working, as before, for Mr Johnson, she met William Godwin A friendship sprang up between them—a friendship, as he himself says, which "melted into love" Godwin states that "ideas which he is now willing to denominate prejudices, made him by no means willing to conform to the ceremony of marriage", but these prejudices were overcome, and they were married at St Pancras church on March 29, 1797. And now Mary had a season of real calm in her stormy existence. Godwin, for once only in his life, was stirred by passion, and his admiration for his wife equalled his affection But their happiness was of short duration The birth of her daughter Mary, afterwards the wife of Percy Bysshe Shelley, on Aug 30, 1797, proved fatal, and Mrs Godwin died on Sept 10 following She was buried in the churchyard of Old St Pancras, but her remains were afterwards removed by Sir Percy Shelley to the churchyard of St Peter's, Bournemouth

Her principal published works are as follows —*Thoughts on the Education of Daughters,* . . (1787); *Mary, a Fiction* (1788), *The Female Reader* (selections) (1789), *An Historical and Moral View of the Origin and Progress of the French Revolution, and the effects it has produced in Europe,* vol i (no more published) (1790), *Original Stories from Real Life* (1791), *Vindication of the Rights of Woman* (1792), *Vindication of the Rights of Man* (1793), *Letters written during a Short Residence in Sweden, Norway and Denmark* (1796), *Posthumous Works* (4 vols, 1798) It is impossible to trace the many articles contributed by her to periodical literature

A memoir of her life was published by Godwin in 1798 A large portion of C. Kegan Paul's work, *William Godwin, his Friends and Contemporaries,* was devoted to her, and an edition of the *Letters to Imlay* (1879), of which the first edition was published by Godwin, is prefaced by a somewhat fuller memoir *See* also E R Pennell, *Mary Wollstonecraft Godwin* (1885), in the Eminent Women Series; E. Dowden, *The French Revolution and English Literature* (1897) pp 82 *et seq ;* E R Clough, *A Study of Mary Wollstonecraft and the Rights of Woman* (1898), an edition of her *Original Stories* (1906), with William Blake's illustrations and an introduction by E V. Lucas; the *Love Letters of Mary Wollstonecraft to Gilbert Imlay* (1908), with an introduction by Roger Ingpen, M. Linford, *Mary Wollstonecraft* (1924).

GODWIN, WILLIAM (1756–1836), English political and miscellaneous writer, son of a Nonconformist minister, was born on March 3, 1756, at Wisbech, Cambridgeshire Both parents were strict Calvinists William Godwin was educated for his father's profession at Hoxton Academy, where he was under Andrew Kippis the biographer and Dr Abraham Rees of the *Cyclopaedia,* and was at first more Calvinistic than his teachers, becoming a Sandemanian, or follower of John Glas (*q v*), whom he describes as "a celebrated north-country apostle who, after Calvin had damned ninety-nine in a hundred of mankind, has contrived a scheme for damning ninety-nine in a hundred of the followers of Calvin." He then acted as a minister at Ware, Stowmarket and Beaconsfield At Stowmarket the teachings of the French philosophers were brought before him by a friend, Joseph Fawcet, who held strong republican opinions He came to London in 1782, still nominally a minister, to regenerate society with his pen—a real enthusiast, who contemplated, in theory, the complete overthrow of all existing institutions, political, social and religious He believed, however, that calm discussion was the only thing needful to carry every change, and from the beginning to the end of his career he deprecated every approach to violence. He was a philosophic radical in the strictest sense of the term

His first published work was an anonymous *Life of Lord Chatham* (1783). Under the inappropriate title *Sketches of History* (1784) he published under his own name six sermons on the characters of Aaron, Hazael and Jesus, in which, though writing in the character of an orthodox Calvinist, he enunciates the proposition "God Himself has no right to be a tyrant" Introduced by Andrew Kippis, he began to write in 1785 for the *Annual Register* and other periodicals, producing also three novels now forgotten The "Sketches of English History" written for the *Annual Register* from 1785 onward still deserve study. He joined a club called the "Revolutionists," and associated with Lord Stanhope, Horne Tooke and Holcroft. His clerical character was now completely dropped

In 1793 Godwin published his great work on political science, *The Inquiry concerning Political Justice, and its Influence on General Virtue and Happiness,* an inquiry into the principles of society, of government and of morals For many years Godwin had been "satisfied that monarchy was a species of government unavoidably corrupt," and from desiring a government of the simplest construction, he gradually came to consider that "government by its very nature counteracts the improvement of original mind" Believing in the perfectibility of the race, that there are no innate principles, and therefore no original propensity to evil, he considered that "our virtues and our vices may be traced to the incidents which make the history of our lives, and if these incidents could be divested of every improper tendency, vice would be extirpated from the world" All control of man by man was more or less intolerable, and the day would come when each man, doing what seems right in his own eyes, would also be doing what is in fact best for the community, because all will be guided by principles of pure reason. In a day when the penal code was still extremely severe, he argued gravely against all punishments, not only that of death Property was to belong to him who most wanted it, accumulated property was a monstrous injustice Hence marriage, which is law, is the worst of all laws, and as property the worst of all properties Perhaps no one received the whole teaching of the book But it gave cohesion and voice to philosophic radicalism Godwin himself in after days modified his communistic views, but his strong feeling for individualism, his hatred of all restrictions on liberty, his trust in man, his faith in the power of reason remained

In May 1794 Godwin published the novel of *Caleb Williams, or Things as they are,* dramatized by the younger Colman as *The Iron Chest* A theorist who lived mainly in his study, Godwin yet came forward boldly to stand by prisoners arraigned of high treason in that same year—1794 The danger to persons so charged was then great, and he deliberately put himself into this same danger for his friends But when his own trial was discussed in the privy council, Pitt sensibly held that *Political Justice,* the work on which the charge could best have been founded, was priced at three guineas, and could never do much harm among those who had not three shillings to spare

In 1797, the intervening years having been spent in strenuous literary labour, Godwin married Mary Wollstonecraft (*see* GODWIN, MARY WOLLSTONECRAFT) Since both held the same views regarding the slavery of marriage, and since they only married at all for the sake of possible offspring, the marriage was concealed for some time, and the happiness of the avowed married life was very brief, his wife's death on Sept 10 left Godwin prostrated by affliction, and with a charge for which he was wholly unfit—his infant daughter Mary, and her stepsister, Fanny Imlay, who from that time bore the name of Godwin His unfitness for

the cares of a family, far more than love, led him to contract a second marriage with Mary Jane Clairmont in 1801. She was a widow with two children, one of whom, Clara Mary Jane Clairmont, became the mistress of Byron. The second Mrs Godwin was energetic and painstaking, but a harsh stepmother, and it may be doubted whether the children were not worse off under her care than they would have been under Godwin's neglect.

Godwin's second novel, *St Leon,* appeared in 1799 It is chiefly remarkable for the beautiful portrait of Marguerite, the heroine, drawn from the character of his own wife. His opinions underwent a change in the direction of theism, influenced, he says, by his acquaintance with Coleridge Study of the Elizabethan dramatists led to the production in 1800 of the *Tragedy of Antonio* Kemble brought it out at Drury Lane, but the failure of this attempt made him refuse *Abbas, King of Persia,* which Godwin offered him in the next year He was more successful with his *Life of Chaucer,* for which he received £600.

The events of Godwin's life were few Under the advice of the second Mrs Godwin, and with her active co-operation, he carried on business as a bookseller under the pseudonym of Edward Baldwin, publishing several useful school books and books for children, among them Charles and Mary Lamb's *Tales from Shakespeare* But for many years Godwin struggled with constant pecuniary difficulties, for which more than one subscription was raised by the leaders of the Liberal Party and by literary men He became bankrupt in 1822, but during the following years he accomplished one of his best pieces of work, *The History of the Commonwealth,* founded on pamphlets and original documents, which still retains considerable value In 1833 the Government of Earl Grey conferred upon him the office known as yeoman usher of the exchequer, to which were attached apartments in Palace Yard, where he died on April 7, 1836

In his own time, by his writings and by his conversation, Godwin had a great power of influencing men, and especially young men Though his character would seem, from much which is found in his writings, and from anecdotes told by those who still remember him, to have been cold and unsympathetic, it was not so understood by enthusiastic young people, who hung on his words as those of a prophet The most remarkable of these was Percy Bysshe Shelley, who in the glowing dawn of his genius turned to Godwin as his teacher and guide The last of the long series of young men who sat at Godwin's feet was Edward Lytton Bulwer, afterwards Lord Lytton, whose early romances were formed after those of Godwin, and who, in *Eugene Aram,* succeeded to the story as arranged, and the plan to a considerable extent sketched out, by Godwin, whose age and failing health prevented him from completing it Godwin's character appears in the worst light in connection with Shelley His early correspondence with Shelley, which began in 1811, is remarkable for its genuine good sense and kindness, but when Shelley carried out the principles of the author of *Political Justice* in eloping with Mary Godwin, Godwin assumed a hostile attitude that would have been unjustifiable in any case, and was ridiculous in the light of his professions He was not, moreover, too proud to accept £1,000 from his son-in-law, and after the reconciliation following on Shelley's marriage in 1816, he continued to demand money until Shelley's death His character had no doubt suffered under his long embarrassments and his unhappy marriage

BIBLIOGRAPHY —Godwin's more important works are—*The Enquiry concerning Political Justice, and its Influence on General Virtue and Happiness* (1793), *Things as they are, or the Adventures of Caleb Williams* (1794), *The Enquirer, a series of Essays* (1797), *Memoirs of the Author of the Rights of Woman* (1798), *St Leon, a Tale of the Sixteenth Century* (1799), *Antonio, a Tragedy* (1800), *The Life of Chaucer* (1803), *Fleetwood, a Novel* (1805), *Faulkener, a Tragedy* (1807), *Essay on Sepulchres* (1809), *Lives of Edward and John Philips, the Nephews of Milton* (1815), *Mandeville, a Tale of the Times of Cromwell* (1817), *Of Population,* an answer to Malthus (1820), *History of the Commonwealth* (1824–1828), *Cloudesly, a Tale* (1830), *Thoughts on Man, a series of Essays* (1831), *Lives of the Necromancers* (1834) A volume of essays was also collected from his papers and published in 1873, as left for publication by his daughter Mrs Shelley Many other short and anonymous works proceeded from his ever busy pen, but many are irrecoverable, and all are forgotten Godwin's life was published in 1876 in two volumes, under the title *William Godwin, his Friends and Contemporaries,* by C Kegan Paul The best estimate of his literary position is that given by Sir Leslie Stephen in his *English Thought in the 18th Century* (ii 264–281, 3rd ed., 1902). *See* also the article on William Godwin in W Hazlitt's *The Spirit of the Age* (1825), and "Godwin and Shelley" in Sir L Stephen's *Hours in a Library* (vol. iii., ed 1892); H Roussin, *William Godwin* (1913), F. K. Brown, *The Life of William Godwin* (1926).

GODWIN-AUSTEN, ROBERT ALFRED CLOYNE (1808–1884), English geologist, the eldest son of Sir Henry E. Austen, was born on March 17, 1808. He was educated at Oriel College, Oxford, of which he became a fellow in 1830 He afterwards entered Lincoln's Inn In 1855 he brought before the Geological Society of London his paper "On the possible Extension of the Coal-Measures beneath the South-Eastern part of England." In this paper he supported the theory of the freshwater origin of the Old Red Sandstone, and discussed the relations of that formation, and of the Devonian, to the Silurian and Carboniferous He was elected F R S in 1849 He died at Shalford House near Guildford on Nov. 25, 1884 Mt Godwin-Austen (K2 or Dapsang) 28,250 ft., in the Himalayas, is named in his honour

GODWINE (d 1053), earl of the West-Saxons and the leading Englishman of his day, was the son of Wulfnoth, whose identity is uncertain Of Godwine's youth, nothing is known except that he soon became a personal favourite of Canute, who, about 1018, conferred upon him the rank of earl—probably of some one shire in Wessex In 1019 Godwine accompanied the king on his visit to Denmark, and shortly afterwards was given in marriage Gytha, sister of Ulf, and raised (1020) to the dignity of earl of all Wessex On Canute's death in 1035, he assisted Queen Emma in supporting the claims of her son, Hardicanute, in opposition to those of Harold Harefoot for whom the Witan at Oxford, led by Leofric, had declared (*see* HARDICANUTE) Meanwhile Aelfred, son of Emma by her former husband Aethelred II, had landed in England with the hope of gaining the crown, but, falling into Godwine's power, he was handed over to Harold and killed

On the death of Hardicanute in 1042, after a reign of less than two years, Godwine secured an English succession to the throne by his promotion of the election of Edward the Confessor, the surviving son of Emma and Aethelred He was now the first man in the kingdom, and though he had powerful rivals in the earl Leofric of Mercia and earl Siward of Northumbria, he secured the marriage of his daughter Eadgyth to the king (1045), an earldom in the Severn valley for his son Sweyn, one in East Anglia for his son Harold, and a third in the Chilterns for his nephew Beorn Nevertheless, his opposition to the Norman favourites of the king, particularly to Robert, abbot of Jumièges, who in 1051 became archbishop of Canterbury, and his attempt to cover up the misdeeds of his son Sweyn (d 1052), was bringing the earl into disfavour The climax came with his refusal to punish the men of Dover for stirring up a riot amongst the retinue of Eustace, Count of Boulogne, who was on a visit to the king in 1051 Godwine and his sons gathered their forces in Gloucestershire, and the earls of Mercia and Northumbria hastened to the assistance of the king Though war was averted by mediation, Godwine and his family were outlawed (*see* EDWARD THE CONFESSOR) In the following year, however, the suspicions of the English thegns having been aroused by a visit of Edward's kinsman, William, duke of Normandy, Godwine was enabled to return in triumph Some six months later, the earl was taken ill while at the king's table, and died on April 15, 1053

See authorities in Freeman's *Norman Conquest,* vols. i. and ii, and *Cambridge Mediaeval Hist,* vol iii

GODWIT, the name of wading birds of the genus *Limosa,* much esteemed for the table The black-tailed godwit, *L limosa,* or yarwhelp, formerly bred in the English fens It is now only a visitor there but breeds commonly in Holland and thence across Europe to south Russia The bird is the size of a large pigeon but with long legs and bill, the latter slightly upturned, the winter plumage is greyish-brown but the breeding dress is marked by bright bay The tail is white for a third of its length and then black with a white margin As in many waders, in spring the males

circle in the air and utter a special call or song The bar-tailed godwit breeds in Lapland and is a winter visitor and bird of passage over the rest of Europe. It is smaller than the preceding and the tail is barred with black and white throughout its length. Scientifically it is *L lapponica* The marbled godwit (*L fedoa*) is very large; it is an American form, as is the smaller Hudsonian godwit (*L. hudsonica*). Both breed in the north and migrate south in winter, the second form reaching the Strait of Magellan. Two forms from Asia winter in Australia and New Zealand.

GOEBEN, AUGUST KARL VON (1816–1880), Prussian general of infantry, was born at Stade, Hanover, on Dec 10, 1816. At seventeen he entered the Prussian army but left the service in 1836 to see actual fighting with the Carlist army in Spain. After five strenuous campaigns in which he suffered two terms of imprisonment he returned to Prussia absolutely beggared, and reentered the Prussian service. In 1848 he had the luck to be transferred to the staff of the IV army corps, his immediate superior being Major von Moltke The two "coming men" became fast friends, and their mutual esteem was never disturbed In the Baden insurrection Goeben served on the staff of Prince William the future emperor Staff and regimental duty alternated for some years after this, till in 1863 he became major-general commanding the 26th infantry brigade In 1860 he was present with the Spanish troops in Morocco, and took part in the battle of Tetuan

In the first of Prussia's great wars (1864) he distinguished himself at Rackebull and Sonderburg. In the war of 1866 von Goeben commanded the 13th division and showed himself a born leader and skilful tactician He held almost independent command with conspicuous success in the actions of Dermbach, Laufach, Kissingen, Aschaffenburg, Gerchsheim, Tauber-Bischofsheim and Wurzburg The mobilization of 1870 placed him at the head of the VIII. (Rhineland) army corps, forming part of the First Army under Steinmetz His resolute and energetic leading contributed mainly to the victory of Spicheren (Aug 6), and won the only laurels gained on the Prussian right wing at Gravelotte (Aug 18). On Jan. 8, 1871 Goeben succeeded Manteuffel in the command of the I. Army, with which he had served throughout the campaign as a corps commander A fortnight later he brought the war in northern France to a brilliant conclusion, by the decisive victory of St. Quentin (Jan 18 and 19, 1871). He commanded the VIII. corps at Coblenz until his death there on Nov 13, 1880

Goeben's memoirs are to be found in his works *Vier Jahre in Spanien* (Hanover, 1841), *Reise-und Lagerbriefe aus Spanien und vom spanischen Heere in Marokko* (Hanover, 1863) and in the Darmstadt *Allgemeine Militarzeitung* The cruiser "Goeben" bore his name.

See G. Zernin, *Das Leben des Generals August von Goeben* (2 vols, 1895–97) and *A von Goeben in Seinen Briefen* (1903), H Barth, *A von Goeben* (1906), and for his share in the war of 1870–71, H Kunz, *Der Feldzug im N und N W Frankreichs 1870–1871* (1889), and the 14th Monograph of the Great General Staff (1891).

"GOEBEN" AND "BRESLAU." The escape of the German battle-cruiser "Goeben" and light-cruiser "Breslau" from Messina on Aug 6, 1914; their flight to the Aegean Sea and the bold decision to make for Constantinople, turned what was for them a desperate situation into one of material advantage to Germany. Their arrival at the Sublime Porte undoubtedly had a considerable influence when Turkey was hesitating whether or no to cast in her lot with the Central Powers

Position in Aug. 1914.—When the World War broke out, the naval forces of the powers concerned in the Mediterranean were as follows:

British forces under Vice-Admiral Sir A Berkeley Milne.—
Battle-cruisers: "Inflexible," "Indomitable," "Indefatigable"
Armoured cruisers under Rear-Admiral E C Troubridge:—
"Defence," "Black Prince," "Duke of Edinburgh," "Warrior" *Light-Cruisers:* "Chatham," "Dublin," "Gloucester," "Weymouth" *Destroyers:* sixteen

French forces under Vice-Admiral de Lapeyrere:—
Battleships: One Dreadnought, fifteen older type *Armoured Cruisers:* Six *Destroyers.* Twenty four

Italian forces:
Battleships: Three Dreadnoughts, three older type.

Austrian forces:
Battleships: Three Dreadnoughts, three older type.

German forces under Rear-Admiral Souchon.—
Battle-cruiser "Goeben"
Light-cruiser: "Breslau"

The preliminary warning sent out on July 27 to Admiral Milne, then at Alexandria, directed him to return to Malta and after completing with fuel and stores, to remain there for the purpose of watching the entrance to the Adriatic These orders were subsequently overridden by a series of telegrams from the Admiralty The first task given to Milne was to assist the French in transporting their African army A lack of international co-operation is here evident, as the French Commander-in-Chief knew nothing of these plans Then followed orders to prevent the "Goeben" entering the Adriatic, to guard British trade in the East Mediterranean and to watch any Austrian ships which emerged from the Adriatic

On July 31 the Italian Government announced its intention to remain neutral, but this important fact was not communicated to Milne until Aug 4 when he was further instructed to observe, strictly, the neutrality and allow no British warship to approach within 6 miles of the coast of Italy A severe handicap this to any operation in or near the Straits of Messina

"Goeben's" Activities.—Admiral Souchon left Messina at 1 AM Aug 3 and made a dash to the African coast where, on the following morning, he fired a few shots into the towns of Bona and Philippeville. He then made off to the eastward, and, by a stroke of luck, narrowly missed meeting the French 1st Squadron, but he was sighted and followed by the "Indomitable" and "Indefatigable" No hostile action could, however, be taken, as war with Germany had not then been declared by Great Britain. Superior speed, aided by hazy weather, enabled Souchon to evade the British ships, and he returned to Messina where our ships could not follow if Italian neutrality was to be strictly observed

Declaration of War.—At 7 02 PM on Aug 4, Milne was informed the ultimatum would expire at midnight When hostilities commenced at that hour the "Indomitable" and "Indefatigable" were between Sicily and Sardinia, the "Inflexible" was in the Malta Channel steering to join her consorts, Troubridge, with the armoured cruisers, was near Cephalonia and the "Goeben" was approaching Messina, where she arrived, with the "Breslau" at 4 AM Aug 5 Her presence there became known to Milne at 5 30 PM Aug 5, and during that night the British battle-cruisers patrolled between Bizerta and Sardinia

"Goeben's" Escape.—Since Austria still hesitated to declare war against Great Britain, Souchon was given permission to act as he thought best About 6 PM Aug 6, Milne decided to close the northern entrance of the Straits of Messina, and, when off the north-west point of Sicily, he received news from the "Gloucester" that the "Goeben" and "Breslau" were leaving Messina by the southern entrance Souchon made the bold decision to run for the Dardanelles He steered to the northward, as if for the Adriatic, until 11 PM and then shaped a course for Cape Matapan, being shadowed throughout the night and the next day by the "Gloucester"

Troubridge steered north to intercept the German ships, but at midnight, realizing that their first course was only a feint, turned and proceeded south at full speed Troubridge had decided not to risk his cruisers against the "Goeben's" 11-inch guns in a daylight action, and finding it impossible to intercept her before daylight, he abandoned the chase

Milne took his battle-cruisers to Malta, coaled, and left again at midnight, Aug 7, for the Aegean A false alarm of war with Austria, sent out by the Admiralty, induced Milne to alter his dispositions and wasted 24 hours When the chase was resumed, it was too late to overtake the "Goeben" and "Breslau," which ships, having coaled at the island of Denusa, reached the Darda-

nelles at about 5 P M. Aug. 10 (J. E.T. H)

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GOEDEKE, KARL (1814–1887), German literary historian, was born at Celle on April 15, 1814 He became professor at Gottingen in 1873, and died there on Oct. 28, 1887. His most important service to German literature was the compilation of the indispensable *Grundriss zur Geschichte der deutschen Dichtung* (3 vols, 1857–81; new ed, 10 vols, 1884–1913), a bibliography of the subject down to the death of Goethe Goedeke published many other works, among them a critical edition of Schiller

GOEJE, MICHAEL JAN DE (1836–1909), Dutch orientalist, was born in Friesland in 1836 He devoted himself at an early age to the study of oriental languages and became especially proficient in Arabic, under the guidance of Dozy and Juynboll, to whom he was afterwards an intimate friend and colleague He took his degree of doctor at Leyden in 1860, and then studied for a year in Oxford, where he examined and collated the Bodleian MSS of Idrīsī (part being published in 1866, in collaboration with R P Dozy, as *Description de l'Afrique et de l'Espagne*) About the same time he wrote *Mémoires de l'histoire et de la géographie orientales*, and edited *Expugnatio regionum* In 1883, on the death of Dozy, he became Arabic professor at Leyden, retiring in 1906. He died on May 17, 1909 He wielded a great influence during his long professoriate not only over his pupils, but over theologians and eastern administrators who attended his lectures, and his many editions of Arabic texts have been of the highest value to scholars, the most important being his great edition of Ṭabarī

Among his chief works are *Fragmenta historicorum Arabicorum* (1869–71); *Diwan of Moslim-ibn-al-Wālid* (1875), *Bibliotheca geographorum Arabicorum* (1870–94), *Annals of Ṭabari* (1879–1901), edition of Ibn Qutaiba's biographies (1904), of the travels of Ibn Jubaye (1907, 5th vol of Gibb Memorial). He was also the chief editor of the *Encyclopaedia of Islam* (vols i–iii), and contributed many articles to periodicals He wrote for the 9th and the 11th edition of the *Encyclopædia Britannica.*

GOES, DAMIÃO DE (1502–1574), Portuguese humanist, was born of a patrician family at Alenquer Under King John III. he was employed abroad for many years from 1523 on diplomatic and commercial missions, and he travelled over the greater part of Europe He was intimate with the leading scholars of the time, was acquainted with Luther and Melanchthon, and in 1532 became the pupil and friend of Erasmus Goes took his degree at Padua in 1538 after a four years' course He married in Flanders a rich and noble Dutch lady D Joanna de Hargen, and settled at Louvain, then the literary centre of the Low Countries, where he was living in 1542 when the French besieged the town He was taken prisoner and confined for nine months in France, till he obtained his freedom by a heavy ransom He was rewarded, however, for his services by a grant of arms from Charles V He finally returned to Portugal in 1545, and in 1548 he was appointed chief keeper of the archives and royal chronicler

In 1558 he was given a commission to write a history of the reign of King Manoel and the first part of this great work appeared in 1566

Damião de Goes was a man of wide culture and genial manners, and a skilled musician He wrote both Portuguese and Latin with classic strength and simplicity, and his style is free from affectation and rhetorical ornaments. His portrait by Albrecht Durer shows an open, intelligent face, and the record of his life proves him to have been upright and fearless But his historical work gave umbrage to the great families; a denunciation to the Inquisition in 1545 was taken up later and in 1571 he was arrested He was sentenced to a term of reclusion at the monastery of Batalha Later he was allowed to return home but died suddenly on Jan 30, 1574.

BIBLIOGRAPHY.—His Portuguese works include *Chronica do felicissimo rei Dom Emanuel* (parts I. and II, 1566, parts III and IV, 1567); other editions appeared in Lisbon in 1619 and 1749 and in Coimbra in 1790; *Chronica do principe Dom Joam* (1558), with subsequent editions in 1567 and 1724 in Lisbon and in 1790 and 1905 in Coimbra; *Livro de Marco Tullio Ciceram chamado Catam Mayor* (Venice, 1538). This is a translation of Cicero's *De senectute* His Latin works comprise· (1) *Legatio magni imperatoris Presbiteri Joannis*, etc. (Antwerp, 1532); (2) *Legatio Davidis Ethiopiae regis*, etc. (Bologna, 1533); (3) *Commentarii rerum gestarum in India* (Louvain, 1539); (4) *Fides, religio, moresque Aethiopum* (Louvain, 1540), incorporating Nos. (1) and (2); (5) *Hispania* (Louvain, 1542), (6) *Aliquot epistolae Sadoleti Bembi et aliorum clarissimorum virorum*, etc. (Louvain, 1544), (7) *Damiani a Goes equitis Lusitani aliquot opuscula* (Louvain, 1544); (8) *Urbis Lovaniensis obsidia* (Lisbon, 1546), (9) *De bello Cambaico ultimo* (Louvain, 1549); (10) *Urbis Olisiponensis descriptio* (Evora, 1554); (11) *Epistola ad Hieronymum Cardosum* (Lisbon, 1556).

See Joaquim de Vasconcellos, *Goesiana* (Porto, 1879–97); Guilherme J C Henriques, *Inedits Goesianos* (2 vols. 1896–98), A. P. Lopes de Mendonça, *Damião de Goes e a Inquisição de Portugal* (1859), Sousa Viterbo, *Damião de Goes e D Antonio Pinheiro* (Coimbra, 1895), M de Lemos, "Damião de Goes," in *Revista de Historia* (1920–22). (E P.; A. B.)

GOES, HUGO VAN DER (1440–1482), a painter of considerable celebrity at Ghent, was known to Vasari, as he is known to us, by a single picture in a Florentine monastery At a period when the family of the Medici had not yet risen from the rank of a great mercantile firm to that of a reigning dynasty, it employed as an agent at the port of Bruges Tommaso Portinari, a lineal descendant, it was said, of Folco, the father of Dante's Beatrix Tommaso, at that time patron of a chapel in the hospital of Santa Maria Nuova at Florence, ordered an altar-piece of Hugo van der Goes, and commanded him to illustrate the sacred theme of *Quem genuit adoravit* In the centre of a vast triptych, comprising numerous figures of life size, Hugo represented the Virgin kneeling in adoration before the new-born Christ attended by Shepherds and Angels. On the wings he portrayed Tommaso and his two sons in prayer under the protection of Saint Anthony and St Matthew, and Tommaso's wife and two daughters supported by St Margaret and St Mary Magdalen The triptych, which has suffered much from decay and restoring, was for over 400 years at Santa Maria Nuova, and is now in the Uffizi Gallery

There are also pieces in public galleries which claim to have been executed by Van der Goes The "Madonna" at Frankfurt; the diptych representing the "Fall" and the "Deposition" at Vienna These are probably early works To a maturer period may be ascribed the precious little triptych in the Liechtenstein collection representing the "Adoration of the Magi"; the two wings of and altar-piece from the Church of the Holy Trinity at Edinburgh now at Holyrood Castle; the "Death of the Virgin" at Bruges; the "Adoration of the Shepherds" at Wilton House To his last years are ascribed two fine pictures painted on a large scale recently acquired by the Berlin Gallery from Spain representing the "Nativity" and the "Adoration of the Magi." Van der Goes, however was not only a painter of easel pieces He made his reputation at Bruges by producing coloured hangings in distemper. After he settled at Ghent, and became a master of his gild in 1467, he designed cartoons for glass windows He also made decorations for the wedding of Charles the Bold and Margaret of York in 1468, for the festivals of the Rhetoricians and papal jubilees on repeated occasions, for the solemn entry of Charles the Bold into Ghent in 1470–1471 and for the funeral of Philip the Good in 1474 About the year 1475 he retired to the monastery of Rouge Cloître near Ghent, where he took the cowl There, though he still clung to his profession, he seems to have taken to drinking, and at one time to have shown decided symptoms of insanity But his superiors gradually cured him of his intemperance, and he died in the odour of sanctity in 1482.

See Joseph Destrée, *H v d Goes* (1914), Max J Friedländer, *Hugo v der Goes* (1926); Sir Martin Conway, *The Van Eycks and their Followers* (1921).

GOES, a town in the province of Zeeland, Holland, on the island of South Beveland, 11½ m by rail E. of Middelburg Pop. (1925) 8,748 The town had its origin in the castle of Oostende, and received a charter early in the 15th century from the countess Jacoba of Holland, who frequently stayed at the castle It is connected by a short canal with the East Scheldt, and has a good harbour (1819) defended by a fort The principal

buildings are the Gothic church (1423) and the old town hall (restored 1771). It is a centre of the linen industry and a market for wheat.

GOETHALS, GEORGE WASHINGTON (1858–1928), American engineer and major-general of the U S army, was born in Brooklyn, N.Y., on June 29, 1858. He graduated from West Point military academy in 1880. From 1880–85 he served in the U S regular army as an engineer officer, and was at various periods an instructor at West Point. From 1891–95 he was in charge of Tennessee river improvements, the Muscle Shoals canal and the design and construction of the Colbert Shoals lock. He was assistant to the chief of engineers, U S army (1895–98), and after serving for a few months as chief engineer of the First Army Corps received his honourable discharge from service in the U S volunteers in 1898. As a major (1900–03) he was in charge of the river and harbour works from Block island to Nantucket, and of the design and construction of Narragansett bay fortifications at New Bedford and at Newport, R.I. From 1903 to 1907 he served on the general staff of the U S army. In 1907 he was appointed by President Roosevelt a member of the Isthmian canal commission, at which time he became a lieutenant colonel, and afterwards became chairman and chief engineer. In 1909 he was promoted to the rank of colonel.

The work, hitherto in charge of civilian engineers, was reorganized and directed by army engineers subject to the control of the president of the United States. Several changes of plan, such as widening the canal, were inaugurated. On Aug. 15, 1914, Goethals completed his task and the canal was declared open to world commerce (*see* PANAMA CANAL). Col. Goethals was appointed the first civil governor of the Canal Zone by President Wilson in 1914 and in the following year was made a major-general. He resigned the governorship in 1916 and at his own request was placed on the retired list of the army. He was then appointed chairman of the board constituted to report on the Adamson eight-hour law. He served for a few months as general manager of the emergency fleet corporation, U S shipping board, but having little faith in the plan for a wooden fleet, resigned. He returned to private practice until Dec. 11, 1917, when he was recalled to active duty as acting quartermaster-general, U S army, becoming in 1918 chief of the division of purchase, storage and traffic. He was also a member of the war industries board. At his request he was relieved from active service in March 1919, and became engaged in the practice of consulting engineering (civil and electrical) in New York city.

After an illness of eight months, Maj.-Gen. Goethals died at his home in New York city, Jan. 21, 1928. (J. B. Bi.)

GOETHE, JOHANN WOLFGANG VON (1749–1832), greatest of German poets, was born at Frankfurt-on-Main. He came, on his father's side, of Thuringian stock, his great-grandfather, Hans Christian Goethe, having been a farrier at Artern-on-the-Unstrut, about the middle of the 17th century. Hans Christian's son, Georg Friedrich, was brought up to the trade of a tailor, and in this capacity settled in Frankfurt in 1687. A second marriage, however, brought him into possession of the Frankfurt inn, "Zum Weidenhof," and he ended his days as a well-to-do innkeeper. His son, Johann Kaspar, the poet's father (1710–1782), studied law at Leipzig, and subsequently travelled in Italy. He hoped, on his return to Frankfurt, to obtain an official position in the government of the free city, but he had not sufficient personal influence to attain this end. In his disappointment he resolved never again to offer his services to his native town, and retired into private life. In 1742 he acquired, as a consolation for the public career he had missed, the title of *kaiserlicher Rat*, and in 1748 married Katharina Elisabeth (1731–1808), daughter of the *Schultheiss* or *Burgermeister* of Frankfurt, Johann Wolfgang Textor. The poet was the eldest son of this union. Of the later children only one, Cornelia (b. 1750), survived the years of childhood; she died as the wife of Goethe's friend, J. G. Schlosser, in 1777. The best elements in Goethe's genius came from his mother's side; of a lively, impulsive disposition, and gifted with remarkable imaginative power, Frau Rat, who was hardly 18 when her son was born, was the ideal mother of a poet. From his father, whose stern, somewhat pedantic nature repelled warmer feelings on the part of the children, Goethe inherited, besides an unamiable stiffness of manner which grew on him with the years, that stability of character which brought him unscathed through temptations and passions, and held the balance to his all too powerful imagination.

Unforgettable is the picture which the poet has left us of his childhood spent in the large house with its many nooks and crannies in the Grosse Hirschgraben at Frankfurt. Books, pictures, objects of art, antiquities, reminiscences of Rat Goethe's visit to Italy, above all a marionette theatre, kindled the child's quick intellect and imagination. His education was conducted in its early stages by his father, and was later supplemented by tutors. Meanwhile the varied and picturesque life of Frankfurt was in itself a liberal education. In 1759, during the Seven Years' War, the French, as Maria Theresa's allies, occupied the town, and, much to the irritation of Goethe's father, who was a stanch partisan of Frederick the Great, a French lieutenant, Count Thoranc, was quartered on the Goethe household. The foreign occupation also led to the establishment of a French troupe of actors, and to their performances the boy, through his grandfather's influence, had free access. One of Goethe's most vivid memories was the picturesque coronation of the emperor Joseph II. in the Frankfurt Romer or town hall in 1764; he also dwells at some length in his autobiography on his first love affair. The object of this passion was a certain Gretchen, who seems to have taken advantage of the boy's interest in her to further the dishonest ends of one of her friends. The discovery of the affair and the investigation that followed cooled Goethe's ardour and caused him to turn his attention seriously to the studies which were to prepare him for the university. Meanwhile his literary instinct had begun to show itself; we hear of a novel in letters—a kind of linguistic exercise, in which the characters carried on the correspondence in different languages—of a prose epic on the subject of Joseph, and various religious poems of which one, *Die Hollenfahrt Christi*, found its way in a revised form into the poet's complete works.

In Oct. 1765, Goethe, then a little over 16, left Frankfurt for Leipzig, where a wider life awaited him. He entered upon his university studies with zeal, but his education in Frankfurt had not been the best preparation for the scholastic methods which still dominated the German universities, of his professors, only Gellert seems to have won his interest, and that interest was soon exhausted. The literary beginnings he had made in Frankfurt now seemed to him worthless; he committed them to the flames; and, under the guidance of E. W. Behrisch, a genial, if somewhat eccentric comrade, he turned over a new leaf, he acquired the art of writing those light Anacreontic lyrics which appealed to the taste of the polite Leipzig society of the day. Artificial as this poetry is, Goethe was, nevertheless, inspired by a real passion in Leipzig, namely, for Anna Katharina Schonkopf, the daughter of a wine-merchant at whose tavern he dined. She is the "Annette" after whom the collection of lyrics discovered in 1897 was named, although it must be added that neither these lyrics nor the *Neue Lieder*, published in 1770, let us see very much of Goethe's real feelings for Kathchen Schonkopf. To his Leipzig student-days belong also two small plays in Alexandrines, *Die Laune des Verliebten*, a comedy in one act, which reflects the lighter side of the poet's love affair, and *Die Mitschuldigen* (published in a revised form, 1769), a more sombre production, in which comedy is incongruously mingled with tragedy. In Leipzig Goethe also had time for what remained one of the abiding interests of his life, for art; he regarded A. F. Oeser (1717–1799), the director of the academy of painting in the Pleissenburg, who gave him lessons in drawing, as the teacher by whom he was most influenced in Leipzig. His art studies were also furthered by a short visit to Dresden. His stay in Leipzig came, however, to an abrupt conclusion, the distractions of student life proved too much for his strength, a sudden haemorrhage supervened, and he lay long ill, first in Leipzig, and, after it was possible to remove him, at home in Frankfurt. These months of slow recovery were a time of serious introspection for Goethe. He still corresponded with his Leipzig friends, but the tone of his letters changed; life had become more

serious for him He pored over books on occult philosophy; he busied himself with alchemy and astrology. A friend of his mother's, Susanne Katharina von Klettenberg, who belonged to pietist circles in Frankfurt, turned the boy's thoughts to religious mysticism.

On his recovery his father resolved that his legal studies should be completed at Strasbourg, a city, which although then outside the German empire, was, in respect of language and culture, wholly German From the moment Goethe set foot in the narrow streets of the Alsatian capital, in April 1770, the whole current of his thought seemed to change The Gothic architecture of the Strasbourg minster became to him the symbol of a national and German ideal, directly antagonistic to the French tastes and the classical and rationalistic atmosphere that prevailed in Leipzig An event of the first importance in Goethe's Strasbourg period was his meeting with Herder, who spent some weeks in Strasbourg undergoing an operation In this thinker, who was his senior by five years, Goethe found the master he sought; Herder taught him the significance of Gothic architecture, revealed to him the beauty of nature unadorned, and inspired him with enthusiasm for Shakespeare and the *Volkslied* Meanwhile Goethe's legal studies were not neglected, and he found time to add to his knowledge in other fields, notably medicine Another factor of importance in Goethe's Strasbourg life was his love for Friderike Brion, the daughter of an Alsatian village pastor in Sesenheim Even more than Herder's precept and example, this passion showed Goethe how trivial and artificial had been the Anacreontic and pastoral poetry, which had occupied him in Leipzig, and the lyrics inspired by Friderike, such as *Kleine Blumen, kleine Blatter* and *Wie herrlich leuchtet mir die Natur!* mark the beginning of a new epoch in German lyric poetry The idyll of Sesenheim, as described in *Dichtung und Wahrheit,* is one of the beautiful love-stories in the literature of the world From the first, however, it was clear that Friderike Brion could never become the wife of the Frankfurt patrician's son, an unhappy ending to the romance was unavoidable, and, as is to be seen in passionate outpourings like *Wanderers Sturmlied,* and in the bitter self-accusations of *Clavigo,* it left deep wounds on the poet's sensitive nature

In Strasbourg Goethe probably planned his first important drama, *Gotz von Berlichingen* In estimating this drama we must bear in mind Goethe's own life, and the turbulent spirit of his age, rather than the historical facts, which the poet found in an autobiography of his hero published in 1731 The latter supplied only the rough materials, the Gotz von Berlichingen whom Goethe drew, with his humane ideals of justice and his enthusiasm for freedom, is a very different personage from the unscrupulous robber-knight of the 16th century There is no historical justification for the vacillating Weislingen in whom Goethe executed poetic justice on himself as the lover of Friderike, or for the women of the play, the gentle Maria, the heartless Adelheid But there is genial, creative power in all the characters, and a vigorous dramatic life in the play's action, irresistible in its appeal even to a modern audience With *Gotz von Berlichingen* the Shakespearian form of drama was established on the German stage, and the literary movement known as *Sturm und Drang* inaugurated

Having received his licence to practice as an advocate, Goethe returned home in Aug 1771, and began his initiation into the routine of his profession In the following year, in order to gain further experience in the practical side of his calling, he spent four months at Wetzlar, where the imperial law-courts were established But Goethe's professional duties had only a small share in the eventful years which lay between his return from Strasbourg and that visit to Weimar at the end of 1775, which turned the whole course of his career, and resulted in his permanent attachment to the Weimar court Goethe's life in Frankfurt was a round of stimulating literary intercourse, in J H Merck (1741–1791), an army official in the neighbouring town of Darmstadt, he found a friend and mentor, whose irony and common sense served as a corrective to his own exuberance of spirits Wetzlar brought new friends and another passion, that for Charlotte Buff, the daughter of the *Amtmann* there—an episode which has been immortalized in *Werthers Leiden;* again the young poet was obsessed by a love which was this time strong enough to bring him to the brink of that suicide which forms the culmination of the novel. A visit to the Rhine, where new interests and the attractions of Maximiliane von Laroche, a daughter of Wieland's friend, the novelist Sophie von Laroche, brought partial healing, his intense preoccupation with literary work on his return to Frankfurt did the rest In 1775 Goethe was attracted by still another type of woman, Lili Schonemann, whose mother was the widow of a wealthy Frankfurt banker A formal betrothal took place, and the beauty of the lyrics which Lili inspired leaves no room for doubt that here was a passion no less genuine than that for Friderike or Charlotte But the gay, social world in which Lili moved was not congenial to him A visit to Switzerland in the summer of 1775 may not have weakened his affection for her, but he began to see that marriage would impose intolerable fetters upon him, and without tragic consequences on either side, the engagement was allowed to lapse Goethe's departure for Weimar in November brought about the final break

The period from 1771 to 1775 was, in literary respects, the most productive of the poet's life. It had been inaugurated with *Gotz von Berlichingen* and a few months later this tragedy was followed by another, *Clavigo,* peopled with equally living figures, and reflecting even more faithfully than *Gotz* the emotional experience Goethe had gone through in Strasbourg Again poetic justice is effected on the unfortunate hero who is persuaded to choose his own personal advancement in preference to his duty to the woman he loves; more pointedly than in *Gotz* is this moral enforced, Clavigo's tragic end is due not so much to this defiance of moral laws, as to his vacillation and want of character With *Die Leiden des jungen Werthers* (1774), the literary precipitate of the author's own experiences in Wetzlar, Goethe succeeded in attracting, as no German had done before him, the attention of Europe Once more it was the gospel that the world belongs to the strong in will, which lay beneath the surface of this romance This, however, was not what Goethe's contemporaries read out of it, nor did they appreciate the wide range of spiritual experience which the book contains *Werther* was to them merely a sentimental story of a lovelorn youth whose burden becomes too great for him to bear While *Gotz* inaugurated the manlier side of the *Sturm und Drang* literature, *Werther* was responsible for its sentimental excesses In *Stella,* "a drama for lovers" (1776), the poet again reproduced, if with less fidelity than in *Werther,* certain aspects of his own love troubles A lighter vein is to be observed in various dramatic satires written at this time such as *Gotter, Helden und Wieland* (1774), *Hanswursts Hochzeit, Fastnachtsspiel vom Pater Brey, Satyros,* and in the *Singspiele, Erwin und Elmire* (1775) and *Claudine von Villa Bella* (1776), while to the *Frankfurter Gelehrte Anzeiger* (1772–73), Goethe contributed vigorous and provocative criticism The exuberance of the young poet's genius is also to be seen in the many unfinished fragments of this period, at one time we find him occupied with dramas on *Caesar* and *Mahomet,* at another with an epic on *Der ewige Jude,* and again with a tragedy on *Prometheus,* of which a magnificent fragment has passed into his works Greatest of all the torsos of this period, however, was his dramatization of the legend of *Faust* Thanks to a manuscript copy of the play in its earliest form—discovered as recently as 1887, and known as the *Urfaust*—we now know exactly how much of *Faust* was the immediate product of the *Sturm und Drang,* and are able to understand the intentions with which the young poet began his masterpiece Goethe's hero changed with the author's riper experience and with his new conceptions of man's place and duties in the world, but the Gretchen tragedy was taken over into the finished poem, practically unaltered, from the earliest draft of the poem With these wonderful scenes, the most intensely tragic in German literature, Goethe's poetry in this period reaches its climax. Still another important work, however, was conceived, and in large measure written at this time, the drama of *Egmont,* which was not published until 1788 This work may, to some extent, be regarded as complementary to *Faust;* it presents the lighter, more cheerful and optimistic side of Goethe's outlook on life in these years, Graf Egmont, the most winning and fascinat-

ing of the poet's heroes, is endowed with that "daimonic" power over the sympathies of men and women, which Goethe himself possessed in so high a degree But *Egmont* is but an indifferent drama. it has little plot and its interest depends almost solely on two characters, Egmont himself and Klarchen, the young girl of the people whom he loves.

In Dec 1774 the young "hereditary prince" of Weimar, Karl August, passing through Frankfurt on his way to Paris, came into touch with Goethe, and invited the poet to visit him in Weimar In Oct 1775 the invitation was repeated, and on Nov 7 Goethe arrived in the little Saxon capital which was to remain his home for the rest of his life During the first few months in Weimar the poet gave himself up to the pleasures of the moment as unreservedly as his patron, indeed, the Weimar court even looked upon him for a time as a tempter who led the young duke astray But the latter, although himself a mere stripling, had implicit faith in Goethe's judgment, and enlisted his services in the government of the duchy Goethe was not long in Weimar before he was entrusted with responsible state duties, and events justified the duke's confidence Goethe displayed as minister of state, both energy and foresight. He interested himself in agriculture, horticulture and mining, which were of paramount importance to the welfare of the duchy, and these interests led to his preoccupation with the natural sciences which took up so much of his time in later years The inevitable love-interest was also not wanting As Friderike had fitted into the background of Goethe's Strasbourg life, Lotte into that of Wetzlar, and Lili into the gaieties of Frankfurt, so now Charlotte von Stein, the wife of a Weimar official, was the appropriate muse of Goethe's Weimar life We possess only the poet's share of his correspondence with Frau von Stein, but it may be inferred from it that, of all Goethe's loves, she was intellectually the most worthy of him Frau von Stein was a woman of refined literary taste and culture, seven years older than he and the mother of seven children. She dominated the poet's life for 12 years, until his journey to Italy in 1786–1788. Of other events of this period the most notable were two winter journeys, the first in 1777, to the Harz mountains, the second, two years later, to Switzerland—journeys which gave Goethe opportunity for that introspection and reflection for which his Weimar life had left him little time On the second of these journeys he revisited Friderike in Sesenheim, saw Lili, who had married and settled in Strasbourg, and made the personal acquaintance of J K Lavater in Zurich

The literary results of these years cannot be compared with those of the preceding period, they are virtually limited to a few wonderful lyrics, such as *Wanderers Nachtlied, An den Mond, Gesang der Geister uber den Wassern*, ballads, such as *Der Erlkonig*, a delicate little drama, *Die Geschwister* (1776), in which the poet's relations to both Lili and Frau von Stein seem to be reflected, a dramatic satire, *Der Triumph der Empfindsamkeit* (1778), and a number of *Singspiele, Lila* (1777), *Die Fischerin, Scherz, List und Rache*, and *Jery und Bately* (1780) But greater works were in preparation. A religious epic, *Die Geheimnisse*, and a tragedy *Elpenor*, did not, it is true, advance much further than plans, but in 1777, under the influence of the theatrical experiments at the Weimar court, Goethe began to write a novel of the theatre on a large scale which was to have borne the title *Wilhelm Meisters theatralische Sendung* A manuscript copy of the novel in this early form was discovered as recently as 1910. In 1779 he himself took part in a representation before the court at Ettersburg, of his drama *Iphigenie auf Tauris* This *Iphigenie* was, however, in prose, in the following year Goethe refashioned it in iambics, but it was not until he went to Italy that it received the form we know

In Sept 1786 Goethe set out from Carlsbad where he had been on holiday—secretly and stealthily, his plans known only to his servant—on that memorable journey to Italy, to which he had looked forward with such intense longing, he could not cross the Alps quickly enough, so impatient was he to set foot in Italy He travelled by way of Munich, the Brenner and Lago di Garda to Verona and Venice, and from thence to Rome, where he arrived on Oct 29, 1786 Here he gave himself up unreservedly to the new impressions which crowded on him, and he was soon at home in the circle of German artists there In the spring of 1787 he extended his journey to Naples and Sicily, returning to Rome in June 1787, where he remained until his final departure for Germany on April 2, 1788 It is difficult to exaggerate the importance of Goethe's Italian journey He himself regarded it as a kind of climax to his life, never before had he attained such complete understanding of his genius and mission as a poet; it afforded him a vantage-ground from which he could renew the past and make plans for the future In Weimar he had already felt that he was no longer in sympathy with the *Sturm und Drang*, but it was Italy which first initiated him into that neo-classicism which superseded *Sturm und Drang* in German poetry To the modern reader, impressed by Goethe's extraordinary sensitiveness to impressions, it may seem strange that his interests in Italy were so limited, for, after all, he had eyes for comparatively little of what Italy had to offer He went to Rome in Winckelmann's footsteps, it was the antique he sought, and he was interested in the artists of the Renaissance only in so far as he saw in them the heirs of antiquity The calm beauty of Greek tragedy is seen in the new iambic version of *Iphigenie auf Tauris* (1787), the classicism of the Renaissance gives the ground-tone to the drama of *Torquato Tasso* (1790), in which the conflict of poetic genius with the prosaic world is transmuted into imperishable poetry Classic, too, in this sense, were the plans of a drama on *Iphigenie auf Delphos* and of an epic, *Nausikaa* Most interesting of all, however, is the reflection of the classic spirit in works already begun in earlier days, such as *Egmont* and *Faust* The former drama was finished in Italy, the latter was brought a step forward, part of it being published as a *Fragment* in 1790

Disappointment in more senses than one awaited Goethe on his return to Weimar He came back from Italy with a new philosophy of life, a philosophy at once classic and pagan, and with new ideals of literary beauty But Germany had not advanced, in 1788 his countrymen were still admirers of that *Sturm und Drang* from which the poet had fled The times seemed to him more out of joint than ever, and he withdrew into himself Even his relations to the old friends were changed Frau von Stein had not known of his flight to Italy until he had been several weeks there, but he looked forward to her welcome on his return The months of absence, however, the change he had undergone, and, doubtless, lighter loves which had beguiled his leisure in Rome, weakened the Weimar ties, if he left Weimar as Frau von Stein's lover he returned only as her friend, and she naturally resented the change Goethe, meanwhile, continuing the freer customs to which he had adapted himself in Rome, took into his household Christiane Vulpius (1765–1816), a young girl who could offer him no kind of intellectual companionship But Christiane gradually filled a gap in the poet's life, she gave him, unobtrusively, without making demands on him, the comforts of a home She was not accepted by court society, she was indifferent to the fact that even Goethe's intimate friends ignored her, but she, who had suited the poet's whim when he desired to shut himself off from all that might dim the recollection of Italy, became with the years an indispensable helpmate to him On the birth in 1789 of his son, Goethe had some thought of legalizing his relations with Christiane, but this intention was not realized until 1806, when the invasion of Weimar by the French made both life and property insecure

The period of Goethe's life which succeeded his return from Italy was restless and unsettled, relieved of his state duties, he returned in 1790 to Venice, only to be disenchanted with the Italy he had loved so intensely a year or two before A journey with the duke of Weimar to Breslau followed, and in 1792 he accompanied his master on that campaign against France which ended ingloriously for the German arms at Valmy In later years Goethe published his account of this *Campagne in Frankreich* as also of the *Belagerung von Mainz*, at which he was present in 1793 His literary work naturally suffered under these distractions *Tasso*, and the edition of the *Schriften* in which it was to appear, had still to be completed on his return from Italy, the *Romische Elegien*, perhaps the most Latin in form and content of all his works,

were published in 1795, and the *Venezianische Epigramme,* the result of the second visit to Italy, in 1796 The French Revolution, in which all Europe was engrossed, was in Goethe's eyes only another proof that the passing of the old régime meant the abrogation of law and order, and he gave voice to his antagonism to the new democratic principles in the dramas *Der Gross-Cophta* (1792), *Der Burgergeneral* (1793), and in the unfinished fragments *Die Aufgeregten* and *Das Madchen von Oberkirch.* The spirited translation of the epic of *Reineke Fuchs* (1794) he took up as a relief and an antidote to the perplexing state of the time Two new interests, however, strengthened the ties between Goethe and Weimar—ties which the Italian journey had threatened to sever his appointment in 1791 as director of the ducal theatre, a post which he occupied for 22 years, and his absorption in scientific studies In 1790 he published his important *Versuch, die Metamorphose der Pflanzen zu erklären,* which was even more fundamental for the new science of comparative morphology than his discovery some six years earlier of traces of a structure in the human jaw-bone analogous to the intermaxillary bone in apes; and in 1791 and 1792 appeared two parts of his *Beitrage zur Optik.*

Meanwhile, however, Goethe had again taken up the novel of the theatre which he had begun years before, with a view to its inclusion in the edition of his *Neue Schriften* (1792-1800) *Wilhelm Meisters theatralische Sendung* became *Wilhelm Meisters Lehrjahre;* the novel of purely theatrical interests was widened out to embrace the history of a young man's apprenticeship to life The change of plan explains, although it may not exculpate, the formlessness and loose construction of the work A hero, who was probably originally intended to demonstrate the failure of the vacillating temperament when brought face to face with the problems of the theatre, proved ill-adapted to demonstrate those precepts for the guidance of life with which the *Lehrjahre* closes, unstable of purpose, *Wilhelm Meister* is not so much an illustration of the author's life-philosophy as a lay-figure on which he demonstrates his views *Wilhelm Meister* is, however, a work of extraordinary variety, its scenes ranging from the commonplace realism of the troupe of strolling players to the poetic romanticism of Mignon and the harper; its pages of intuitive criticism—notably of *Hamlet*—add to its value as a *Bildungsroman* in the best sense of that word Of all Goethe's works, this exerted the most immediate and lasting influence on German literature, it served as a model for the best fiction of the next 30 years

In completing *Wilhelm Meister,* Goethe found a sympathetic critic in Schiller, to whom he owed in great measure his renewed interest in poetry. After years of tentative approach on Schiller's part, years in which that poet was not even himself clear that he desired a friendly understanding with Goethe, the favourable moment arrived It was in June 1794, when Schiller was seeking collaborators for his new periodical *Die Horen;* and his invitation addressed to Goethe was the beginning of a friendship which continued unbroken until the younger poet's death The friendship of Goethe and Schiller, of which their correspondence is a priceless record, had, however, its limitations, it was essentially a literary friendship, a certain barrier of personal reserve being maintained to the last As far as actual work was concerned, Goethe went his own way as he had always been accustomed to do, but the mere fact that he devoted himself with increasing interest to literature was due to Schiller's stimulus. It was Schiller who induced him to undertake those studies on the nature of epic and dramatic poetry which resulted in the epic of *Hermann und Dorothea* and the fragment of the *Achilleis;* without the friendship there would have been no *Xenien* and no ballads, and it was again, his younger friend's encouragement which induced Goethe to betake himself once more to the "misty path" of *Faust,* and bring the first part of that drama to a conclusion

Goethe's share in the *Xenien* (1796) may be briefly mentioned This collection of distichs, written in collaboration with Schiller, was prompted by the indifference and animosity of contemporary criticism, and its disregard for what the two poets regarded as the higher interests of German poetry The *Xenien* succeeded as a retaliation on the critics, but the masterpieces with which both poets justified their attack, were in the long run a more effective antidote to the prevailing mediocrity. The collection of stories, *Unterhaltungen deutscher Ausgewanderten* (1797) was unworthy of Goethe's genius, and the translation of Benvenuto Cellini's *Life* (1796–1797) was only a translation. But in 1798 appeared *Hermann und Dorothea,* one of Goethe's most perfect poems. It is indeed remarkable—when we consider by how much theoretic discussion the composition of the poem was preceded and accompanied—that it should make upon the reader so simple and unsophisticated an impression; in this respect it is the triumph of an art that conceals art Goethe has here taken a simple story of village life, mirrored in it the most pregnant ideas of his time, and presented it with a skill which may well be called Homeric; but he has discriminated with the insight of genius between the Homeric method of reproducing the heroic life of primitive Greece and the same method as adapted to the commonplace happenings of 18th century Germany In this respect, he was guided by a forerunner who had depicted the life of the German people in the epic manner and in hexameters, J. H Voss, the author of *Luise.* Hardly less imposing in their calm, placid perfection are the poems with which, in friendly rivalry, Goethe seconded the more popular ballads of his friend; *Der Zauberlehrling, Der Gott und die Bayadere, Die Braut von Korinth, Alexis und Dora, Der neue Pausias* and *Die schone Mullerin*—the latter a cycle of poems in the style of the *Volkslied* —are among the masterpieces of Goethe's poetry On the other hand, even the friendship with Schiller did not help him to add to his reputation as a dramatist *Die natürliche Tochter* (1803), the first part of a trilogy, in which he proposed to embody his ideas of the Revolution on wide canvas, did not get beyond this Goethe's abstract classic principles, when applied to the swift, direct art of the theatre, were ineffective, and *Die naturliche Tochter,* notwithstanding its good theoretic intention, remains the most lifeless and shadowy of all his dramas. Even less in touch with the living present were the various prologues and *Festspiele,* such as *Palaophron und Neoterpe* (1800), *Was wir bringen* (1802), which in these years he composed for the Weimar theatre

Goethe's classicism brought him into inevitable antagonism with the new Romantic movement which had been inaugurated in 1798 by the *Athenaum,* edited by the brothers Schlegel. The sharpness of the conflict was, however, blunted by the fact that, without exception, the young Romantic writers looked up to Goethe as their master, they modelled their fiction on *Wilhelm Meister;* they regarded his lyrics as the highwater mark of German poetry, Goethe, Novalis declared, was the "Statthalter of poetry on earth " With regard to painting and sculpture, however, Goethe felt that a protest was necessary, if the ideas propounded in works like Wackenroder's *Herzensergiessungen* were not to bring back the confusion of the *Sturm und Drang;* and, as a rejoinder to the Romantic theorists, Goethe, in conjunction with his Swiss friend, Heinrich Meyer (1760–1832), published from 1798 to 1800 an art review, *Die Propylaen* In *Winckelmann und Sein Jahrhundert* (1805) Goethe defended the classical ideal of beauty in art. But in the end he himself proved the greatest enemy to the strict classical doctrine by the publication in 1808 of the completed first part of *Faust,* a work which was accepted by contemporaries as a triumph of Romantic art *Faust* is a patchwork of many colours. With the aid of the vast body of *Faust* literature which has sprung up in recent years, and the many new documents bearing on its history—above all, the so-called *Urfaust,* to which reference has already been made—we are able now to discriminate between the various phases of the work; on the original *Sturm und Drang* hero of the opening scenes and of the Gretchen tragedy—the brother of Gotz, and Clavigo—is superimposed, in the completed poem, a Faust of calmer moral and intellectual ideals, who corresponds to Hermann and Wilhelm Meister, in Goethe's work In its first form the poem was concerned with very definite personal problems, in the years of Goethe's friendship with Schiller it was widened to embody the higher strivings of 18th-century humanism; ultimately, in the second part, it became a vast allegory of human life and activity Thus the elements of which *Faust* is composed were even more difficult to

blend than were those of *Wilhelm Meister;* but the very want of uniformity is one source of the perennial fascination of the tragedy, and has made it in a peculiar degree the national poem of the German people, a mirror in which the national life and poetry are reflected, from the outburst of *Sturm und Drang* to the tranquil classicism of Goethe's maturity.

The third and final period of Goethe's long life may be said to have begun after Schiller's death. He never again lost touch with literature as he had done in the years which preceded his friendship with Schiller; but he stood in no active or immediate connection with the literary movement of his day His life moved on comparatively uneventfully. Even the era of Napoleonic oppression, 1806–1813, disturbed but little his equanimity Goethe, the cosmopolitan *Weltburger* of the 18th century, had himself no very intense feelings of patriotism, and, having seen Germany flourish as a group of small states under enlightened despotisms, he had little confidence in the dreamers of 1813 who hoped to see the glories of Barbarossa's empire revived Napoleon, moreover, he regarded not as the scourge of Europe, but as the defender of civilization against the barbarism of the Slavs; and in the famous interview between the two men at Erfurt the poet's admiration was reciprocated by the French conqueror Thus Goethe had no great sympathy for the war of liberation which in 1813 kindled young hearts from one end of Germany to the other, and when the national enthusiasm rose to its highest pitch he buried himself in those optical and morphological studies, which, with increasing years, occupied more and more of his time

The events and writings of the last 25 years of Goethe's life may be briefly summarized In 1805, as we have seen, he suffered an irreparable loss in the death of Schiller; in 1806, Christiane became his legal wife, and to the same year belongs the magnificent tribute to his dead friend, the *Epilog zu Schillers Glocke.* Two new friendships about this time kindled in the poet something of the passion of younger days Bettina von Arnim came into touch with Goethe in 1807, and her *Briefwechsel Goethes mit einem Kinde* (published in 1835) is, in its mingling of truth and fiction, one of the most delightful products of the Romantic mind, but the episode was of less importance in Goethe's eyes than Bettina would have us believe. On the other hand, his interest in Minna Herzlieb, foster-daughter of the publisher Frommann in Jena, was of a warmer nature, and has left its traces on the novel, *Die Wahlverwandtschaften* and on his sonnets

In 1808, as we have seen, appeared the first part of *Faust,* which in 1809 was followed by the novel just mentioned That novel, hardly less than the drama, effected a change in the public attitude towards the poet Since the beginning of the century the conviction had been gaining ground that Goethe's mission was accomplished, that the day of his leadership was over; but here were two works which not merely re-established his position, but proved that the old poet was in sympathy with the movement of letters, and keenly alive to the change of ideas which the new century had brought with it The intimate study of four minds, which forms the subject of the *Wahlverwandtschaften,* was an essay in a new type of psychological fiction and pointed out the way for developments of the German novel after the stimulus of *Wilhelm Meister* had exhausted itself Less important than *Die Wahlverwandtschaften* was *Pandora* (1810), the final product of Goethe's classicism and the most uncompromisingly classical and allegorical of all his works And in 1810, too, appeared his treatise *Zur Farbenlehre* In the following year the first volume of his autobiography was published under the title *Aus meinem Leben, Dichtung und Wahrheit.* The second and third volumes of this work followed in 1812 and 1814, the fourth, bringing the story of his life up to the close of the Frankfurt period in 1833, after his death Goethe felt, even late in life, too intimately bound up with Weimar to discuss in detail his early life there, and he shrank from carrying his biography beyond the year 1775 But a number of other publications—descriptions of travel, such as the *Italienische Reise* (1816–17), the materials for a continuation of *Dichtung und Wahrheit* collected in *Tag-und Jahreshefte* (1830) are important additions to the documents of his life Meanwhile, no less valuable biographical materials were accumulating in his diaries, his voluminous correspondence and his conversations, as recorded by J. P Eckermann, the chancellor F von Muller and F. Soret. Several periodical publications, *Über Kunst und Altertum* (1816-32), *Zur Naturwissenschaft uberhaupt* (1817-24), *Zur Morphologie* (1817-24), bear witness to the extraordinary width of Goethe's interests in these years Art, science, literature—little escaped his ken—and that not merely in Germany. English writers, Byron, Scott and Carlyle, Italians like Manzoni, French scientists and poets, could all depend on friendly words of appreciation and encouragement from Weimar

With *Westostlicher Diwan* (1819), Goethe had another surprise in store for his contemporaries, this is a collection of lyrics, matchless in form and more concentrated in their apophthegmatic expression than those of earlier days, it was suggested by a German translation of the Persian poet, Hafiz And, again, an actual passion—that for Marianne von Willemer, whom he met in 1814 and 1815—had rekindled in him the lyric fire Meanwhile the years were thinning the ranks of Weimar society Wieland, the last of Goethe's greater literary contemporaries, died in 1813, his wife in 1816, Charlotte von Stein in 1827 and Duke Karl August in 1828 Goethe's retirement from the direction of the theatre in 1817 meant for him a break with the literary life of the day In 1822 a passion for a young girl, Ulrike von Levetzow, whom he met at Marienbad, inspired the fine *Trilogie der Leidenschaft,* and between 1821 and 1829 appeared the long-expected and long-promised continuation of *Wilhelm Meister, Wilhelm Meisters Wanderjahre* The latter work, however, was a disappointment perhaps it could not have been otherwise Goethe had lost the thread of his romance, and it was difficult for him to find it again Problems of the relation of the individual to society and industrial questions were to have formed the theme of the *Wanderjahre;* but after the French Revolution these problems had entered on a new phase and demanded a method of treatment which it was not easy for the old poet to acquire Thus his intentions were only partially carried out, and the volumes were filled out by irrelevant stories, written at widely different periods

But the crowning achievement of Goethe's literary life was the completion of *Faust* The poem had accompanied him since early manhood and was the repository for the fullest "confession" of his life; it is the poetic epitome of his experience. The second part is far removed from the impressive realism of the *Urfaust* or even the classicism of the first part It is a phantasmagory, a drama the actors in which are not creatures of flesh and blood, but shadows in an unreal world of allegory The lover of Gretchen had, as far as poetic continuity is concerned, disappeared with the close of the first part In the second part it is virtually a new Faust who, accompanied by a new Mephistopheles, goes out into a world that is not ours Yet behind the elusive allegories of an imperial court with its financial difficulties, behind the classical *Walpurgisnacht,* the fantastic creation of the Homunculus, the noble Helena episode and the impressive mystery-scene of the close, where the centenarian Faust finally triumphs over the powers of evil, there lies a philosophy of life, a ripe wisdom born of experience, such as no other modern European poet has given us *Faust* has been well called the "divine comedy" of 18th-century humanism

The second part of *Faust* forms a worthy close to the life of Germany's greatest man of letters, who died in Weimar on March 22, 1832 His was the last of those universal minds which have been able to compass all domains of human activity and knowledge, for he stood on the brink of an era of rapidly expanding knowledge which has made forever impossible the universality of interest and sympathy which distinguished him As a poet, his fame has undergone many vicissitudes since his death, ranging from the indifference of the "Young German" school to the enthusiastic appreciation of the closing decades of the 19th century —an enthusiasm to which we owe the Weimar *Goethe-Gesellschaft* (founded in 1885) and a vast literature dealing with the poet's life and work That Goethe is Germany's greatest poet and the master of her classical literature has never been seriously questioned The intrinsic value of his poetic work, regarded apart from his personality, may be smaller in proportion to its

bulk than is the case with some lesser German poets and with the great poets of other literatures. But Goethe was a new type of literary man; a poet whose supreme greatness lay in his subjectivity. Only a small fraction of his poetical work sprang from what might be called a purely artistic and objective impulse; by far the larger—and the better—part is the immediate precipitate of his thought, emotions, and experiences

It is as a lyric poet that Goethe's supremacy is least likely to be challenged; he has given his nation, whose highest literary expression has in all ages been essentially lyric, its greatest songs. No other German poet has succeeded in attuning feeling, sentiment and thought so perfectly to the music of words as he, none has expressed so fully that subtle spirituality in which the strength of German lyrism lies Goethe's dramas, on the other hand, have not, in the eyes of his nation, succeeded in holding their own beside Schiller's; but the reason is rather because Goethe refused to be bound by the conventions of the theatre, than because he was deficient in the cunning of the dramatist. For, as a creator and interpreter of human character, Goethe is without a rival among modern poets, and there is not one of his plays that does not contain scenes and characters which bear indisputable testimony to this mastery *Faust* is Germany's most national drama, and it remains perhaps for the theatre of the future to prove itself capable of popularizing psychological masterpieces like *Tasso* and *Iphigenie*. As a novelist, Goethe has suffered most by the lapse of time The *Sorrows of Werther* no longer maintains its hold upon us, and even *Wilhelm Meister* and *Die Wahlverwandtschaften* require more understanding for the conditions under which they were written than do *Faust* or *Egmont* Goethe could fill his prose with rich wisdom, but he was the perfect artist only in verse

Less attention is nowadays paid to Goethe's work in other fields, work which he himself in some cases prized more highly than his poetry It is only as an illustration of his many-sidedness and his manifold activity that we now turn to his achievement as a statesman, as a practical political economist, as a theatre-director. His art-criticism is symptomatic of a phase of European taste to which the growing individualism of Romanticism was repugnant His scientific studies and discoveries now possess only an historical interest We marvel at the obstinacy with which he, with inadequate mathematical knowledge, opposed the Newtonian theory of light and colour, and at his championship of "Neptunism," the theory of aqueous origin, as opposed to "Vulcanism," that of igneous origin of the earth's crust. Of real importance was, on the other hand, his foreshadowing of the Darwinian theory in his works on the metamorphosis of plants and on biological morphology Indeed, the deduction to be drawn from Goethe's contributions to botany and anatomy is that he, as few of his contemporaries, possessed that type of scientific mind which, in the 19th century, has made for progress, he was Darwin's predecessor by virtue of his enunciation of what has now become one of the commonplaces of natural science—organic evolution Modern, too, was the outlook of the aging poet on the changing social conditions of the age and on its new political ideals, unexpectedly sympathetic his attitude towards modern industry, which steam was just beginning to establish on a new basis The Europe of his later years was very different from that of the enlightened autocracies of the 18th century, in which he had spent his best years; yet Goethe was at home in it too

From the philosophic movement, in which Schiller and the Romanticists were deeply involved, Goethe stood apart Comparatively early in life he had found in Spinoza the philosopher who responded to his needs, and for the subtle dialectic of later thinkers he had neither liking nor understanding As a convinced realist he took his standpoint on nature and experience, and could afford to look on with indifference at the battles of the metaphysicians Of Kant's work, however, he was not ignorant, and under Schiller's stimulus he learned from him, but of the younger thinkers, only Schelling, whose mystic nature-philosophy was akin to Spinoza's thought, touched a sympathetic chord in his nature As a moralist and a guide to the conduct of life—an aspect of Goethe's work which Carlyle, viewing him through the coloured glasses of Fichtean idealism, emphasized and interpreted not always justly—Goethe was a powerful force on German life in years of intellectual and political depression It is difficult even still to get beyond the maxims of practical wisdom he scattered so liberally through his works and the lessons to be learned from *Meister* and *Faust;* the calm optimism which never deserted Goethe, and was so completely justified by the tenor of his life, is still an uplifting element of his thought. If the philosophy of Spinoza provided the poet with a religion which made individual creeds and dogmas seem unnecessary, Leibnitz's doctrine of predestinism supplied the foundations for his faith in the divine purpose of human life

Goethe's many-sided activity is a tribute to the greatness of his mind and personality; we may see in him merely the embodiment of his particular age, or we may regard him as a poet "for all time"; but with one opinion all who have felt the power of Goethe's genius are in agreement—the opinion which was condensed in Napoleon's often cited words, uttered after the meeting at Erfurt· *Voilà un homme!* Of all modern men of genius, Goethe is the most universal It is the full, rich humanity of his personality—not the art behind which the artist disappears, or the definite pronouncements of the thinker or the teacher—that constitutes his claim to a place in the front rank of men of letters His life was his greatest work

BIBLIOGRAPHY —(*a*) *Collected Works, Diaries, Correspondence, Conversations* The following editions of Goethe's writings appeared in the poet's lifetime *Schriften* (Leipzig, 1787–90), *Neue Schriften* (1792–1800), *Werke* (13 vols, Stuttgart, 1806–10), *Werke* (26 vols, Stuttgart, 1815–22), *Werke* (Vollstandige Ausgabe letzter Hand) (40 vols, Stuttgart, 1827–30) Goethe's *Nachgelassene Werke* appeared as a continuation of this edition in 20 volumes (Stuttgart, 1832–42). These were followed by several editions of Goethe's *Samtliche Werke,* published by Cotta of Stuttgart. The first critical edition with notes was published by Hempel, Berlin, 1868–79 The standard edition is that published at Weimar between 1887 and 1919; it is divided into four sections I *W ke,* II *Naturwissenschaftliche Werke;* III *Tagebucher;* IV. *Briefe* Of other recent editions the most noteworthy are: *Samtliche Werke* (Jubilaums-Ausgabe), ed E von der Hellen (Stuttgart, 1902–7), *Werke,* ed K Heinemann (Leipzig, 1900 ff), the cheap edition of the *Samtliche Werke,* ed L Geiger (Leipzig, 1901), and the "Propylaen-Ausgabe" (Munich, 1909 ff) There are also innumerable editions of selected works, reference need only be made here to the useful collection of the early writings and letters by M Bernays, *Der junge Goethe* (Leipzig, 1875, new ed, 1909–11). A French translation of Goethe's *Œuvres complètes,* by J. Porchat, appeared at Paris in 1860–63. There is, as yet, no uniform English edition, but Goethe's chief works have all been frequently translated and most of them will be found in Bohn's Standard Library.

The definitive edition of Goethe's diaries and letters is that forming Sections III and IV of the Weimar edition Collections of selected letters based on the Weimar edition have been published by E von der Hellen (1901–13), and by P Stein (1901–24) Of the many separate collections of Goethe's correspondence mention may be made of the *Briefwechsel zwischen Schiller und Goethe,* edited by Goethe himself (1828–29), by H G Graf and A Leitzmann (1923), Eng trans (1877–79), *Briefwechsel zwischen Goethe und Zelter* (1833–34), Eng trans (1887); *Briefwechsel mit Bettina von Arnim,* ed R Steig (1922), *Goethes Briefe an Frau von Stein,* ed A Scholl (1848–51), ed J Wahle (1899–1900); *Briefwechsel zwischen Goethe und K F von Reinhard* (1850), *Briefwechsel zwischen Goethe und Knebel* (1851); *Briefwechsel zwischen Goethe und Staatsrat Schultz* (1853); *Briefwechsel des Herzogs Karl August mit Goethe* (1863; ed. H. Wahl, 1915–18), *Briefwechsel zwischen Goethe und Kaspar Graf von Sternberg* (1866), *Briefwechsel mit Christiane,* ed H G Graf (1923), *Briefwechsel mit H Meyer,* ed M Hecker (1920), *Goethes naturwissenschaftliche Korrespondenz,* and *Goethes Briefwechsel mit den Gebrudern von Humboldt* (ed F. T. Bratranek (1874–76), *Goethes und Carlyles Briefwechsel* (1887), also in English, *Goethe und die Romantik,* ed. C Schuddekopf and O. Walzel (1898–99), *Goethe und Lavater,* ed H Funck (1901), *Goethe und Österreich,* ed A Sauer (1902–4). Besides the correspondence with Schiller and Zelter, Bohn's library contains a translation of *Early and Miscellaneous Letters,* by E Bell (1884). The chief collections of Goethe's conversations are J P. Eckermann, *Gesprache mit Goethe* (1836, vol. iii., also containing conversations with Soret, 1848, ed H. H. Houben, 1926, Eng trans, 1850) *Cf* J Petersen, *Die Entstehung der Eckermannschen Gespräche* (1926) The complete conversations with Soret have been published in German translation by C A H. Burkhardt (1905); *Goethes Unterhaltungen mit dem Kanzler F. von Müller* (1870). Goethe's collected *Gesprache* were published by W. von Biedermann (1889–96); new ed. 1909–11

(*b*) *Biography.*—Goethe's autobiography, *Aus meinem Leben· Dichtung und Wahrheit,* appeared in three parts between 1811 and 1814, part iv in 1833 (Eng. trans, 1846), it is supplemented by other

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(*c*) *Criticism*—H. G. Graf, *Goethe uber seine Dichtungen* (1901–14), J W Braun, *Goethe im Urteile seiner Zeitgenossen* (1883–85); T. Carlyle, *Essays on Goethe* (1828–32), X Marmier, *Études sur Goethe* (1835), W. von Biedermann, *Goethe-Forschungen* (1879–99); J Minor and A Sauer, *Studien zur Goethe-Philologie* (1880), H Duntzer, *Abhandlungen zu Goethes Leben und Werken* (1881), A Scholl, *Goethe in Hauptzugen seines Lebens und Wirkens* (1882), V. Hehn, *Gedanken uber Goethe* (1884, 7th ed, 1909), W Scherer, *Aufsatze uber Goethe* (1886), Sir J R Seeley, *Goethe reviewed after Sixty Years* (1894); E. Dowden, *New Studies in Literature* (1895), É Rod, *Essai sur Goethe* (1898), M Morris, *Goethe-Studien* (1897–98, 2nd ed, 1902); A Luth r, *Goethe, sechs Vortrage* (1905), R Saitschik, *Goethes Charakter* (1898), W Bode, *Goethes Lebenskunst* (1900, 3rd ed, 1903), by the same, *Goethes Asthetik* (1901), T Vollbehr, *Goethe und die bildende Kunst* (1895), E Maas, *Goethe und die Antike* (1912), E. Lichtenberger, *Études sur les poésies lyriques de Goethe* (1878), T. Achelis, *Grundzuge der Lyrik Goethes* (1900), B. Litzmann, *Goethes Lyrik* (1903), R Riemann, *Goethes Romantechnik* (1901); R Virchow, *Goethe als Naturforscher* (1861); E Caro, *La Philosophie de Goethe* (1866, 2nd ed, 1870), R Steiner, *Goethes Weltanschauung* (1897), E. A Boucke, *Goethes Weltanschauung* (1897), F. Siebeck, *Goethe als Denker* (1902); F. Baldensperger, *Goethe en France* (1904), C Schrempf, *Goethes Lebensanschauung* (1905–7), H Loiseau, *L'Évolution morale de Goethe* (1911), B Croce, *Goethe* (Bari, 1919; Eng trans, 1923), K J. Obenauer, *Goethe in seinem Verhaltnis zur Religion* (1921), P Fischer, *Goethes Altersweisheit* (1921), H. A Korff, *Die Lebensidee Goethes* (1925)

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(*d*) *Bibliographical Works, Goethe-Societies &c*—S. Hirzel, *Verzeichnis einer Goethe-Bibliothek* (1884), to which G. von Loeper and W von Biedermann have supplied supplements. Goedeke's *Grundriss zur Geschichte der deutschen Dichtung* (vol iv, 3rd ed, 1910–13), and the bibliographies in the *Goethe-Jahrbuch* (1880–1913) Also K Hoyer, *Zur Einfuhrung in die Goethe-Literatur* (1904) On Goethe in England *see* E Oswald, *Goethe in England and America* (1899, 2nd ed, 1909); J M Carré, *Goethe en Angleterre* (1921); W Heinemann, *A Bibliographical List of the English Translations and Annotated Editions of Goethe's Faust* (1886)

A *Goethe-Gesellschaft* was founded at Weimar in 1885, its publications include the annual *Goethe-Jahrbuch* (1880–1913), now *Jahrbuch der Goethe-Gesellschaft* (1914 ff), and a series of *Goethe-Schriften* A *Goethe-Verein* has existed in Vienna since 1887, and an English Goethe society since 1886 (*Publications*, 1880–1910, new series 1924 ff) A complete list of the literature on Goethe up to 1913 is given in Goedeke's *Grundriss der deutschen Literaturgeschichte*, 3rd ed vol 4 (J G R)

GOETHITE, a mineral crystallizing in the orthorhombic system and isomorphous with diaspore and manganite (*q v*) It consists of an iron hydroxide, $Fe_2O_3H_2O$; first noticed in 1789, and named after the poet Goethe Crystals are prismatic, acicular or scaly in habit, they have a perfect cleavage in one direction Reniform and stalactitic masses with a radiated fibrous structure also occur The colour varies from yellowish or reddish to blackish-brown, and by transmitted light it is often blood-red, the streak is brownish-yellow, hardness, 5, specific gravity, 4 3 The best crystals are the brilliant, blackish-brown prisms with terminal pyramidal planes from the Restormel iron mines at Lostwithiel, and the Botallack mine at St Just, Cornwall A variety occurring as thin red scales at Siegen, Westphalia, is known as Rubinglimmer or pyrrhosiderite; lepidocrocite is a scaly-fibrous variety from the same locality

GOG, a hostile power that is to manifest itself in the world immediately before the end of things (Ezek xxxviii *sq*, Rev xx) Magog who is joined with Gog in the latter passage is the name of Gog's origin in the former In Gen x 2 (and Ezek. xxxviii 2) Magog appears to represent a locality in Armenia.

The legends attached to the gigantic effigies (dating from 1708 and replacing those destroyed in the Great Fire) of Gog and Magog in Guildhall, London, are of unknown date According to the *Recuyell des histoires de Troye*, Gog and Magog were the survivors of a race of giants descended from the thirty-three wicked daughters of Diocletian, after their brethren had been slain by Brute and his companions, Gog and Magog were brought to London (Troy-novant) and compelled to officiate as porters at the gate of the royal palace Effigies similar to the present existed in London as early as the time of Henry V

GOGH VAN, VINCENT (1853–1890), Dutch painter of the Post-Impressionist movement He was born on March 3, 1853, at Groot-Zundert, in Brabant, Holland, where his father was Calvinist pastor. At the age of 16 he worked in the firm of his uncle, a picture dealer at The Hague, and was later employed with Goupil and company in Paris and in London In 1876 he was art teacher in Ramsgate, and then determined to follow the religious vocation In 1877 he returned to Holland to study theology at Amsterdam Imbued with ideals of Christian communism, and seeking practical work, he went to live among the miners at Wasmes, in the Borinage There he spent his free time in drawing In 1880 he went to Brussels to take up the study of

painting, and then spent some years in his father's home in the village of Neunen, painting the simple life of the peasants, the moorland and still life His chief work of this period is "The Potato Eaters" (1885), a group of labourers sitting round a table, under a lamp, painted in heavy brown tones and displaying the hardship and ugliness of proletarian life Six lithographs of like subjects, of which only a few impressions are extant, were also executed at this time. He took some lessons from Mauve, who was his cousin. In 1885 he studied at the Academy at Antwerp, and a year later joined his brother, Théo, in Paris. At the studio of Cormon he met Emile Bernard, Anquetin and Toulouse-Lautrec, and joined in their revolt against slavish copying of nature. Through his brother, who was employed at Goupil, he was introduced to the Impressionist and Neo-Impressionist school, and he was persuaded to remove the browns and umbers from his palette and to paint with the clear, bright colours, and in the luminous divisionist technique of Seurat. He studied Japanese prints, and the works of Delacroix and Monticelli. "The Restaurant on Montmartre" (Luxembourg museum) was the first canvas painted in this luminous key The portraits of the colour man, Tanguy (1887) (example at the Rodin museum), show his more developed style. But only few works of his Parisian period have survived, and of the mural decoration of the café Tambourin only fragments remain After two years in Paris he longed to go south, and in Feb. 1888, with the financial aid of his brother, he settled at Arles, in Provence. There he painted the blossoming fruit trees, the fields bathed in sunlight, the cypresses and sunflowers, his simple room, his rustic chair, and his own portrait with keen and restless blue eyes and abnormal skull His models were the postman and his family, the innkeeper's wife ("L'Arlésienne") and the "Berceuse" Colour seemed to him vital, he revelled in it, using it thick and pure, in long and nervous brush strokes. "I am thinking of decorating my studio with half-a-dozen sunflowers," he wrote to his brother, "it will be a decorative effect in which the glaring or broken tones of chromes will stand out vividly against a background of variegated blue, ranging from the most delicate emerald green to royal blue, enclosed in narrow strips of golden yellow. It will produce the sort of effect that Gothic church windows do" He tried to render the very texture of things. His technique was not scientific and calculated, like that of Seurat, but almost barbaric in its display of intense emotion. In October, Gauguin, whom he had befriended in Paris, arrived in response to his pressing invitation. The two worked for a while together; but soon Van Gogh's nerves gave way, undermined by privation and strain and by undue exposure to the sun. One day he threatened his friend with a knife, and then, repentant, cut off his own ear. He was brought to the hospital, and though dismissed after a fortnight, had to be interned again in Feb 1889. The remainder of his life was passed under the shadow of insanity, though all the time he continued to paint. He was moved to St Remy, and in May 1890 to Auvers-sur-Oise, under the care of Dr. Gachet, whose portrait he painted (Frankfurt museum). His last work was the "Mairie au 14 juillet," a picture full of sunlight. He shot himself, and died on July 29, 1890

During his lifetime the only one who believed in his art and who helped him was his brother. Van Gogh's letters to him, dated from 1872 to his death, are moving documents describing his aims and his work.

See Maurice Denis, *De Gauguin et de van Gogh au Classicisme* (Occident XV, 1909); T Duret, *Vincent v. Gogh* (1916), J Meier-Graefe, *V. v Gogh* (Eng trans, 1928). Van Gogh's letters were first published in the *Mercure de France* (1893–95) Since then they have appeared in book form also in English translation. *Letters of a Post-Impressionist* (1912), *The Letters of V. v Gogh to his Brother (1872–86) with a Memoir by his Sister-in-Law, J. v. Gogh-Bonger* (1927); *Letters de V. v Gogh à E. Bernard* (1911). (I A R)

GOGOL, NIKOLAI VASILIEVICH (1809–1852), Russian novelist and dramatist, was born at Sorochintsky, province of Poltava, on March 31, 1809, of a family of Ukrainian Cossack gentry. Educated at the Niezhin gymnasium, he there started a manuscript periodical, *The Star*, and wrote several pieces including a tragedy, *The Brigands*. In 1820 he went to St. Petersburg, where he tried the stage but failed In 1821 he obtained a clerkship in the department of appanages, but soon resigned it. In 1829 he published anonymously a poem called *Italy*, and, under the pseudonym of V Alof, an idyll, *Han Küchelgarten*, which was so ridiculed that Gogol bought up all the copies he could and burnt them. He was terribly disheartened, and thought of emigrating to America. Indeed, he got as far as Lübeck, but then returned to St. Petersburg, and entered the civil service He made his way in literary circles, and was well received by Pushkin, whom he met in 1831.

In 1831 appeared *Evenings in a Farm near Dikanka: by Rudy Panko*, a volume of stories of Ukrainian life, which was enthusiastically received. Gogol then planned a history of Little-Russia of the middle ages, to be completed in eight or nine volumes. This remained a plan only, but served to win for him a chair of history in the university of St Petersburg. His lectures were a failure, and he resigned in 1835 Meanwhile he had published his *Arabesques*, a collection of essays and stories; his *Taras Bulba*, the best known of the *Cossack Tales* translated into English by George Tolstoi (1860) and by J Cournos (Everyman Edition, 1906), and a number of other short stories, including *Old World Gentlefolks*, a sketch of the tranquil life led in a quiet country house, also *The Cloak*, a description of the petty miseries endured by an ill-paid clerk in a government office, the great object of whose life is to secure the "cloak" from which his story takes its name. On April 19, 1836, his famous comedy, the *Revizor* (Eng trans by C. Garnett, *The Government Inspector*, 1926,) was produced The *Revizor* is the greatest of Russian comedies, it is a brilliant satire on bureaucracy, which was received with enthusiasm by the intelligentsia and with horror by the official classes But it is an error to look on its historical and political significance as its principal claim to rank among the great European comedies Even when played in another language (and Gogol more than any other Russian author loses in translation), it is recognised as pure and universal comedy The plot is very simple. A traveller who arrives with an empty purse at a provincial town is taken for an inspector whose arrival is awaited with fear, and he receives all the attentions and bribes which are meant to propitiate the dreaded investigator of abuses

After the production of the *Revizor*, Gogol went abroad, and for twelve years (1836–48) lived mainly in Rome, while paying occasional short visits to Russia Rome left a deep impression on his mind, but during his residence there he was occupied with purely Russian subjects There he wrote the classic novel, *Mertvuya Dushi*, or "Dead Souls," the first part of which appeared in 1842 The hero of the story is an adventurer who goes about Russia making fictitious purchases of "dead souls," *i.e.*, serfs who have died since the last census, with the object of pledging his imaginary property to the government His adventures provide the occasion for a series of unforgettable pictures of Russian provincial life, and of types of Russian society These amazingly vivid pictures are a fundamental part of the experience of all Russian students of their own language Gogol had an individual vision which presented his types with a force and truth of the kind attained by Dickens at his best. No one can fully appreciate Gogol's merits as a humorist who is not intimate with the language in which he wrote, but there are good English versions by C Garnett (1922) and by D J Hogarth (Everyman Edition, 1906). To the period of his residence in Rome belong also the recasting of *Taras Bulba* and his second comedy, *Marriage*.

Dead Souls was published in 1842; Gogol lived ten years longer He was still a young man, only 43, and it was reasonable to expect that the creator of the *Revizor* and of *Dead Souls* would produce other great imaginative works. He was a great artist and though both the comedy and the novel were "events" in the history of Russia, they are what they are because of the imaginative genius of the author. Gogol the man found himself the hero of those who would regenerate Russia, and he seems at this point to have stifled his natural genius because of his conviction that he had a mission However that may be, he began to work on the second part of his epic of *Dead Souls*, with the idea of showing the redemption of Chichikov and his kind. He failed, and destroyed the draft, but he wrote what he conceived to be his message to Russia in his *Selected Passages from a Cor-*

respondence with Friends (1847) It called forth some bitter replies, especially from Belinsky, who accused him of "falsifying Christianity for the profit of those in power" (*see* D Mirsky, *Hist of Russ Lit*). Gogol felt the rebuff deeply, and sought compensation in a religious experience that was denied to him. In vain he went on pilgrimage to the Holy Land (1848) On his return he fell under the influence of a fanatic, Father Matthew Konstantinovsky, who persuaded him that his imaginative work was sinful. He fell into melancholy and destroyed some of his mss. He died on Feb. 21, 1852.

The works of Gogol, translated by C Garnett, have been published by Chatto and Windus (1922, etc,) See *Materials for the Biography of Gogol* (in Russian) (1897) by Shenrok· "Illness and Death of Gogol," by N. Bazhenov, *Russkaya Muisl,* January 1902, J. Lavrin, *Gogol* (1926); M Theiss, *Nikolaus W. Gogol und seine Buhnenwerke* (1922).

GOGRA, a river of northern India It rises in Tibet near Lake Manasarowar, not far from the sources of the Brahmaputra and the Sutlej, passes through Nepal as the Kauriala, and becomes the most important waterway in the United Provinces It joins the Ganges at Chapra after a course of 600 m. Its tributary, the Rapti, is also commercially important The Gogra is also called the Sarju, and in its lower course the Deoha

GOHIER, LOUIS JEROME (1746–1830), French politician, son of a notary, was born at Semblançay (Indre-et-Loire) on Feb 27, 1746 He practised law at Rennes. As a member of the Legislative Assembly he protested against the exaction of a new oath from the priests (Nov 22, 1791), and demanded the sequestration of the emigrants' property (Feb 7, 1792) He was minister of justice (March 1793–April 1794), and in June 1799 succeeded Treilhard in the Directory His wife was intimate with Josephine Bonaparte, and when Bonaparte returned from Egypt in Oct 1799 he tried to gain over Gohier, who was then president of the Directory Refusing to resign after the *coup d'état* Gohier was detained for a time, and on his release retired to Eaubonne In 1802 Napoleon made him consul-general at Amsterdam He died at Eaubonne on May 29, 1830

His *Mémoires d'un vétéran irréprochable de la Révolution* was published in 1824, his report on the papers of the civil list preparatory to the trial of Louis XVI is printed in *Le Procès de Louis XVI* (Paris, an III) and elsewhere.

GÖHRDE, a forest of Germany, in the Prussian province of Hanover, immediately W of the Elbe, between Wittenberg and Luneburg It has an area of about 85 sq m and is famous for its oaks, beeches and game preserves It is memorable for the victory gained here, on Sept 16, 1813, by the allies, under Wallmoden, over the French forces commanded by Pecheur The hunting-box situated in the forest was built in 1689 and was restored by Ernest Augustus, King of Hanover It is known to history on account of the constitution of Gohrde promulgated here in 1719

GOIDELIC DIALECTS: *see* CELTIC LANGUAGES

GOITO, a village of Lombardy, Italy, province of Mantua, from which it is 11 m N W, on the road to Brescia Pop (1921) 898 (village); 7,739 (commune) It is situated on the right bank of the Mincio near the bridge and has been repeatedly fortified as a bridge-head The Piedmontese forces won two actions (April 8, and May 30, 1848) over the Austrians here

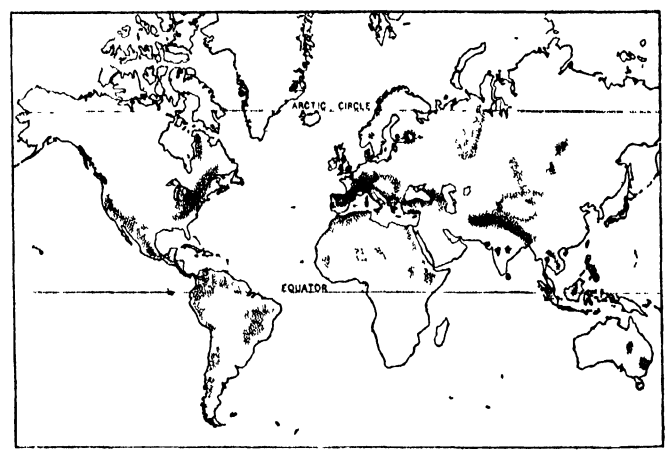
GOITRE. Goitre or "Derbyshire neck" is a term used for abnormal enlargements, usually chronic, of the thyroid gland in the front of the neck The enlargement may be general and uniform (parenchymatous goitre), or may be localised to one part of the gland or to the isthmus connecting the two halves or lobes Local enlargements are either innocent, which are common, or malignant, which are rare; the innocent growths are known as adenomas (adenomatous goitre) which at first solid may soften down and become liquid-forming cysts, these cystic goitres or bronchoceles contain yellow, glue-like material (colloid), from bleeding into, their interior may rapidly enlarge, otherwise they grow slowly, or may exist for many years without increasing in size or causing discomfort They often arise in parenchymatous goitres. Malignant disease commonly starts in an adenoma and is generally a carcinoma which grows slowly but has a special tendency to produce secondary deposits (metastases) in bones The other form of malignant disease, sarcoma, is much rarer, but runs a rapid course

Simple Goitre.—This is usually endemic, *ie*, occurring in special regions, such as Derbyshire, the Thames Valley, the Yorkshire Dales, Hampshire and Sussex, in the neighbourhood of the Great Lakes in North America, in Switzerland, the Pyrenees and some mountainous parts of Asia, and is then due to some local condition, especially the water supply In Kashmir Col R. McCarrison correlated it with infection of the drinking water; "goitre springs" and "wells" are known, and fish and animals may also be affected in endemic areas. The observation that boiling the water prevents the incidence of goitre and the occurrence of epidemics of acute goitre in schools are compatible with this view. But that this is the only cause is uncertain, for simple goitre can be prevented by the administration of iodine and the water in goitrous regions is hard and poor in iodine Goitre may also occur sporadically in areas where it is rare, but is seldom congenital except in endemic regions It appears most commonly about puberty and is about seven times commoner in females than in males. Large goitres may give rise mechanically, to difficulty of breathing by compressing the windpipe

Toxic Goitre.—The adenomatous enlargement may remain latent without any symptoms for years, and then become active and produce an internal secretion which excites toxic symptoms resembling, but not exactly the same as, those of exophthalmic goitre, protrusion of the eyes being absent

The preventive treatment of simple goitre consists in boiling the water, removal from an endemic district, and the administration of iodine, or iodide of potassium, in small doses But in cases of adenomatous goitre iodine is said to lead to a toxic goitre Exposure to X-rays may reduce the size of the goitre, but by producing adhesions renders surgical removal, should it become necessary, less easy Surgical removal is necessary for pressure symptoms, toxic manifestations, and may be desirable for cosmetic considerations

Exophthalmic Goitre.—(Synonyms, Graves' or Basedow's disease)—This has very striking symptoms—an enlarged thyroid gland, protrusion of the eyes, rapid action of the heart and palpitation, tremor, extreme nervousness, wasting, flushing, sweating and mental irritability It is indeed the converse of myxoedema The skin may be pigmented, and in bad cases diarrhoea, vomiting and indigestion may be troublesome Ninety per cent, if not more, of the patients are women The basal metabolism (the minimal production of heat) is raised and this may be connected with the wasting and tolerance to cold There is a structural change in the thyroid, probably due to poisons from the alimentary canal, but it may come on after mental shock or emotion As a result of the change in the thyroid its internal secretion is altered (dysthyroidism) and causes the nervous symptoms The disease is usually chronic, more than half the patients



FROM ROBERT MC CARRISON "ETIOLOGY OF ENDEMIC GOITRE," BY PERMISSION OF JOHN BALL, SONS & DANIELSON

SKETCH MAP OF THE WORLD SHOWING THE APPROXIMATE DISTRIBUTION OF ENDEMIC GOITRE

recover and others improve but do not become absolutely normal Acute infections, such as influenza, are likely to prove fatal. In a few instances the morbid activity of the thyroid gland is followed by atrophy and myxoedema.

Treatment.—The patients should live a simple life in fresh, country air, avoid much protein (meaty) food, stuffy rooms and excitement. Bromides, quinine hydrobromate, belladonna, digitalis and X-rays or radium to the gland should be employed. If these measures fail, and the case is severe, operative removal of part of the gland or ligature of some of its arteries should be undertaken; the operative mortality of excision of half the gland is now about five per cent. Iodine in the form of Lugol's solution improves the patient's condition so that operation can be more safely undertaken. (H R)

GOKAK, a town of British India, in the Belgaum district of Bombay, 8 m. from a station on the Madras and Southern Mahratta railway. Pop. (1921) 9,989 It contains old temples with inscriptions. About 4 m N W. at the Gokak Falls, the Ghatprabha rushes over a precipice 170 ft. high Close by, the water has been impounded for a large irrigation canal, and as motive power for a big cotton-mill The irrigation works are extending

GOKCHA (Gok-Chai; Armen. *Sevanga;* anc *Haosravagha*), a lake in Armenia 40° 20′ N. and 45° 35′ E, altitude 6,345 ft, triangular in shape, measures 45 m N W–S.E, max. width 25 m, max depth 67 fathoms, area 540 sq m It is surrounded by barren mountains of volcanic origin 12,000 ft. high Its outflow is the Zanga, a tributary of the Aras (*Araxes*); it never freezes, and its level undergoes periodical oscillations It contains four species of *Salmonidae,* and two of *Cyprinidae,* peculiar to the drainage area of this lake. A lava island in it is crowned by an Armenian monastery.

GOKHALE, GOPAL KRISHNA (1866–1915), Indian politician, was born at Kolhāpur of a humble Chitpavan Brahman family Graduating at the Elphinstone college, Bombay, in 1884, he joined, as professor of history and political economy, the group of teachers at the Fergusson college, Poona, pledged to serve for 20 years on a merely nominal salary He remained on the staff, finally as principal, until 1902.

He was associated with the Indian National Congress from the beginning, and was for some years its joint secretary In 1897 he paid the first of several visits to England, and gave evidence before the Royal Commission on Indian Expenditure From then onwards he specialized as a critic of Indian official finance In 1902 he became a member of the Bombay Legislature and was then elected to represent the non-official members thereof in the viceregal legislature. His persuasive eloquence, close reasoning and accurate knowledge of the subjects discussed, and instincts of statesmanship won him the Indian leadership, and Lord Curzon recognized his earnest patriotism by nominating him for the C I E in 1904.

Consulting him freely in reference to his projected constitutional reforms, Lord Morley wrote of him to the viceroy as appreciating executive responsibility and having an eye for the tactics of common sense (*Recollections,* vol 2, p. 181, 1917) He was fiercely assailed by the extremist section, which never succeeded in his lifetime in capturing the congress machinery. In 1905 he became president of that body, on the occasion of its meeting at Benares In the same year he founded at Poona his Servants of India Society, whose members take vows of poverty and lifelong service to their country in a religious spirit In the enlarged viceregal legislature set up in 1910 Gokhale was the commanding Indian figure His quickness in debate, the attractive literary style of his speeches, his studied moderation, and the care which he took to master his subjects, made him a most effective critic of the Government, though he indignantly disclaimed the title of the leader of an opposition party

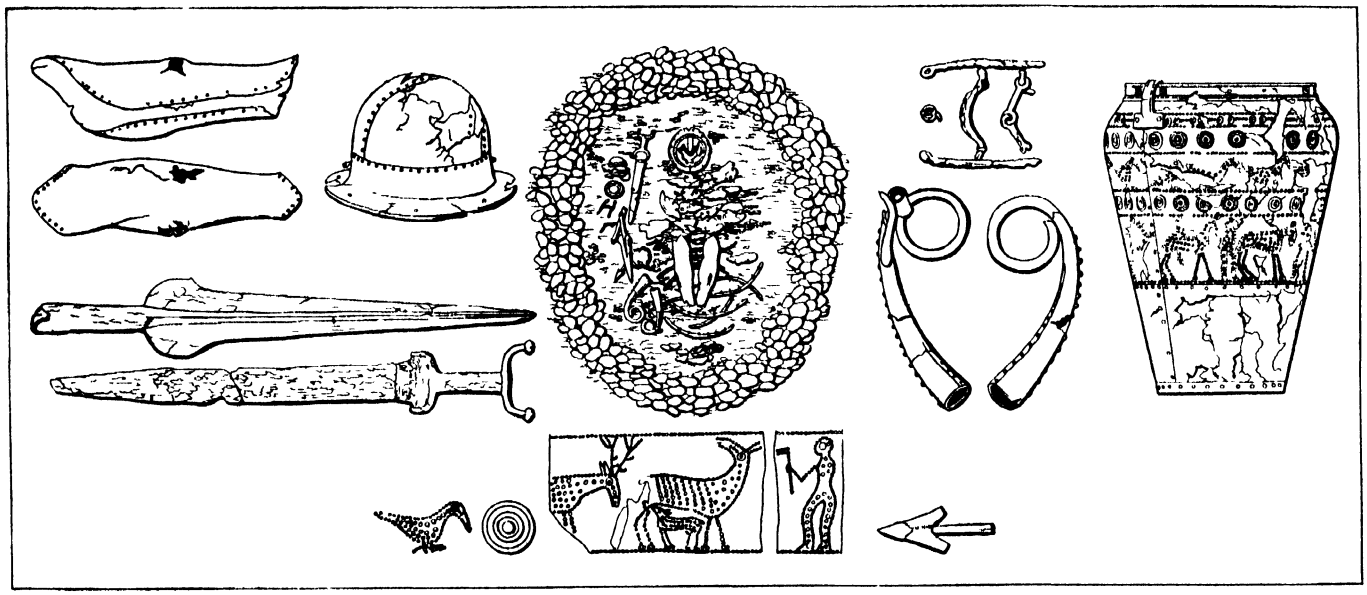
Besides his brilliant handling of general topics, and more particularly of the annual budgets, he promoted measures for compulsory education on a basis of local option, but did not survive to see this principle introduced from 1918 onwards in all the large provinces Though his last years were clouded by illness he went to South Africa to acquaint himself at first hand with the grievances of Indians in that country. His last public duty was to serve as a member of the Indian Public Services Commission (1912–15). His death at Poona on Feb. 19, 1915, was a severe blow to the Constitutional party at a critical moment in India's political history. His last political testament, entrusted on his death-bed to the Aga Khan, was published in Aug. 1917, and outlined plans of reform based on provincial autonomy. Gokhale's intense patriotism, powerful grasp of facts and great industry raised him head and shoulders above his contemporaries; and his moderation, invariable courtesy and lofty personal character marked him out as one of the last and greatest of the old school of congress politicians before the age of non-co-operation.

See *Speeches of the Honourable Mr G K Gokhale* (Madras 1908, 3rd ed., 1920); R. P Parāñjpye, *Gopal Khrishna Gokhale* (1915).

GOLASECCA is a village situated on the river Ticino, a few miles below the point at which it issues from Lago Maggiore Extensive cemeteries of the iron age have been found all over this district, and the name Golasecca has come to be applied indiscriminately to the whole series, occupying an area of nearly forty square kilometres Some of them are situated on the left bank of the Ticino at Somma, Vergiate, Sesto Calende and Golasecca itself; others on the right bank at Castelletto Ticino and the Lazzaretto of Borgo Ticino During the past hundred years all these sites have been despoiled by excavators, very often unauthorized, and the objects found in them have been broken up or scattered over the world The only collection of any size or importance is in the newly arranged museum at the Sforza castle in Milan There may be seen the contents of the Sesto Calende tomb illustrated in the accompanying plate, as well as the collection formed by Castelfranco, the only archaeologist of the past generation to make any comprehensive study of the region

All the cemeteries of the Somma plateau were of the cremation rite The tombs were very simple, each containing a single cinerary urn, often enclosed in the centre of a circle of rough stones In several instances these circles were approached by a corridor of similar stones The most perfect example of this kind is a circle 17 metres in diameter enclosing a smaller circle 4½ metres in diameter approached by a corridor 30 metres long One burial was found within the small circle and three more within the outer circle Castelfranco observed traces of about 50 stone enclosures and it is probable that there had been many more. Castelfranco, whose explorations were fairly extensive and systematic, states that he invariably found a tomb in the centre of every circle that he explored, and that the tombs found within the circles contained precisely the same pottery as those which stood isolated from any enclosure The construction of the graves moreover was precisely the same whether enclosed within a circle or not. There were four varieties, viz (1) Plain round holes in which the ossuary was placed without any protection, (2) a heap of small stones surrounding the ossuary, which rested on a bed of similar stones and was sometimes covered with a rough slab, (3) rough slabs forming an oblong protection; (4) regular cists made of several slabs These four methods of grave-making are precisely those employed by the other cremating peoples of Italy, which shows that the Golaseccans belonged to the same original family as the Comaelnes, Atestines and Villanovans The contents of the ossuaries were poor, consisting at most of one or two fibulae or weapons, or small objects of bronze, iron, amber or glass. Outside the cinerary urn itself were sometimes smaller jars and bowls

It was principally upon a study of this pottery that Castelfranco based his division of the Golasecca antiquities into two periods. It expresses a theory which cannot be maintained There are undoubtedly two schools of pottery-making represented at Golasecca, the one characterized by rough jars with incised ornamentation, the other by a finer ware with striped decoration obtained by double-burnishing. Examples of each class are shown in the accompanying plate. But the two styles were sometimes found together in a single tomb and they are certainly not mutually exclusive. Similarly the attempt to establish the existence of two periods by the evidence of fibulae has broken down under analysis, so that there is only one period in all the Golasecca cemeteries.



THE TOMB OF SESTO CALENDE, GOLASECCA, CIRCA 500 B C

Extensive cemeteries of the Stone Age have been found near Golasecca, a village on the river Ticino, near the point at which it issues from Lago Maggiore The most important single discovery made was of the tomb of Sesto Calende, found in 1867 by a farmer when ploughing his field. The grave, in the top centre, and the principal objects contained in it are shown

As to the chronology there have been until lately great divergencies of opinion, caused chiefly by the different interpretations given to the warrior's tomb of Sesto Calende (*see* illustration above)

The tomb of the warrior Sesto Calende is the most important single discovery in the Golasecca area It was found by a farmer in the process of ploughing his field in 1867, and was described by Biondelli in the same year A sketch of the grave is shown in the plate, with the principal objects contained in it Discussion as to the date has centred upon the situla made of plates of hammered bronze ornamented with rudely executed figures and scenes These are not embossed or engraved as on the fine situlae of the Etruscans or Atestines but outlined by the very primitive process of pointillé, that is to say with small consecutive dots The technique is so infantile and the execution so poor that it was natural to suppose the situla to be a very archaic work Actually however, comparisons have shown that though childish art it is not primitive For an attentive examination of the scenes brings out the fact that they are derivations with a good deal of travesty and misunderstanding from a well known Etruscan original And from the date of this original it is possible to fix the date of the Sesto Calende situla, which can be very little if at all earlier than 500 B C The theory therefore that this is the grave of some very early Celtic warrior, with all its implications of a Gaulish invasion in the early iron age must be finally abandoned Nor is there any reason for attributing the burial to a Celt even of the fifth century, for the weapons and accessories are not distinctively Gaulish, in fact the tomb though richer than the average is a fair representation of the usual Golasecca civilization

The entire subject thus becomes much clearer The Sesto Calende warrior and his famous situla find their natural place at the end of the Golasecca period There are not two periods, as Castelfranco supposed, but only one, which ranges from 750 or 700 to 500 B C as the fibulae plainly show The Golasecca period therefore is precisely conterminous with the Arnoaldi period of Bologna

The amount of material available for a study of Golasecca, though lamentably meagre, shows that in the 7th and 6th centuries B C. that branch of the cremating invaders which had made its way by stages from the Eastern Alps to a home on Lago Maggiore was backward in its civilization The Golaseccans are far behind the Atestines and the Villanovans of the same period, they are distinctly poor relations, living in a remote province on the outskirts of the more progressive nations They were not of much importance in the development of early Italy. There seems, however, to have been a trade system which extended all through the pre-Alpine region from the Ticino to Trieste, by which the products of the Adriatic filtered to this distant corner And perhaps it is possible to detect in some of the metal work and in the individual character of the pottery the beginnings of a native local style which is independent although barbaric The Golaseccans, however, form only a part of the early population of Lombardy with neighbours and kinsmen living round Varese and Como In this region the records begin earlier and the material though scattered is more abundant (*see* COMACINES)

BIBLIOGRAPHY —The Gaulish theory of Bertrand is given in his book written with S Reinach in 1894 *Les Celtes dans les vallées du Po et du Danube* D Randall-MacIver, *The Iron Age in Italy* (1927), gives all the original references The articles by de Mortillet and Castelfranco are now out of date, though the latter has a certain value as an original record The old-fashioned dissertation of the Abbé Giani has been usefully summarized by Montelius *La Civilisation primitive en Italie,* cols 231–247, with plates, who has reproduced the best of his drawings, as well as those of Castelfranco and Biondelli Déchelette *Manuel d'Archéologie,* vol II², pp 730–743 is useful Hoernes has a good discussion of the Situla in his *Urgeschichte der bildenden Kunst*

GOLCONDA, a fortress and ruined city of India, in the Nizam's Dominions, 5 m W of Hyderabad city Golconda was the capital of a large and powerful kingdom of the Deccan, ruled by the Kutb Shahi dynasty, founded in 1512 by a Turkoman adventurer on the downfall of the Bahmani dynasty, but the city was subdued by Aurangzeb in 1687, and annexed to the Delhi empire The fortress of Golconda, on a granite ridge, is extensive and strong, and contains many enclosures, but is commanded by the summits of the enormous and massive mausolea of the ancient kings about 600 yd distant These buildings form a vast group in an arid, rocky desert Time and man have damaged them, but they have recently been repaired Golconda has given its name in English literature to the diamonds which were found in other parts of the dominions of the Kutb Shahi dynasty, and cut at Golconda

GOLD, an extremely heavy, very valuable, bright yellow metal, with a resplendent lustre (symbol Au, atomic number 79, atomic weight 197 2) On account of its brilliant appearance, unalterability and occurrence in the native condition, gold was almost certainly the first metal to attract the attention of man It was known and highly valued by the earliest civilizations, Egyptian, Minoan, Assyrian and Etruscan, and from all these periods ornaments of great variety and beautiful and elaborate workmanship have survived, many of them being as perfect now as when they were first made several thousands of years ago (*See* JEWELLERY, PLATE, EGYPT, CRETE, AEGEAN CIVILIZATION, NUMIS-

MATICS.)

The making of gold from base metals by means of the "philosopher's stone" and discovery of the elixir of life were the chief aims of the alchemists of the middle ages and many of the advances in early chemistry were the direct outcome of such experiments, and even to-day the transmutation of base metals into gold is not regarded as scientifically impossible Gold is found very widely distributed in nature, but usually occurs in such small quantities as not to repay extraction. It is generally found in the native or uncombined state but is almost invariably associated with variable proportions of silver It exists in two forms—reef gold, in which the metal is embedded in a solid matrix, and alluvial gold, which has been formed by the weathering of auriferous rocks Gold also occurs in sea water, assays of sea water from various sources vary from 5 to 267 parts of gold per 100,000,000 of water These minimal amounts represent in the aggregate an enormous quantity, which has been calculated at 10,000,000,000 tons (Mendeleyev, *The Principles of Chemistry*) Many processes, fraudulent or otherwise, have been proposed for extracting gold from this source, but none has proved commercially possible

The principal elements with which gold is admixed in nature are silver, tellurium, copper, iron, bismuth, mercury, palladium and rhodium The native gold-silver alloys are known as electrum, and have a colour range from pale yellow to pure white, depending on the amount of silver present

Gold is found combined with tellurium in the minerals calaverite, $AuTe_2$, in which generally the gold is partly replaced by a certain amount of silver; sylvanite, $AuAgTe_4$, nagyagite, which contains lead, copper, antimony and sulphur, and other tellurium ores to which local names have frequently been given Gold-mercury ores are known as gold amalgam The other metals mentioned above are usually present in small amounts only and are not of great importance

Gold is generally present to a small extent in iron pyrites, FeS_2, and much alluvial gold is regarded as having been produced by the weathering of this mineral, in addition, galena, PbS, which often contains silver, is generally found to include appreciable amounts of gold, so that the silver obtained from lead by cupellation is usually auriferous. The common occurrence of gold together with silver is well shown in the fact that, even at the present time, several of the smaller countries in North, Central, and South America possess a silver coinage which, being of the intrinsic silver value of their contents and not mere tokens, as in Great Britain, renders the extraction of gold from them an economical process This condition existed in Germany prior to the establishment of the German Empire in 1871, when each small German State possessed its own silver currency These coins were recalled by the Imperial Government and refined by a company specially formed for this purpose (Deutsche Gold und Silber Scheide Anstalt of Frankfurt a/M) with the result that after several years' work, gold to the value of about £3,000,000 was recovered

PHYSICAL PROPERTIES

Gold in the massive state possesses a characteristic yellow colour which by multiple reflection becomes orange or even red This colour can be remarkably affected by alloying the gold with other metals Small quantities of silver reduce the depth of yellow (*vide supra*), and when the amount of silver is increased to 30–40% a distinctly greenish tint results Copper, on the other hand, deepens the yellow shade, and British standard gold coinage of 22-carat gold, or 91 67% Au to 8 33% Cu, is noticeably redder than the pure metal

The effect of small quantities of the platinum metals on the colour of gold is very marked, thus, less than 25% platinum gives a pure white alloy—the white gold of the jeweller—which, as it can be made to contain 75% of gold, can be and is hall-marked as 18-carat gold Palladium has a still greater whitening power than platinum and about 12% is sufficient to produce a perfectly white alloy A remarkable colour effect is produced by alloying gold with aluminium Roberts-Austen produced a fine purple alloy (containing about 80% Au and 20% Al), but unfortunately too brittle to be made into jewellery.

In a finely divided state the colour of gold is very variable, depending upon the size of the particles. The usual colour of precipitated gold is brown, but black, purple, blue and pink shades are also known. In very thin sheet or leaf, gold is translucent and transmits a greenish light Gold when pure is the most malleable and ductile of all the metals; it can be beaten to not more than 0 00001 mm. in thickness (*see* GOLD-BEATING), and a single gram has been drawn into a wire 2 miles long Traces of other metals reduce considerably the malleability and ductility, lead being especially injurious in this respect. Cadmium, tin, bismuth, antimony, arsenic, tellurium and zinc act in like manner

Gold is one of the softest metals, its hardness varying according to treatment and being somewhere between that of zinc and tin; it is considerably softer than silver under all conditions Dental gold is really a gold sponge produced by electrolytic methods; it is so soft as to be capable of welding at ordinary temperatures

The specific gravity of gold also depends upon its previous treatment Cast gold is always somewhat lighter than gold that has been rolled or drawn Different observers give the specific gravity of cast gold as from 19 23 to 19 29 and for worked gold as from 19 29 to 19 34 Precipitated gold, however, has a greater density and varies with the precipitant employed and the temperature of precipitation Ferrous sulphate appears to give the densest precipitate which has been found by G Rose to be as high as 20 72 For practical purposes the density of pure gold may be taken as 19 3

The melting point of gold has been determined by many observers with varying results but the mean of recent observations is 1,063° C Gold is comparatively easily volatilized at high temperatures, at its melting point the loss is insignificant, but becomes appreciable at higher temperatures, and at 1,250° C it is 2 6 parts per thousand per hour (T K Rose) In all mints and gold refineries the flues are carefully swept periodically and considerable quantities of the metal are thus recovered In the presence of other metals, volatilization is greater than with pure gold, tellurium and selenium being most active in this respect and zinc and mercury less so Some of the recently reported transmutations of mercury into gold have been traced to the mercury containing a minute quantity of gold which had not been removed by simple distillation The boiling point of pure gold is about 2,500° C

The electrical conductivity of gold is greatly influenced by traces of impurities, so reported values are very variable At ordinary temperatures the conductivity of gold is about 75% of that of pure silver, which has the greatest conductivity of any metal The electrical resistance, which is the converse of conductivity, steadily diminishes with a lowering of the temperature, and at the boiling point of helium *in vacuo* (*i e*, below 5° Absolute) it has practically disappeared (H K Onnes), or, in other words, gold is then a perfect conductor of electricity

The mean specific heat of gold is 0 03, a number which agrees well with the law of Dulong and Petit Its coefficient of linear expansion is about 0·000014 for 1° C

The spark spectrum of gold is very complicated, the most prominent lines in the visible spectrum lie at 6278 and 5957 in the orange and red, 5837 and 5656 in the yellow, 5065 in the green, 4793 and 4437 in the blue, and 4065 and 3898 in the violet

CHEMICAL PROPERTIES

Gold is permanent in air or water under all conditions of temperature It is insoluble in nitric, hydrochloric or sulphuric acids, but soluble in hot selenic acid forming gold selenate Hot telluric acid likewise dissolves it The usual solvent for gold is aqua regia (*q v*)—a mixture of 3 volumes of strong hydrochloric acid with one volume of strong nitric acid which in practice is always diluted with a considerable volume of water The nitric and hydrochloric acids interact producing nitrosyl chloride (NOCl) together with free chlorine, which attacks the metal The other halogen elements, fluorine, bromine and iodine, also attack gold freely, producing the corresponding halogen compounds Gold is also soluble in aqueous solutions of alkaline sulphides and thiosulphates Alkali cyanides, even in very dilute solution, attack

gold readily, especially in the presence of air or oxygen (*see* below).

Gold and Oxygen.—Gold and oxygen do not combine directly under any conditions; hence all oxides and hydroxides have to be made by indirect methods. Two well-determined oxides of gold are known, namely aurous oxide, Au_2O, and auric oxide, Au_2O_3. The oxides Au_2O_2, Au_2O_4 and Au_2O_5 have been described, but their individuality is doubtful

Aurous hydroxide, AuOH, is best prepared either by treating a neutral aqueous solution of auric chloride, $AuCl_3$, with mercurous nitrate, or by decomposing aurous chloride, AuCl, or bromide, AuBr, with cold dilute caustic potash or soda (not ammonia). It is also obtained by boiling an aqueous solution of auric chloride with the alkaline salt of an organic acid such as potassium acetate It is a violet-black powder which, on heating to about 200° C loses water giving violet-brown aurous oxide, which at 250° C decomposes into gold and oxygen The oxide and hydroxide have feebly basic properties and are capable of forming salts with halogen acids

Auric hydroxide is produced by precipitating a solution of auric chloride or of aurichloric acid, $HAuCl_4$, with a limited amount of caustic alkali The hydroxide thus prepared cannot be entirely freed from alkali by washing, and the precipitation is preferably effected with magnesia or zinc oxide, excess of the precipitant being removed with dilute nitric acid Auric hydroxide is a brownish-black powder which, on drying over phosphoric oxide, forms a brown powder of auryl hydroxide, AuO(OH), dehydrated at 140° C to trioxide, and this oxide on further heating to 170° is said to lose oxygen and form the oxide Au_2O_2 Auric oxide is capable either of forming salts with haloid acids or of acting as an acidic anhydride by combining with strong bases to form aurates Potassium aurate, $KAuO_2,3H_2O$, is a yellow crystalline compound, $Ba(AuO_2)_2$ is a yellow precipitate

Halogen Compounds.—Fluorine does not act on gold in the cold but only at a dull red heat, when a yellowish deposit is formed

Two chlorides of gold are known with certainty, aurous chloride, AuCl, and auric chloride, $AuCl_3$ The identity of an intermediate chloride, Au_2Cl_4, is doubtful Aurous chloride is almost always formed by heating auric chloride The optimum temperature is about 175° C, and several days are required to complete the reaction If a higher temperature is used complete decomposition occurs into gold and chlorine This decomposition of auric into aurous chloride takes place to some extent even in hot aqueous solution

Aurous chloride is a yellowish-white solid insoluble in cold water but undergoing slow decomposition into gold and soluble auric chloride

Auric chloride can be obtained either by heating aurichloric acid to 200° in a stream of chlorine, or by dissolving gold in chlorine water, preferably in darkness It is obtained as a reddish-brown powder or as ruby-red crystals, it gives a neutral solution and can be sublimed unchanged in a stream of chlorine The auric chloride of commerce is really aurichloric or chloroauric acid, $HAuCl_4,3H_2O$, a brown deliquescent substance very soluble in water or ether

If gold is dissolved in aqua regia and the resulting solution freed from nitric acid by evaporation with further quantities of hydrochloric acid to near the crystallizing point, the dissolved gold compound corresponds to the formula H_2AuCl_5, but on allowing this solution to crystallize, brownish-yellow crystals of aurichloric acid are formed, having a strongly acid reaction These crystals always contain a small amount of aurous chloride unless chlorine has been passed through the solution during evaporation They are also frequently contaminated with small amounts of silver chloride as this substance is soluble in strong solutions of auric chloride and is only precipitated therefrom by considerable dilution with water.

Aurichloric acid forms a series of salts called aurichlorides or chloroaurates, having the general formula $MAuCl_4$. These salts may be obtained either by neutralizing the acid with the metallic base or by treating the acid with the equivalent amount of the metallic chloride. The aurichlorides of lithium, potassium and sodium are very soluble in water; those of rubidium and especially caesium are much less soluble The sodium salt, $NaAuCl_4,2H_2O$, separating in yellowish-red prisms, is an article of commerce under the name of "sodio-gold chloride"; it has the advantage over aurichloric acid of being non-deliquescent Aurichloric acid combines with the chlorides of many organic bases to form well-defined crystalline aurichlorides, frequently used in identifying and purifying such bases

Two bromides of gold are known, AuBr and $AuBr_3$, corresponding with the two chlorides; the tribromide, prepared by the action of bromine water on finely divided gold, forms dark brownish-red crystals and in its reactions resembles the corresponding chloride; the monobromide is obtained by heating the tribromide or $HAuBr_4$ to 105–200° C Auric bromide forms auribromides, $MAuBr_4$, similar to the aurichlorides These salts have been used in determining the atomic weight of gold

On mixing aqueous solutions of potassium iodide and $AuCl_3$ or $HAuCl_4$, some auric iodide, AuI_3, is produced, but being somewhat unstable, it decomposes to a large extent into aurous iodide, AuI, and free iodine The latter reaction is complete on warming. Although unstable by itself, yet in combination with alkali and alkaline-earth iodides auric iodide forms a stable series of complex auriodides The potassium salt, $KAuI_4$, crystallizes in black, lustrous prisms Iodine in aqueous, or preferably aqueous-alcoholic, solution combines with metallic gold to produce aurous iodide, AuI, a white or lemon-yellow powder insoluble in water

Gold Cyanides.—In the presence of air gold dissolves in aqueous solutions of potassium or sodium cyanide to form potassium or sodium aurocyanide, $KAu(CN)_2$ or $NaAu(CN)_2$, and on precipitating this solution with dilute hydrochloric acid, aurous cyanide, AuCN, is deposited in yellow, insoluble, microscopic, hexagonal plates Auric cyanide, $Au(CN)_3$, has not been isolated with certainty, but stable complex salts are known with alkali and other cyanides Potassium auricyanide, $2KAu(CN)_4,3H_2O$, forms colourless efflorescent crystals The silver salt, $AgAu(CN)_4$, is formed by precipitating a solution of $KAu(CN)_4$ with silver nitrate From this salt auricyanic acid, $2HAu(CN)_4,3H_2O$, is obtained by removing the silver with hydrochloric acid and crystallizing the solution

Fulminating Gold.—When auric oxide or a gold solution is treated with strong ammonia, a black powder is formed called fulminating gold ($AuN_2H_3,3H_2O$) When dry it is a very powerful explosive, as it detonates either by friction or on heating to about 145°, it should always be handled with great caution

Purple of Cassius.—When a solution of auric chloride is precipitated with a solution of stannous chloride a reddish or purplish precipitate is produced containing both metallic gold and tin hydroxide The composition of this precipitate is as variable as is its colour This product is mainly used in the preparation of ruby glass.

Liquid Gold.—A preparation known as "liquid gold" (German, *Glanzgold*) is very largely used in the decoration of pottery and earthenware It consists essentially of a sulpho-resinate of gold dissolved in various essential oils, together with small quantities of bismuth, rhodium and sometimes other metals The liquid gold is applied by suitable means to the surface of the glaze of the ware it is then allowed to dry and fired at about 700–800° C A brilliant film of metallic gold is thus left on the surface of the ware (F E M.)

GOLD: MINING AND METALLURGY. It is probable that gold was the first metal to attract the attention of prehistoric man, but it could hardly have been used even for ornaments until the art of melting had been invented in the bronze age. The earliest mining work of which traces remain was on gold ores in Egypt, and gold washing is depicted on monuments of the fourth dynasty (2900 B C) There are many other records of work on gold in ancient times The legend of the Golden Fleece, stripped of its heroic dress, describes an expedition about 1200 B C to seize gold which was being laboriously washed out from the river sands with the aid of sheepskins by the long-suffering people of Armenia It is interesting to note as an example of the value

of some old ideas that, in the latest development of practice in the Transvaal, blankets are used to collect the gold (*see* AMALGAMATION).

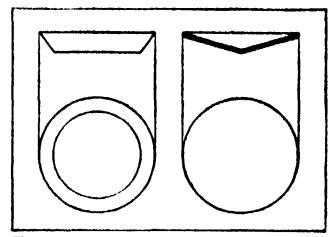
Occurrence and Distribution of Gold.—Gold occurs in minute quantities in almost all rocks Igneous and metamorphic rocks contain more than sedimentary deposits which have doubtless derived it from the sea. In sea-water the amount of gold present appears to vary from 0 03 grain to 1 grain (2 to 60 mg) per ton, but all attempts to extract it at a profit have failed. It exists in all copper and lead ores It is everywhere, apparently even in vegetation, for there is gold in the coal of the Cambrian coalfield of Wyoming and a rich deposit in a bed of lignite in Japan

Disseminations throughout large masses of rock, rich enough to be called ores, are unusual and gold is generally obtained from quartz lodes or veins, or from deposits derived from them by denudation, *e g*, river gravels and the "banket" or conglomerate of the Transvaal. The gold is not evenly distributed in the lodes but is concentrated in certain parts Many lodes are barren, especially those which do not contain pyrites or other sulphides The reason why gold occurs in greater quantities in lodes than in the neighbouring rocks is not known with certainty but it is considered that it has risen from below with other minerals, partly at least in solution in hot water, and has been precipitated where it is found The mineral most commonly found with gold in lodes is iron pyrites, a yellow sulphide of iron Others are copper pyrites, arsenical pyrites, zinc blende and stibnite—all sulphides At the surface of the ground, where the lodes are weathered, limonite, a yellow oxide of iron, is the best indicator of gold In alluvial deposits ("placers") magnetite ("black iron sand") usually occurs No mineral, however, is an infallible guide to gold, except perhaps in particular localities

The gold in ores is generally free or native, not combined with other elements to form chemical compounds except in the tellurides Even the gold contained in iron pyrites is metallic, consisting of thin films coating the crystals or perhaps the cleavage planes of the pyrites Gold in ore is generally invisible unless magnified, but sometimes occurs in crystalline grains or arborescent flakes which can be seen, and more rarely gold is found in considerable masses Large crystals of an inch or more across have been found in alluvial deposits in California They belong to the cubic system and are usually in the form of octahedra or rhombic dodecahedra. In Transylvania gold occurs in thin plates and in some other districts in wire form Tellurides of gold are contained in rich ores in Western Australia and Colorado and occur elsewhere The mineral calaverite, a bronze-yellow gold telluride, contains 40% of gold, and *sylvanite* or graphic tellurium, a steel-grey mineral, contains up to 28% of gold combined with some silver The tellurides are often grey or blackish Tellurium is removed from telluride ores by weathering and finely divided yellow amorphous gold or "mustard gold" is left. It resembles yellow clay, but can be made bright by burnishing It occurs in yellow splashes at Kalgoorlie. The rocks through which auriferous veins pass are generally metamorphic, such as slates or schists, with volcanic rocks in the neighbourhood Andesite, a volcanic rock, is often found in gold districts. Alluvial deposits or "placers" have been the most prolific sources of gold in the past, although by 1927 they had become of little importance They are the sands, gravels and detritus of ancient or existing streams and have been derived from the disintegration of auriferous veins or rocks The gold occurs as "gold dust," which consists of small scales and rounded grains, and "nuggets" or larger masses of a rounded or mammilated form The largest nugget ever found was the "Welcome Stranger," 2,520 oz in weight, which was found in 1869 in Victoria in a rut made by a cart, only a few inches below the surface of the ground

Among the most productive goldfields in ancient times were those in Egypt, where in the deep mines the enslaved labourers were cruelly maltreated, and in Asia Minor where flows the river Pactolus, the source of the riches of Croesus The Romans obtained their gold in great part from Transylvania, still a goldfield. After the discovery of America the main supplies to Europe came from there In 1850–60 the gold diggings of California and Australia were at their zenith and at the end of the 19th century the "placers" of Klondike and Alaska, the last-named a beach deposit, were famous for a short time By 1927 the Transvaal had been for many years the richest goldfield in the world but there are important goldfields in every continent and in many countries (*see* GOLD, PRODUCTION AND WORLD RESOURCES) The geological age of the deposits in which gold is found ranges from Archaean to Quaternary but is mainly very ancient or comparatively recent The series of rocks formed between these eras contain little gold

Placer Mining and Prospecting.—Gold sands and gravels occur in the beds of most rivers which flow for part of their course through a region composed of crystalline rocks The gold may be dispersed through the sand or caught in the crevices of the rocky bed of the river and covered by sand. Sometimes the auriferous sands are covered by thick beds of barren detritus or even lava flows and can be reached only by sinking shafts or driving tunnels The mining operations are usually simple In Siberia, Alaska and the Yukon the gravels are perennially frozen and are thawed with steam jets or wood fires The sand is tested by panning The "dirt" is stirred and shaken with water in a pan (fig 1) to enable the gold to settle to the bottom, and the upper portions are gradually washed away by dipping the pan into water and pouring it off until only the gold and heavy minerals are left Finally the gold is separated by a series of dexterous twists and tilts The "batea" (fig 2), a shallow wooden cone, is used instead of the pan in South America and by negro miners If the deposit is found to be rich enough to work it is treated in pans or cradles or sluice boxes Work with the pan is simply a repetition of the testing process already mentioned In the Klondike a single pan of earth sometimes yielded 15 oz of gold, but that was exceptional and work on so small a scale has seldom paid expenses The "cradle" or "rocker" (fig 3), which resembles a child's cradle, deals with larger quantities of earth and is more profitable The gravel is shovelled on to the perforated iron plate, and water is poured on. The fine material drops through on to the apron, which is then carried forward over the sloping floor, rocking being continuous The gold is caught by the "riffles," which may be strips of wood. A riffle or riffle bar is almost anything which will break the current of water and provide a protected spot where gold can settle and remain undisturbed Mercury is often placed in riffles to amalgamate the gold (*see* AMALGAMATION). Thousands of improved cradles were in use at Nome in Alaska as recently as 1900. A "sluice box" (fig 4) is an inclined wooden trough through which gravel is washed by a stream of water The troughs are fitted together to form a sluice which may be hundreds of yards long If gold is still being caught at the lower end of the sluice, more boxes are added, but most of the gold is caught in riffles near the upper end, where the gravel is shovelled in and mercury sprinkled In California thick beds of gravel on hill-sides in the gulches have been worked by hydraulic mining Powerful jets of water break down the banks of gravel and wash the material through a line of sluices without hand labour. The work was sometimes on a very large scale requiring huge reservoirs as for a great city, with many miles of pipes and flumes The nozzle for the jet was increased to 11in. in diameter with a pressure of water given by a head of 200ft The cost of treatment was only a few cents per cubic yard and poor ground could be treated at a profit. Millions of tons of sand were washed down and delivered as "tailings" into the



FIGS 1 AND 2 —MINER'S PAN AND BATEA
Simple appliances for separating gold from river gravel by washing with water; used mainly in prospecting

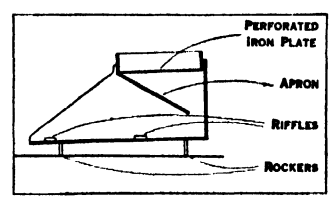


FIG 3 —MINER S CRADLE OR ROCKER, A PRIMITIVE APPARATUS FOR EXTRACTING GOLD FROM GRAVEL

Yuba and Feather rivers, and the effects on farming lower down were so marked that an injunction was obtained against the hydraulic miners in 1880 and their work thereafter was strictly limited

In the period 1900–15 dredging became the most important branch of placer working The chain-bucket dredger was in general use It is similar to those used in harbours, having a number of buckets attached to an endless moving chain. The gravel is scooped up from river beds and delivered on the deck of the vessel, where it is washed It is disintegrated in revolving screens and then flows over gold-saving tables furnished with riffles, or through short sluices. The tailings pour overboard at the stern or are deprived of the water in them by being run on to sieves and are then stacked on the river bank by a bucket elevator. Dredging originated in New Zealand and attained its greatest

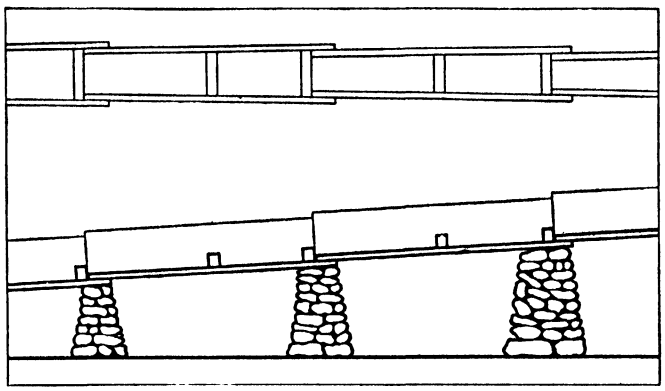


FIG 4.—SLUICE BOXES, INCLINED WOODEN TROUGHS FOR SEPARATING GOLD FROM GRAVEL, SHOWING PLAN (TOP) GRAVEL, CONTAINING GOLD, IS CARRIED DOWN THE SLUICE BY A STREAM OF WATER THE GOLD SINKS TO THE BOTTOM AND LODGES BEHIND THE CROSS-BARS

popularity on the rivers there, and in California "Paddock dredging," a later development in western America, enabled all flat placer ground to be treated, even if not in or near river beds. The dredger is placed in a reservoir filled with water, the gravel is dug away from one end of the reservoir, the gold is washed out, and the tailings are stacked at the other end In this way the dredger moves across country taking the reservoir with it By piling gravel round the reservoir and letting in more water the dredger can be made to work its way uphill The cost of dredging before the World War was only about 2d or 3d per cubic yard of gravel, not counting the capital expenditure, so that poor material could be treated at a profit, but in 1926 comparatively few dredgers remained at work

Vein Mining and Ore Treatment.—Methods of exploration and mining of veins do not greatly differ from those in use on the deposits of other metals (*see* MINING, METALLIFEROUS) Gold ore raised to the surface is treated by amalgamation or by the cyanide process (*q v*). Before the invention of the cyanide process, the tailings from amalgamation mills were often concentrated on sloping tables, or in troughs lined with blanketing or by other machines The concentrates consisted chiefly of sulphides, especially pyrites, and often contained 2 or 3 oz of gold per ton They were treated by smelting and in some places by chlorination, an obsolete process Gold ores which cannot be treated by amalgamation or cyaniding are smelted with copper or lead ores (*see* COPPER and LEAD) The gold is found in the metallic copper or lead which is tapped out from the furnaces and is recovered in the electrolytic refining of the copper and the desilverizing of the lead. The amount of gold produced in the world by smelting is comparatively small

Refining.—Gold bars produced at the mines and gold dust and nuggets from placers are impure, containing as a rough average about 90% gold with 8–9% of silver and smaller quantities of other metals. The gold is often brittle and is refined to make it suitable for minting or for use in the industries The ancients refined gold by "cementation" Plates of gold were stacked in an earthen pot, and were surrounded and separated by powdered porous stone or brickdust, mixed with common salt and sulphate of iron. The pot was covered and heated to redness, but the temperature was not high enough to melt the gold The silver and other impurities in the gold were gradually converted into chlorides, which melted and oozed out of the gold and were absorbed by the brickdust, and the gold was purified Nitric acid was in use for refining gold in the 16th century The gold was melted with three times its weight of silver (process of "inquartation"), and granulated by pouring into water The granules were boiled in nitric acid which dissolved the silver and left the gold unchanged If the alloy of gold and silver contains more than 33% gold, part of the silver remains undissolved, and it is for that reason that the excess of silver is melted with the gold in inquartation The silver was recovered from the acid and used again. In the 19th century sulphuric acid replaced nitric acid and is cheaper to use The chlorine process (not to be confused with chlorination, the obsolete process of treating ores) was invented in 1869 in Australia where acid was expensive, and has become the usual method of refining The gold is melted in clay pots and a stream of chlorine gas is bubbled through it (fig 5) The chlorine is absorbed by the silver which is present, and silver chloride is formed and rises to the surface of the molten metal whence it is skimmed off The silver is recovered by electrolysis in another vessel Most of the other metals are chloridized like silver, but the gold is not attacked until nearly all the silver has been removed When the gold is about 995 fine (containing 995 parts of gold per 1,000), chlorine bubbles through to the surface freely, brown fumes appear, gold begins to be lost by volatilization and by spirting, and the work must be stopped Platinum is not recovered by the process and, if present, remains in the gold, but the impurities which cause brittleness in minting are always removed The cost of the process

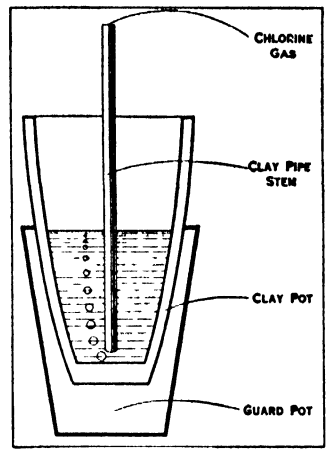


FIG 5.—REFINING BY CHLORINE GAS FORCED THROUGH MOLTEN GOLD CONTAINED IN CLAY POT, REMOVING IMPURITIES, WHICH RISE TO THE SURFACE, PURIFYING THE GOLD

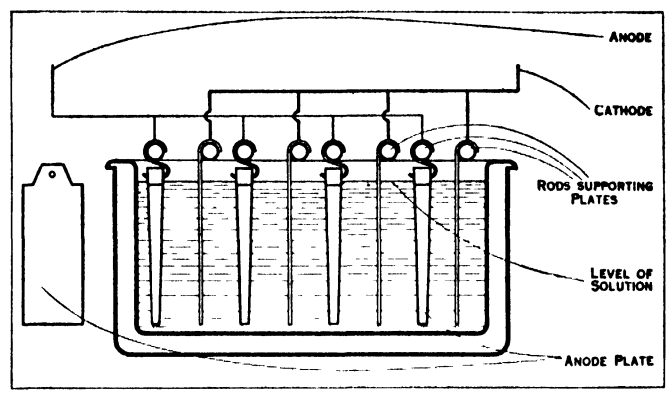


FIG 6.—ELECTROLYTIC REFINING, IN WHICH ANODE PLATES OF IMPURE GOLD HUNG BY HOOKS IN HOT ACID, WASTE AWAY BY THE ACTION OF A CURRENT OF ELECTRICITY PASSING FROM THEM THROUGH THE LIQUID TO THE THIN CATHODE PLATES, WHERE PURE GOLD IS DEPOSITED

at Ottawa in 1916–18 when the Transvaal output was being refined was about 3 cents per oz of gold

In the United States mints the electrolytic process, introduced there in 1902, has since been used for refining most of the gold produced in North America The gold is cast into thick plates which are suspended on gold or silver hooks in a porcelain cell filled with a solution of gold chloride containing some hydrochloric acid The hooks are hung on metal rods and the whole series of plates and hooks are connected and are made the anode (fig 6) A series of thin rolled plates of pure gold are suspended in the cell alternately with the impure plates and also connected to form

the cathode. The liquid in the cell is heated to about 60°C., and is continuously stirred, and a current of electricity is passed from the anode plates to the cathode through the liquid. The gold is dissolved from the anodes and is precipitated on the cathodes At the end of the run it is stripped off the cathode plates and melted into bars The silver is converted into insoluble chloride which falls to the bottom of the cell, and other metals, including platinum, dissolve in the liquid and remain in solution The platinum is, however, subsequently recovered and sometimes pays for the whole operation The process is somewhat slow, occupying three or four days, but the cathode gold is over 999 fine.

Alloys of Gold.—Gold alloys with silver in all proportions and the alloys are soft, malleable and ductile The colour of gold gradually changes from yellow to white as the proportion of silver increases When the silver is over 70% the alloys are white "Green gold" (gold 75%, silver 25%) is used in jewellery and is of about the same composition as the *electrum* of the ancients Gold-silver alloys are used to make trial plates, or standards of reference with which the fineness of gold wares and coins are compared Copper hardens gold and forms alloys of reddish yellow colour at conveniently low melting points. These alloys are used for coinage. They blacken when heated, but the discolouration is removed by sulphuric acid The triple alloys of gold, silver and copper are malleable and ductile, with a rich gold colour. They are much used for the production of gold wares Some zinc is often present in 9 carat gold Hot nitric acid attacks all but the richer alloys of gold with silver or copper or both, and if the proportion of gold is no more than 33%, practically the whole of the silver and copper are removed in solution Some of the gold-palladium and gold-platinum alloys are ductile and fit for use in jewellery The alloys containing 10–20% of palladium are nearly white Amalgams are alloys of gold and mercury A piece of gold rubbed with mercury is immediately penetrated by it, turning white and becoming exceedingly brittle The ductility is not always restored on driving off the mercury by heat Solid amalgam contains 40% or more of gold, but any excess of mercury over 60% makes the amalgam pasty. The amalgam produced in gold mills (*see* AMALGAMATION) is not a true amalgam but a collection of little nuggets of gold, coated and partly saturated with mercury. Lead when molten takes up gold readily, and zinc removes the gold from molten lead The zinc and gold form a solid crust which floats on the surface of the lead Advantage is taken of these properties in smelting Gold forms alloys with many other metals but most of them are brittle, and none is of metallurgical importance Even a minute quantity (0·02%) of tellurium, bismuth or lead makes gold brittle

See J Percy, *Metallurgy of Silver and Gold* (1880), J C F Johnson, *Getting Gold* (1897), W. R Crane, *A Treatise on Gold and Silver* (1908), J M Maclaren, *Gold, its Geological Occurrence and Geographical Distribution* (1908), Sir T K Rose, *The Metallurgy of Gold* (1915); H. Garland and C O Bannister, *Ancient Egyptian Metallurgy* (1927), A F Taggert, *Handbook of Ore Dressing* (1927)

(T. K. R)

GOLDBEATING. The art of goldbeating is of great antiquity, being referred to by Homer, and Pliny (*N H.* 33 19) states that 1 oz of gold was extended to 750 leaves, each leaf being four fingers (about 3in) square, such a leaf is three times as thick as the ordinary leaf gold of the present time In all probability the art originated among the eastern nations, where the working of gold and the use of gold ornaments have been distinguished characteristics from the most remote periods On Egyptian mummy cases specimens of original leaf-gilding are met with, where the gold is so thin that it resembles modern gilding (*q v*) The minimum thickness to which gold can be beaten is not known with certainty According to Mersenne (1621) 1 oz. was spread out over 105sq ft ; Réaumur (1711) obtained 146½ sq ft ; other values are 189sq ft and 300sq ft Its malleability is greatly diminished by the presence of other metals, even in very minute quantity In practice the average degree of tenuity to which the gold is reduced is not nearly so great as the last example quoted above A "book of gold" containing 25 leaves measuring each 3¼in , equal to an area of 264sq in. generally weighs from four to five grains

The gold used by the goldbeater is variously alloyed, according to the colour required. Fine gold is commonly supposed to be incapable of being reduced to thin leaves. This, however, is not the case, although its use for ordinary purposes is undesirable on account of its greater cost. It also adheres on one part of a leaf touching another, thus causing a waste of labour by the leaves being spoiled; but for work exposed to the weather it is much preferable, as it is more durable, and does not tarnish or change colour. The external gilding on many public buildings, *e.g.*, the Albert memorial in Kensington gardens, London, is done with pure gold The following is a list of the principal classes of leaf recognized and ordinarily prepared by British beaters, with the proportions of alloy per oz. they contain

Name of leaf.	Proportion of gold	Proportion of silver	Proportion of copper
	Grains	Grains	Grains
Red	456–460		20–24
Pale red	464		16
Extra deep	456	12	12
Deep	444	24	12
Citron	440	30	10
Yellow	408	72	.
Pale yellow	384	96	.
Lemon	360	120	.
Green or pale	312	168	..
White	240	240	

Method of Manufacture.—The process of goldbeating is as follows. The gold, having been alloyed according to the colour desired, is melted in a crucible at a higher temperature than is necessary simply to fuse it, as its malleability is improved by exposure to a greater heat; sudden cooling does not interfere with its malleability, gold differing in this respect from some other metals. It is then cast into an ingot, and flattened, by rolling between a pair of powerful smooth steel rollers, into a ribbon of 1½in wide and 10ft in length to the oz After being flattened it is annealed and cut into pieces of about 6½grs each, or about 75 per oz , and placed between the leaves of a "cutch," which is about ½in thick and 3½in square, containing about 180 leaves of a tough paper. Formerly fine vellum was used for this purpose, and generally still it is interleaved in the proportion of about one of vellum to six of paper The cutch is beaten on for about 20 minutes with a 17 lb hammer, which rebounds by the elasticity of the skin, and saves the labour of lifting, by which the gold is spread to the size of the cutch; each leaf is then taken out and cut into four pieces and put between the skins of a "shoder," 4½in sq and ¼in thick, containing about 720 skins, which have been worn out in the finishing or "mould" process. The shoder requires about two hours' beating upon with a 9-lb. hammer As the gold will spread unequally, the shoder is beaten upon after the larger leaves have reached the edges The effect of this is that the margins of larger leaves come out of the edges in a state of dust This allows time for the smaller leaves to reach the full size of the shoder, thus producing a general evenness of size in the leaves Each leaf is again cut into four pieces, and placed between the leaves of a "mould," composed of about 950 of the finest goldbeaters' skins, 5in square and ¼in thick, the contents of one shoder filling three moulds The material has now reached the last and most difficult stage of the process; and on the fineness of the skin and judgment of the workman the perfection and thinness of the leaf of gold depend During the first hour the hammer is allowed to fall principally upon the centre of the mould This causes gaping cracks upon the edges of the leaves, the sides of which readily coalesce and unite without leaving any trace of the union after being beaten upon At the second hour, when the gold is about 150,000th part of an inch in thickness, it for the first time permits the transmission of the rays of light. Pure gold, or gold but slightly alloyed, transmits green rays, gold highly alloyed with silver transmits pale violet rays The mould requires in all about four hours' beating with a 7-lb hammer, when the ordinary thinness for the gold leaf of commerce will be reached A single ounce of gold will at this stage be extended to 75×4×4 =1,200 leaves, which will trim to squares of about 3¼in each

The dryness of the cutch, shoder, and mould is a matter of extreme delicacy. The finished leaf is taken out of the mould, and the rough edges are trimmed off by slips of the ratan fixed in parallel grooves of an instrument called a waggon, the leaf being laid upon a leathern cushion. The leaves thus prepared are placed into "books" capable of holding 25 leaves each, which have been rubbed over with red ochre to prevent the gold clinging to the paper. Dentist gold is gold leaf carried no farther than the cutch stage, and should be perfectly pure gold

By the above process also silver is beaten, but not so thin, the inferior value of the metal not rendering it commercially desirable to bestow so much labour upon it Copper, tin, zinc, palladium, lead, cadmium, platinum, and aluminium can be beaten into thin leaves, but not to the same extent as gold or silver

Goldbeaters' Skin.—The fine membrane called goldbeaters' skin, used for making up the shoder and mould, is the outer coat of the caecum or blind gut of the ox It is stripped off in lengths about 25 or 30in , and freed from fat by dipping in a solution of caustic alkali and scraping with a blunt knife. It is afterwards stretched on a frame, two membranes are glued together, treated with a solution of aromatic substances or camphor, in isinglass, and subsequently coated with white of egg Finally it is cut into squares of 5in or 5½in , and to make up a mould of 950 pieces the gut of about 380 oxen is required, about 2½ skins being got from each animal A skin will endure about 200 beatings in the mould, after which it is fit for use in the shoder alone.

GOLDBERG, a town of Germany, in the Prussian province of Silesia,[1] 14 m by rail S W of Liegnitz, on the Katzbach Pop (1925) 7,120 Goldberg owes its origin and name to a gold mine in the neighbourhood, abandoned since the Hussite wars The town obtained civic rights in 1211 It suffered from the Tatars in 1241, from the plague in 1334, from the Hussites in 1428, and from various armies during the Thirty Years' War The principal buildings are an old church dating from the beginning of the 13th century and the classical school (founded in 1524), which was famous in the 17th century and numbered Wallenstein among its pupils The chief manufactures are woollen cloth, gloves, stockings, cigars and beer

GOLD COAST, that portion of the Guinea Coast (West Africa) which extends from Assini upon the west to the river Volta on the east It derives its name from the quantities of grains of gold mixed with the sand of the rivers traversing the district The term Gold Coast is now generally identified with the British Gold Coast colony This extends from 30° 7′ W. to 1° 14′ E , the length of the coast-line being about 370 miles It is bounded west by the Ivory Coast, east by Togoland On the north the British possessions, including Ashanti (*q v*) and the Northern Territories, extend to the 11th degree of north latitude Their combined area is given as 78,650 sq m , with a total population, at the 1921 census, of 2,110,424 The Gold Coast colony alone has an area of 23,490 sq m , with a population (1921 census) of 1,173,439, including some 1,500 Europeans For the British mandated area of Togoland, which is administered by the Gold Coast, *see* TOGOLAND

Physical Features.—Though the lagoons common to the West African coast are found both at the western and eastern extremities of the colony (Assini in the west and Kwitta in the east) the greater part of the coast-line is of a different character Cape Three Points (4° 44′ 40″ N 2° 5′ 45″ W) juts boldly into the sea Thence the coast trends east by north, and is but slightly indented The usually low, sandy beach is, however, diversified by bold, rocky headlands The flat belt of country does not extend inland any considerable distance, the spurs of the great plateau which forms the major part of West Africa advancing in the east, in the Akwapim district, near to the coast Here the hills reach an altitude of over 2,000 feet Out of the level plain rise many isolated peaks, generally of conical formation. Numerous rivers descend from the hills, but bars of sand block their mouths, and the only deep water harbour the Gold Coast possesses is that of Takoradi (*q v*), built at great expense and dating only from 1928 Great Atlantic rollers break unceasingly upon the shore. The chief rivers are the Volta (*q v*) the Ankobra and the Prah. The Ankobra or Snake river traverses auriferous country, and reaches the sea some 20 m W of Cape Three Points It has a course of about 150 m , and is navigable in steam launches for about 80miles The Prah ("Busum Prah," sacred river) is regarded as a fetish stream by the Fanti and Ashanti The Prah rises in the north-east of the colony and flows south-west Some 60 m from its mouth it is joined by the Ofin, which comes from the north-west The united stream flows south and reaches the sea in 1° 35′ W As a waterway the river, which has a course of 400 m , is almost useless, owing to the many cataracts in its course

Geology.—The geological structure of the country is only partially known Igneous rocks underlie large areas and are exposed in various areas Granites, diorites and dolerites occur Cretaceous rocks along the coast belt are mostly hidden under superficial deposits Basalt occurs at Axim Inland, large tracts are covered by water-bearing sandstone and laterite Pure sandstones, quartzite and hornstones are of wide distribution, as are clays, shales and slates, and surface deposits of limonite and pisolite cement In the western region are extensive beds of conglomerate or "banket," containing gold Here also are irregular gold bearing veins of quartz, known as the Birrimian system, usually highly inclined and traversing rocks of great age Manganese ore is widely distributed, being found as an oxide in slate and phyllites and in highly metamorphosed rocks such as gneisses Bauxite, formed from clay shales and phyllites, is the cap—sometimes 50 ft thick—of several hills Alluvial silts and gravels carry gold and diamonds

Climate.—The climate on the coast is hot and moist, but with proper precautions, not particularly unhealthy for Europeans The mean temperature in the coast towns is 78° to 80° F There are two wet seasons, not very clearly defined, but the "greater rains" usually begin in March and end in July, and the "lesser rains" occur mostly in September and October From the end of December to about the end of February the dry *harmattan* wind blows from the Sahara In consequence of the prevalence of the sea-breeze from the south-west the western portion of the colony, up to the mouth of the Sekum river (a small stream to the west of Accra), is called the windward district, the eastward portion being known as the leeward The rainfall at Accra, in the leeward district, averages 27 in in the year, but at places in the windward district is much greater, varying from 55 up to 80 inches

Flora and Fauna.—The greater part of the colony is covered with primeval forest Here the vegetation is so luxuriant that in the struggle to reach the sunlight the forest growths are almost entirely vertical The chief trees are silk cottons, especially the bombax, and gigantic hard-wood trees, such as the African mahogany, ebony, odum and camwood The lowest growth in the forest consists of ferns and herbaceous plants Of the ferns some are climbers reaching 30 ft to 40 ft up the stems of the trees they entwine Flowering plants are comparatively rare, they include orchids and a beautiful white lily The "bush" or intermediate growth is made up of smaller trees, the rubber vine and other creepers, some as thick as hawsers, bamboos and sensitive mimosa, and has a height of 30 to 60 feet The creepers are found not only in the bush, but on the ground, and hanging from the branches of the highest trees West of the Prah the forest comes down to the edge of the Atlantic East of that river the coast land is covered with bushes 5 to 12 ft high, occasional large trees and groves of oil palms Still farther east, by Accra, are numerous arborescent Euphorbias, and immediately west of the lower Volta, forests of oil palms and grassy plains with fan palms Behind all these eastern regions is a belt of thin forest country before the denser forest is reached In the north-east are stretches of orchard-like country, with wild plum, shea-butter and kola trees, baobabs, dwarf date and fan palms The cotton and tobacco plants grow wild At the mouths of the rivers and along the lagoons the mangrove is the characteristic tree There are numerous coconut palms along the coast The fruit trees and plants also include the orange, pineapple, mango, papaw, banana and avocado, or alligator pear

[1]Goldberg is also the name of a small town in Mecklenburg-Schwerin, Germany Pop (1925) 3,082

The fauna includes leopards, panthers, hyenas, Potto lemurs, jackals, antelopes, buffaloes, wild-hogs and many kinds of monkey, including the chimpanzee and the *Colobus vellerosus* whose skin with long, black, silky hair is much prized in Europe. Among the snakes are pythons, cobras, horned and puff adders and the venomous water snake Crocodiles, and, in fewer numbers, manatees and otters frequent the rivers and lagoons, and hippopotami are found in the Volta Lizards of brilliant hue, tortoises and great snails are common Birds, which are not very numerous, include parrots and hornbills, kingfishers, ospreys, herons, crossbills, curlews, woodpeckers, doves, pigeons, storks, pelicans, swallows, vultures and the spur plover (the last-named rare). Shoals of herrings frequent the coast; the other fish include mackerel, sole, skate, mullet, bonito, flying fish, fighting fish and shynose Sharks abound at the mouths of all the rivers, edible turtle are fairly common, as are the sword fish, dolphin and sting ray (with poisonous caudal spine) Oysters are numerous on rocks running into the sea and on the exposed roots of mangrove trees Insect life is multitudinous, beetles, spiders, ants, fireflies, butterflies and jiggers abound The earthworm is rare The mosquitoes include the *Culex* or ordinary kind, the *Anopheles*, which carry malaria fever, and the *Stegomyia*, a striped white and black mosquito which carries yellow fever

Inhabitants.—The natives are all of the negro race The districts in general are named after the tribes inhabiting them Those in the western part of the colony are mainly of Fanti stock (*see* FANTI), the Accra and allied tribes inhabit the eastern portion and are believed to be the aboriginal inhabitants The Akim (Akem), who occupy the north-east portion of the colony, have engaged in gold-digging from time immemorial The Akwapim (Aquapem), southern neighbours of the Akim, are extensively engaged in agriculture and in trade The Accra, a clever race, are to be found in all the towns of the West African coast as artisans and sailors On the right bank of the Volta, occupying the low marshy land near the sea, are the Adangme The Krobos live in little villages in the midst of the palm tree woods which grow round about the Kroboberg, an eminence about 1,000 ft high Their country lies between that of the Akim and the Adangme In the west of the colony is the country of the Ahanta, one of the finest and most intelligent of the tribes of Accra stock The Apollonia, a kindred race, occupy the coast region nearest the Ivory Coast

The Twi Tshi or Chi language (the name occurs in many other forms) is that most spoken on the Gold Coast It belongs to the great prefix-pronominal group There are many dialects which may be reduced to two classes or types, Akan and Fanti Akwapim, which is based on the Akim variety of the Akan type, but exhibits Fanti influences, has been made the book-language by the Basle missionaries They had reduced it to writing before 1850 About a million people in all, it is estimated, speak dialects of the Twi In the south-east another language, the Ga or Accra, is spoken It comprises the Ga proper and the Adangme and Krobo dialects Ga proper is spoken by about 40,000 people The Adangme and Krobo dialects are spoken by about 80 000 people They differ very considerably from Ga proper, but books printed in Ga can be used by both the Krobo and Adangme natives Other tongues, less known, are Guan and the Obutu East of the Volta are tribes speaking the Ewe group of languages

Fetishism (*q v*) is the prevailing religion, but there are large numbers of Christians and a lesser number of converts to Islam Belief in a God is universal, as also is a belief in a future state A Moravian mission was started at Christiansborg about 1736, the Basle mission (Evangelical) was begun in 1828, the missionaries combining manual training and farm labour with purely religious work, the Wesleyans started a mission among the Fanti in 1835, and the Anglican and Roman Catholic Churches are also represented

Towns.—Owing to the multiplicity of traders of rival nations, who went to the coast in quest of gold, there are a large number of towns on the coast There are, however, now only two ports of consequence, Takoradi (with a deep water harbour), and Accra (the capital), both separately noticed Going from west to east the first place of note is Axim (pop. 2,189), the site of an old Dutch fort built near the mouth of the Axim river, and in the pre-railway days the port of the gold region Rounding Cape Three Points, whose vicinity is marked by a line of breakers nearly 2½ m long, Dixcove is reached, and then Takoradi, long neglected. A few miles further on is Sekondi (*q v*), the first starting-point of the railway to the gold-fields and Kumasi Elmina (*q v*), formerly one of the most important posts of European settlement, is some distance east of the mouth of the Prah Eight miles east of Elmina is Cape Coast (*q v*), at one time the colonial capital Anamabo, 9 m. farther east is where, in 1807, a handful of English soldiers made a successful defence against the Ashanti host Saltpond, another 9 m along the coast, is a well-built town (pop 6,342), and is singular in possessing no ancient fort Between Anamabo and Saltpond is Kormantine (Cormantyne), noted as the place whence the English first exported slaves from this coast Hence the general name Cormantynes given in the West Indies to slaves from the Gold Coast Winnebah (pop 6,980), 50 m from Cape Coast, is an old town noted for the manufacture of canoes Next along the coast is Accra, and on the right bank of the Volta, near its mouth, is the town of Addah Kwitta lies beyond the Volta, not far from the Togoland frontier Of the inland towns the most populous are on the railway between Accra and Kumasi—but none has as many as 10,000 inhabitants Akropong, in the hills north-east of Accra is 1,400 ft above the sea and is a centre of missionary work Yarkwa is the centre of the gold mining industry

Communications.—Up to 1898, when the first railway was begun, internal communication was mainly by tortuous bush tracks, but there was a good main road (141 m long) from Cape Coast to Kumasi The first railway started from Sekondi (the terminus is now at Takoradi), and after traversing the gold-fields (with a branch line, 18 m to Preston) was continued to Kumasi (168 m), which was reached in Oct 1903 In 1907–10 a railway (35 m in length) was built from Accra to Mangoase To meet the growing needs of trade this line was extended to Kumasi, reached in July 1923, the distance from Accra being 196 miles An east-west line through the centre of the colony was opened in 1927 It starts from the Sekondi-Kumasi line at Huni valley and goes to Kade It is 99 m long The railways are on the 3 ft 6 in gauge, and are State owned Over 5,000 m of main roads for motor traffic had been built by 1928, and as early as 1925 the railways, in which the Government had sunk over £8,000,000 capital, were complaining of road competition The Volta is navigable in parts and there is canoe traffic on other rivers There is an extensive system of telegraphs and telephones, and there is cable communication with Europe Regular mail services are maintained between England and the Gold Coast, the usual time taken, Liverpool to Takoradi, being 14 or 15 days

Agriculture, Mining and Trade.—Originally the chief exports from the coast were gold and slaves, when the slave trade was stopped palm oil and palm nuts, monkey skins, guinea grain and kola nuts took their place To these rubber was added about 1880 In 1895 the chief exports and their value were rubber (£332,000), gold dust (£91,000), palm oil and palm kernel (£308,000), and kola nuts (£30,000) Four years later (1899) cocoa, for the production of which the Gold Coast is now chiefly famous, figures in the exports as 714,000 lb in weight and £16,000 in value, while the rubber exported, was worth £555,000, gold and gold dust had fallen to the value of £51,000, but palm oil and kola nuts held their place Thereafter, the rubber trade fluctuated and finally declined, chiefly because of the competition of plantation rubber from the East Timber was added to the exports, and with the adoption of modern methods and railway facilities, the gold mining industry revived For a time gold and cocoa became rivals as the two chief exports (cocoa, £866,000, and gold, £790,000 in 1910) with kola nuts progressing and the palm oil exports tending to fall off Cocoa, however, rapidly outdistanced gold, while the discovery of manganese ore in 1914 added another valuable product to the list of exports Later (in 1919) came the discovery of diamonds and bauxite Thus the chief exports, besides cocoa, came to be gold, manganese ore, kola nuts, lumber

and diamonds, with palm oil and kernels and copra subsidiary; and much of the cocoa and most of the gold comes from Ashanti Imports include every variety of goods, the first in value being cotton piece goods

The cocoa industry was started by a native of Accra, who in 1879, returning from Fernando Po, brought with him a few pods, the seeds from which he planted at his home at Mampong in the Akwapim hills The experiment was successful and a large demand for seeds arose In 1890 a Government botanical station was established at Aburi, with the object of fostering agriculture, and the officials gave encouragement to the growers of cocoa. The first export of 80 lb. was made in 1891 and it fetched £4, in 1893 two tons of cocoa were exported The natives, in whose hands the industry was, now became exceedingly keen on cocoa farms, the more so as they were easy to run, and large areas of forest were cleared. First in the eastern province and then in the central province and in Ashanti, farmer after farmer took up cocoa, so that by 1913 the output exceeded 50,000 tons and fetched nearly £2,500,000 In 1924–25 the output had grown to 220,000 tons (value £7,896,000) In 1920 an abnormal "boom" year, following the World War, a crop of 124,000 tons had fetched over £10,000,000, and the sharp fall in prices in 1921 caused a partial crisis, the farmers finding it hard to understand world economic workings The building of roads and railways, by reducing costs—much cocoa had been planted in places where it did not pay to bring the crop to market by head loads—helped to restore normal conditions With the aid of the Agricultural Department in seeing that farmers used the best methods, the industry was placed on a stable basis The export of cocoa in 1926 was valued at £9,181,000 The industry was built up within a quarter of a century without the use of European capital, by the natives themselves, and mainly by a large number of illiterate farmers, each working a small area

The cultivation of cocoa led to the neglect of the oil palm in many districts, but the Volta region continued to export palm-oil and kernels, while the Government sought to encourage the cultivation of other crops, notably sisal hemp—a plantation being started near Accra in 1921—and citrus fruits The cultivation of Para rubber on plantation lines was also begun In the eastern districts the cocoanut palm is abundant, and thence came the copra exports For home consumption Indian corn, cassava and yams are largely grown At many of the coast towns fishing is a big industry and salted and sun-dried fish from Addah and Kwitta (Keta) find a ready sale inland While efforts to grow cotton for export were not successful, cloths are woven by the natives, partly from home-grown but mostly from imported yarn, canoes are made from the silk cotton tree, salt is prepared from the Addah and other lagoons Native artificers in gold and other metals often show skill and taste, odum wood is used for building and cabinet work The timber exported is largely mahogany

The gold mines, since about 1874, have been worked by European companies though it is only since 1902 that modern methods have been used The chief mines in the colony are at Tarkwa and Prestea; the most valuable mine is at Obuasi, in Ashanti Alluvial gold is obtained by hydraulic sluicing For many generations the gold exported was dust, collected by the natives from the gravel or streams—small quantities are still obtained by African women, who use the calabash—but there is evidence that the Portuguese in their day did some regular mining The output of gold in 1927 was valued at £803,000 Between 1903 and 1927 the total value of gold produced was 6,148,192 oz., valued at £26,117,856. The manganese ore mined is found along the Sekondi-Kumasi railway, some 34–36 m from Sekondi Mining began in 1916, for the year 1926–27 over 390,000 tons of ore were railed—and the value of the total export since 1916 was about £2,500,000 The diamonds are of alluvial origin and are found chiefly in the gravel of streams in the Prah and Birim basins Up to 1927 the value of the diamonds found, mostly stones under one carat was over £800,000 Owing to the bauxite deposits occurring in regions distant from the railways, the mining of that metal had not begun up to 1929. The ore had, however, been proved to be of high grade

In 1887 the total external trade of the Gold Coast was imports, £363,000; exports, £372,000; by 1900—that is before the development of the cocoa plantation and the modern methods of gold mining—the figures had grown to imports, £1,294,000; exports, £885,000 Twenty-five years later (1925) the figures were imports, £9,782,000, exports £10,890,000 Two-thirds of the imports are from Great Britain, which takes only about a third of the exports Much of the cocoa goes to the Continent of Europe, the kola nuts go mostly to Nigeria Shipping is largely British (2,698,000 tons out of a total of 4,812,000 tons in 1926–27)

Administration, Education and Revenue.—At the head of the administration is a governor, who is assisted by an executive council composed of officials, and a legislative council of official and non-official members, including, since 1925, members elected by the municipalities and chiefs chosen by the council of head chiefs of each province The provinces are three—western, central and eastern—each presided over by a commissioner The provinces, again, are divided into districts and the district commissioner is the official in direct touch with the chiefs and people. In respect of internal affairs each tribe forms a petty, independent, and democratic State Each town or village has its chiefs or headman, and these chiefs form a council of State which elects, and can depose, the *omanhene* (head chief) In practice the omanhene, who is the occupant of the tribal stool (throne), and formerly by Europeans was styled king, is chosen from certain selected families, and succession to the stool is normally through the female line An omanhene is usually succeeded by a son—chosen by the council—of his eldest sister. The principal woman of the tribe, a personage of much influence, is known as the Queen Mother She is usually an aunt or sister of the omanhene The head chiefs had been accustomed for years to meet to discuss matters of common interest, but they had not statutory powers until 1925 They did much good work in guiding the tribes at a time when the rapid growth of commerce and the intermingling of the peoples was breaking up old tribal customs, and they were instrumental in getting for the natives a fuller share in the Central Government There are native tribunals with a limited civil and criminal jurisdiction, and native law is administered in all the courts as far as is compatible with "natural justice" and the law of the colony—which by an ordinance of 1874 is based on the common law of England

Education was at first wholly in the hands of missionaries, who, by grants from the administration, still provide most of the school teaching There are also Government primary schools. Industrial instruction, mainly agricultural in character, is given in most primary schools A Government technical school was opened at Accra in 1909 and, later, trade schools were opened in other places These schools instruct in agriculture, carpentry, metal work and other subjects, the object being to turn out lads likely to become capable, adaptable citizens For teachers there are the Government training college at Accra and the Presbyterian Mission seminary at Akropong In all the institutions Africans take part in the teaching and, by an ordinance of 1927, all teachers are registered Special care is taken to develop character, together with the preservation of all that is good in African culture, taking from Western civilization only that which is worthy To this end a college—known as the Prince of Wales' college—was built at Achimota, near Accra, at a cost of £500,000, primarily as a Government secondary school for boys and girls, but also to afford education from kindergarten to university standards It was opened in 1927 with a staff of 50 teachers, the principal being a European and the vice-principal an African The Gold Coast natives, in general, showed a keen desire for education, the attendance in the elementary schools (1926) was about 30,000 All teachers must know at least one vernacular tongue The languages taught are Twi, Fanti, Ga, Ewe and English The "bush" schools, in which trained teachers give unsupervised instruction, are discouraged by the Government and, as far as possible, closed

Revenue in 1887 was £122,000, it first exceeded £300,000 in 1898 Thereafter, with the growth of trade, it increased more rapidly and in 1910 exceeded £1,000,000, in 1914 £1,331,000;

and in 1924–25, which may be regarded as a normal year after the fluctuations caused by war and post-war conditions, was £3,971,000. In 1926–27 the figures were. revenue, £4,365,000; expenditure, £4,812,000.

Expenditure was regulated by receipts, which were chiefly derived from customs (£2,244,000 in 1926–27). There is a tax of one-eighth of a penny per lb of cocoa exported It should be noted that, as in the case of trade returns, the figures of revenue and expenditure for the Gold Coast include Ashanti, the Northern Territories and British Togoland

HISTORY

It is claimed by some writers that English seamen made voyages to the Gold Coast in the reign of Edward I, also that a company of Norman merchants established themselves about 1364 at a place they named La Mina (Elmina), and carried on trade with the natives for nearly 50 years, when the enterprise was abandoned There is no definite evidence to support these claims. By order of John II of Portugal an expedition under Diogo d'Azambuja, accompanied by Bartholomew Diaz and, probably, by Christopher Columbus, took possession of (or founded) Elmina in 1481–82. By the Portuguese it was called variously São Jorge da Mina or Ora del Mina—the mouth of the (gold) mines That besides alluvial washings they also worked the gold mines was proved by discoveries in the latter part of the 19th century The Portuguese had no rivals on the coast for some half century, but in 1553 English ships brought back from Guinea gold to the weight of.150 lb The fame of the Gold Coast thereafter attracted to it adventurers from almost every European nation, the most aggressive being the Dutch, who from the end of the 16th century sought to oust the Portuguese, and in whose favour the Portuguese did finally withdraw in 1642, in return for the withdrawal of the Dutch claims to Brazil The Dutch henceforth made Elmina their headquarters on the coast Traces of the Portuguese occupation, which lasted 160 years, are still to be found, notably in the language of the natives Such familiar words as palaver, fetish, caboceer and dash (*i e*, a gift) have all a Portuguese origin

English and Dutch Rivalry.—An English company built a fort at Kormantine previously to 1651, and some ten years later the fort or castle at Cape Coast was built The settlements made by the English provoked the hostility of the Dutch and led to war between England and Holland, during which Admiral de Ruyter destroyed (1664–65) all the English forts save Cape Coast castle The Treaty of Breda in 1667 confirmed the Dutch in the possession of their conquests, but the English speedily opened other trading stations Charles II in 1672 granted a charter to the Royal African Company, which built forts at Dixcove, Sekondi, Accra, Whydah and other places, besides repairing Cape Coast castle At this time the trade both in slaves and gold was very great, and at the beginning of the 18th century the value of the gold exported annually was estimated by William Bosman, the chief Dutch factor at Elmina, to be over £200,000 Piracy was rife along the coast, and was not indeed finally stamped out until the middle of the 19th century

The Royal African Company, which lost its monopoly of trade with England in 1700, was succeeded by another, the African Company of Merchants, which was constituted in 1750 by act of parliament and received an annual subsidy from government The slave trade was then at its height and some 10,000 negroes were exported yearly Many of the slaves were prisoners of war sold to the merchants by the Ashanti, who had become the chief native power. The abolition of the slave trade (1807) crippled the company, which was dissolved in 1821, when the Crown took possession of the forts

Contact with the Ashanti.—Since the beginning of the 19th century the British had begun to exercise territorial rights in the towns where they held forts, and in 1817 the right of the British to control the natives living in the coast towns was recognized by the Ashanti In 1824 the first step towards extension of British authority beyond the coast region was taken by Governor Sir Charles M'Carthy, who incited the Fanti to rise against their oppressors, the Ashanti (The Fanti's country had been conquered by the Ashanti in 1807.) Sir Charles and the Fanti army were defeated, the governor losing his life, but in 1826 the British gained a victory over the Ashanti at Dodowah. The home government, however, disgusted with the Gold Coast because of the perpetual disturbances in the protectorate, determined to abandon the settlements, and sent instructions for the forts to be destroyed and the Europeans brought home. The merchants, backed by Major Rickets, 2nd West India regiment, the administrator, protested, and as a compromise the forts were handed over to a committee of merchants (Sept 1828), who were given a subsidy of £4,000 a year. The merchants secured (1830) as their administrator Mr. George Maclean—a gentleman with military experience on the Gold Coast and not engaged in trade. To Maclean is due the consolidation of British interests in the interior. He concluded (1831) a treaty with the Ashanti advantageous to the Fanti, whilst with very inadequate means he contrived to extend British influence over the whole region of the present colony. In 1843 the Colonial Office resumed control of the forts, Maclean continuing to direct native affairs until his death in 1847. British jurisdiction was defined by the bond of March 6, 1844, an agreement with the native chiefs by which the Crown received the right of trying criminals, repressing human sacrifice, etc The purchase of the Danish forts in 1850, and of the Dutch forts and territory in 1871, led to the consolidation of the British power along the coast; and the Ashanti war of 1873–74 resulted in the extension of the area of British influence

For a considerable time the Gold Coast had been a virtual dependency of Sierra Leone. In 1874 the Gold Coast and Lagos were created a separate crown colony, this arrangement lasting until 1886 when Lagos was cut off from the Gold Coast administration.

The Struggle for Hinterland.—At this period the partition of Africa had begun, and the British endeavoured to secure, north of Ashanti, an ample hinterland for the Gold Coast They had to meet not only the keen rivalry of the French, their neighbours on the west (in the Ivory Coast) but also on the east that of the Germans who in 1884 had secured a tiny seaboard at Togo and claimed for it a large hinterland The Gold Coast had, in addition, further troubles with Ashanti leading finally to the annexation of that country in 1901 (*see* ASHANTI, *History*) By that time the disputes with Germany and France had been settled The Germans, newcomers to the West Coast, had simply sought to get as much elbow room as they could By an agreement of 1889, which defined the Gold Coast-Togoland frontier, they did very well But the rivalry between the French and British was much more serious Advancing from Senegal and the Ivory Coast the French tried to hem in the Gold Coast in the same manner in which they did in fact hem in the Gambia and Sierra Leone But from 1882 onward British agents had penetrated the country north of Ashanti, prominent among them being George E Ferguson, a native of West Africa, who had previously explored northern Ashanti Between 1892 and 1897 Ferguson concluded several treaties guarding British interests In 1897 Lieut Henderson and Ferguson occupied Wa, where they were attacked by the *sofas* of Samory (*see* SENEGAL, *History*)

Henderson, who had gone to the *sofa* camp to parley, was held prisoner for some time, while Ferguson was killed A period of considerable tension, arising from the proximity of British and French troops in the disputed territory, was ended by the signature of a convention in Paris (June 14, 1898), in which the western and northern boundaries were defined and the British abandoned their claim to the important town and district of Wagadugu in the Niger bend

By the agreement with Germany and France, Britain had secured an area north of Ashanti of 30,600sq m In 1897 this region was organized under the name of the Northern Territories, as a dependency of the Gold Coast, and placed in the charge of a commissioner Col H P Northcott (killed in the Boer War, 1899–1902) was the first commissioner and commandant of the troops The government was at first of a semi-military character, but in 1907 a civilian staff was appointed to carry on the administration. In these northern regions, consisting of open but well-timbered country inhabited by tribes who were both agriculturists and

stock-raisers, steady progress was made. There was considerable transport trade both with Ashanti in the south and the French colonies to the north

An Era of Development.—In the Gold Coast colony a new era began about 1900, the year in which the revolt of the Ashanti was crushed. Sir Matthew Nathan who then became governor began the railway from Sekondi to Kumasi and in other ways initiated a vigorous policy of development, maintained by his successors, notable among whom were Sir John Rodger (governor 1904–10), Sir Hugh Clifford (1912–19) and Sir Gordon Guggisberg (1919–27) Progress was seen in zeal for education (technical as well as literary), sanitation, and a greatly improved standard of living generally. There was a notable increase in the converts to Christianity; and in short a social and economic revolution occurred which even the World War was powerless materially to affect. The chief agent in this transformation was cocoa The first cocoa plantation had been started in 1879 by a native of Accra At that time coffee was being grown and it was not until 1898, when the cultivation of coffee became no longer profitable, that serious attention was paid to cocoa The natives then took up its cultivation on an ever-increasing scale By 1900 the export of cocoa had become noteworthy; 20 years later the Gold Coast produced half the world's cocoa crop The industry is entirely in the hands of the natives, Europeans acting only as purchasers and shippers, and in a decreasing degree, as carriers The growth of the cocoa industry created private property in real estate, contrary to local custom, under which all lands are communal Many natives became wealthy and prosperity was general

On the outbreak of the World War the Gold Coast regiment, under Lieut.-Col Bryant invaded Togoland and, with some help from French troops from Dahomey, speedily conquered it (Aug 1914) Subsequently the Gold Coast regiment served both in the Cameroons and in German East Africa where it had a distinguished record It was regularly supplied with drafts from the colony and at the time of the armistice in 1918 had expanded into a brigade In other ways the colony gave substantial help in the war, notably by meeting the cost of the occupation of part of Togoland, which was eventually divided into British and French spheres (*see* TOGOLAND)

The "boom" in trade which followed the war, and the depression which succeeded affected the Gold Coast but recovery came quickly Much attention was paid to providing better communications, not only by railway, but by building roads for motor traffic, while a deep water harbour, opened in April 1928, was built at Takoradi (near Sekondi) Sir Gordon Guggisberg's governorship was notable not only for material progress but for the successful efforts made to improve the social, moral and political condition of the people In tribal matters the chiefs and their councils already had much power and natives had been nominated to seats on the legislative council of the colony In 1925 further measures were taken to associate the people with the government The franchise was granted for the election of the non-official members of the council, and provincial councils of head chiefs were established In this year the prince of Wales visited the Gold Coast and he gave his name to Achimota college, an institution providing for education up to a university standard, but aiming chiefly at character-building The college was opened in Jan 1927, though the buildings were not then completed The vice-principal was Dr Kivegyir Aggrey, a Fanti, and the greatest native authority on the education of West Africans Dr. Aggrey's death, on July 30, 1927, was a loss to the whole of negro Africa

A notable step had been taken in 1919 when by international agreement the importation of trade spirits into the Gold Coast and the other West African colonies was prohibited The best authorities were at variance as to the effect of trade gin on the natives, but generally, prohibition was welcomed As the duty on spirits had been a main source of revenue, other means had to be found to get money, and they included taxes on food But a succession of good budgets enabled the Government to abolish the food taxes in 1928. Efforts were made to widen the basis of the country's prosperity, but, apart from cocoa, only kola nut cultivation had much attraction for the natives In its mineral resources however the colony had another valuable asset. Besides the gold mines, manganese ores were found, and from 1921 became an important export Diamonds and other minerals were also discovered.

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(F. R. C.)

GOLDCREST or **GOLDEN CRESTED WREN** is the type of a small group placed among the *Sylviidae,* Old World warblers The goldcrest (*Regulus cristatus*) is the smallest of British birds, its whole length being about 3½ in., and its weight some 5 grams Generally of an olive-green colour, the top of its head is bright yellow, deepening into orange, and bounded on either side by a black line The wing coverts are dull black with a whitish bar The cock has a pleasant but weak song, which has been compared to the squeaking of young mice The nest is of moss, wool and spiders' webs, lined with feathers, and usually built under and near the end of the branch of a yew, fir or cedar, supported by the interweaving of two or three twigs The six to ten eggs are dull white, sometimes freckled with reddish-brown. The species lives most of the year in family parties often in company with titmice Though to be met with in Britain at all seasons, in the autumn large numbers of migrants from northern Europe visit the east coast A more local European species is the fire-crest (*R ignicapillus*) recognizable by the black streak on each side of the head, as well as by the deeper colour of its crown A third species, *R maderensis,* inhabits the Madeiras Examples from the Himalayas and Japan are *R himalayensis* and *R japonicus* North America has two species, *R satrapa,* very like the European *R ignicapillus,* and the ruby-crowned wren, *R calendula,* which has a loud and very melodious song

GOLDEN, a city of Colorado, U.S.A., 14m. W. by N. of Denver, at an altitude of 5,700ft.; the county seat of Jefferson county It is served by the Colorado and Southern and the Denver and Intermountain (electric) railways The population in 1920 was 2,484 The Colorado School of Mines (1874) is situated at Golden, and one m. S. is the State industrial school for boys The manufactures include china, pottery, drain pipe, bricks, flour and malted milk Golden is at the entrance to Denver's system of mountain parks The city was named after Tom Golden, one of the pioneer prospectors who established a mining camp at this point in 1859 It was incorporated as a town in 1865 and as a city in 1870 From 1862 to 1868 it was the capital of Colorado Territory

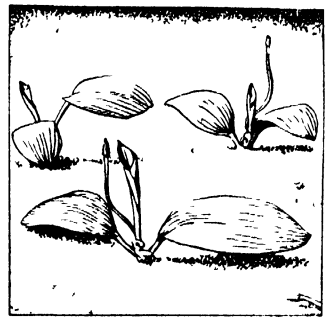
GOLDEN BULL, the general designation of any charter decorated with a golden seal or *bulla* The name, however, has become practically restricted to a few documents of unusual political importance, the golden bull of the empire, the golden bull of Brabant, the golden bull of Hungary, and the golden bull of Milan—and of these the first is undoubtedly *the* golden bull *par excellence* The main object of the golden bull was to provide a set of rules for the election of the German kings, or kings of the Romans, as they are called in this document Since the informal establishment of the electoral college about a century before (*see* ELECTORS), various disputes had taken place about the right of certain princes to vote at the elections, these and other difficulties having arisen owing to the absence of any authoritative ruling Under these circumstances the emperor Charles IV determined by an authoritative pronouncement to make such uncertainty impossible in the future, and at the same time to add to his own power and prestige, especially in his capacity as king of Bohemia In its first form the bull was promulgated at the diet of Nuremberg on Jan 10, 1356, but it was not accepted by the princes until some modifications had been introduced, and in its final form it was issued at the diet of Metz on Dec 25 following

The text of the golden bull consists of a prologue and of 31 chapters The early chapters are mainly concerned with details

of the elaborate ceremonies which are to be observed on the occasion of an election The number of electors is fixed at seven, the duke of Saxe-Wittenberg, not the duke of Saxe-Lauenburg, receiving the Saxon vote, and the count palatine, not the duke of Bavaria, obtaining the vote of the Wittelsbachs. The electors were arranged in order of precedence thus: the archbishops of Mainz, of Trier and of Cologne, the king of Bohemia, the count palatine of the Rhine, the duke of Saxony and the margrave of Brandenburg The work of summoning the electors and of presiding over their deliberations fell to the archbishop of Mainz, but if he failed to discharge this duty the electors were to assemble without summons within three months of the death of a king Elections were to be held at Frankfort; they were to be decided by a majority of votes, and the subsequent coronation at Aix-la-Chapelle was to be performed by the archbishop of Cologne. During a vacancy in the empire the work of administering the greater part of Germany was entrusted to the count palatine of the Rhine, the duke of Saxony being responsible, however, for the government of Saxony, or rather for the districts *ubi Saxonica jura servantur.*

The chief result of the bull was to add greatly to the power of the electors. To these princes were given sovereign rights in their dominions, which were declared indivisible and were to pass according to the rule of primogeniture Except in extreme cases, there was to be no appeal from the sentences of their tribunals, and they were confirmed in the right of coining money, of taking tolls, and in other privileges, while conspirators against their lives were to suffer the penalties of treason One clause gave special rights and immunities to the king of Bohemia, who, it must be remembered, at this time was Charles himself, and others enjoined the observance of the public peace. Provision was made for an annual meeting of the electors, to be held at Metz four weeks after Easter This arrangement, however, was not carried out, although the electors met occasionally Another clause forbade the cities to receive *Pfahlburger, i e ,* forbade them to take men dwelling outside their walls under their protection It may be noted that there is no admission whatever that the election of a king needs confirmation from the pope

GOLDEN CLUB (*Orontium aquaticum*), a North American aquatic plant of the arum family (Araceae), found in shallow ponds and less frequently in swamps from Massachusetts to Florida, chiefly near the coast It is a somewhat fleshy perennial, with thick oblong, ascending, or floating leaves, 5 to 10 in long, and bearing in early spring a narrow but dense cluster (spike) of small bright yellow flowers, terminating a flattened stalk, ½ ft to 2 ft. long, which rises above the water. This handsome aroid, the only species of the genus, is sometimes transplanted in water gardens (*see* Araceae)



BY COURTESY OF THE WILD FLOWER PRESERVATION SOCIETY

THE GOLDEN CLUB (ORONTIUM AQUATICUM), WHICH BEARS MINUTE YELLOW FLOWERS

GOLDEN-EYE, a name given to a diving duck (*Glaucion,* or *Clangula*), breeding in far northern regions, whence it migrates south in winter. It nests in hollow trees In Scandinavia the people set up artificial nesting-boxes, whence they take toll of the bird's eggs and down The adult male is mainly black above, with a white eye-patch and scapulars, the lower parts are white, in the female, dark brown replaces black An elaborate courtship during which the drake may dive and bob up just in front of the female, occurs in the early spring

Two species inhabit North America These are Barrow's golden-eye (*C. islandica*), with a high northern breeding range, and the American golden-eye (*C c americana*)

GOLDEN FLEECE, in Greek mythology, the fleece of the ram on which Phrixus and Helle escaped, for which *see* Argonauts; *see* also Knighthood and Chivalry, section *Orders of Knighthood.*

GOLDEN-GLOW, a double-flowered cultivated variety of the tall cone-flower (*Rudbeckia laciniata*), native to North America, widely grown in the United States and Canada as an ornamental plant. It is a showy summer bloomer, usually 4 ft. to 7 ft high, with smooth, much branched stems, more or less divided leaves and numerous flowering heads 2½ to 3½ in across, crowded with brilliant golden yellow ray flowers (*See* article Black-eyed Susan.)

GOLDEN HORDE, a body of Tatars who in the middle of the 13th century overran a great portion of eastern Europe and founded in Russia the Tatar khanate, known as the Empire of the Golden Horde or Western Kipchaks They invaded Europe about 1237 under the leadership of Bātū Khan, a grandson of Jenghiz Khan, passed over Russia with slaughter and destruction, and penetrated into Silesia, Poland and Hungary, finally defeating Henry II , duke of Silesia, at Liegnitz in the battle known as the Wahlstatt on April 9, 1241 So costly was this victory, however, that Bātū, finding he could not reduce Neustadt, retraced his steps and established himself in his magnificent tent (whence the name "golden") on the Volga The new settlement was known as *Sir Orda* ("Golden Camp," whence "Golden *Horde*") Very rapidly the powers of Bātū extended over the Russian princes, and so long as the khanate remained in the direct descent from Bātū nothing occurred to check the growth of the empire But the death of Jānī-Beg, in 1357, threw everything into confusion until in 1378 Töktāmish, of the Eastern Kipchaks, succeeded in ousting all rivals For a short time the glory of the Golden Horde was renewed, but it was finally crashed by Timur in 1395. (*See* Mongols and Russia)

GOLDEN MOLE, the name given to species of the South African family Chrysochloridae of the order Insectivora (*q v*) from the bright lustre of their fur They resemble the true moles (*q v*) in habits and, to some extent, in appearance, but dig by means of the enormous claws on the two middle digits of the forelimbs, an adaptation to the hard soil For their structure and relationships, *see* Insectivora

GOLDEN RAGWORT (*Senecio aureus*), a North American plant of the composite family (Compositae), called also squaw-weed, life-weed and false valerian, found in wet places from Newfoundland to Ontario and Wisconsin and southward to Florida and Texas It is a slender perennial with strongly scented roots and a smooth stem, 1 to 2 ft high, bearing large, rounded, heart-shaped, basal leaves on slender stalks and a few narrow, toothed or divided, somewhat clasping stem leaves. The conspicuous golden-yellow flower heads, about ¾ in across, are borne in a long-stalked, terminal, more or less flat-topped cluster The plant is a common late spring and early summer wild flower throughout most parts of its range (*see* Senecio)



BY COURTESY OF THE WILD FLOWER PRESERVATION SOCIETY

GOLDEN RAGWORT (SENECIO AUREUS), ALSO CALLED SQUAW-WEED AND LIFEROOT, A NORTH AMERICAN PLANT FORMERLY A FAVOURITE MEDICINE OF THE INDIANS

GOLDEN ROD, the popular name for plants of the botanical genus *Solidago,* of the family Compositae, comprising about 125 species, natives chiefly of North America, a few, however, occurring in the Old World and in South America. They are erect perennial herbs, mostly from 2 to 8 ft high, usually unbranched or slightly branched, with undivided toothed or entire leaves and very numerous small heads of brilliant yellow (rarely white) flowers arranged in conspicuous terminal or axillary clusters. The European golden rod (*S Virgaurea*), the only British species. with a stem, usually 1 to 3 ft high, bearing a long cluster of showy flower heads, is found in woods and thickets It is one of the best garden plants of the genus, several other species of which are sparingly cultivated for ornament The golden rods are characteristic plants in eastern North America, where about 60

species occur, many of which are widely distributed and of great abundance. They are found almost everywhere,—in woodlands, swamps, on mountains, in fields and along roadsides With the asters, whose bright colours they complement, the golden rods form one of the chief floral glories of autumn from the Great Plains eastward to the Atlantic While numerous handsome species occur in the Rocky Mountain region and on the Pacific coast they are less abundant and conspicuous than in the eastern States Among the best-known eastern species are the early golden rod (*S juncea*), the late golden rod (*S serotina*), the tall golden rod (*S altissima*), the Canada golden rod (*S canadensis*), the dwarf golden rod (*S. nemoralis*), the wreath golden rod (*S. caesia*), the pale golden rod or white rod (*S bicolor*), the sweet golden rod (*S. odorata*) and the showy golden rod (*S. speciosa*). Among the western species are the western golden rod (*S occidentalis*), found from the Rocky mountains westward; the California golden rod (*S californica*), the *oreja de liebre* of the Spanish Californians, and the coast golden rod (*S. spathulata*), of central Californian shores (*See* ASTER)

GOLDEN ROSE, an ornament made of wrought gold and set with gems, generally sapphires, which is blessed by the pope on the fourth (*Laetare*) Sunday of Lent, and usually afterwards sent as a mark of special favour to some distinguished individual, to a church, or a civil community Formerly it was a single rose of wrought gold, coloured red, but the form finally adopted is a thorny branch with leaves and flowers, the petals of which are decked with gems, surmounted by one principal rose. The origin of the custom is obscure From very early times popes have given away a rose on the fourth Sunday of Lent, whence the name Dominica Rosae, sometimes given to this feast The practice of blessing and sending some such symbol (*e g , eulogiae*) goes back to the earliest Christian antiquity, but the use of the rose itself does not seem to go farther back than the 11th century Beginning with the 16th century, a letter was sent with the rose, giving the reasons for sending it and recounting the merits and virtues of the receiver When the change was made from the form of the simple rose to the branch is uncertain The rose sent by Innocent IV in 1244 to Count Raymond Berengar IV of Provence was a simple flower without any accessory ornamentation, while the one given by Benedict XI in 1303 or 1304 to the church of St. Stephen at Perugia consisted of a branch garnished with five open and two closed roses enriched with a sapphire, the whole having a value of seventy ducats The value of the gift varied according to the character or rank of the recipient John XXII gave away some weighing 12 oz , and worth from £250 to £325 Many kings and queens have received this honour at the hands of the pope, and if, in any year, there is deemed to be no worthy recipient the rose is laid up in the Vatican

Some of the most famous Italian goldsmiths have been employed in making the earlier roses, and such intrinsically valuable objects have, in common with other priceless historical examples of the goldsmith's art, found their way to the melting pot, therefore few specimens are extant There is one of the 14th century in the Cluny Museum, Paris, believed to have been sent by Clement V to the prince-bishop of Basel, one conferred in 1458 on his native city of Siena by Pope Pius II , and the rose bestowed upon Siena by Alexander VII , a son of that city, is depicted in a procession in a fresco in the Palazzo Pubblico at Siena

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GOLD FERN, a handsome American fern (*Gymnogramma triangularis* or *Pityrogramma triangularis*), native to the Pacific coast region from British Columbia south to Ecuador, so called because the leaves (fronds) are coated beneath with a bright orange-coloured powder, varying to white The dark-brown, glossy leaf-stalks (stipes), 6 in to 12 in high, rise from the rootstock in dense tufts, and bear triangular-shaped, somewhat leathery leaves, 3 in to 4 in. long and broad, more or less deeply cut into rounded leaflets or lobes A tropical American species, *G chrysophyllum,* popular in greenhouse cultivation, with golden yellow powder on the under surface of the fronds, is also called gold fern

GOLDFIELD, a mining town in the desert in south-western Nevada, U S A , served by the Tonopah and Goldfield and the Tonopah and Tidewater railways, the county seat of Esmeralda county. The population in 1920 was 1,558 Gold was discovered here in 1902, two or three years after the lucky strike at Tonopah, 28m north, and Goldfield soon became the largest town in the State Production was at its peak in 1910–11, with an annual output of about $10,000,000 After 1918 it declined until in 1927 only about 500 tons of ore was mined Much of the ground has not yet been explored, and in 1928 active prospecting operations were in progress by lessees of the principal mining property

The Goldfield mines were the scene of a bitter labour struggle Conflict between the miners (organized as a branch of the Western Federation of Miners) and the operators began early, and there were several set strikes in the year beginning Dec 1906 From Dec 6, 1907, to March 7, 1908, Federal troops under Gen Frederick Funston, sent by President Roosevelt on an appeal from Gov. Sparks, were stationed in the town to maintain order On their arrival the mine-owners reduced wages and announced that no members of the Western Federation of Miners would be employed After their withdrawal work was gradually resumed, on the operators' terms, and there has been no union organization since.

GOLDFINCH, *Carduelis carduelis,* a well-known and beautiful bird found over the greater part of Europe and north Africa, and eastwards to Persia and Turkistan It is a favourite cage-bird As a songster it is surpassed by other species, but its docility and attachment to its master or mistress make up for any defect in its vocal powers In some parts of England the trade in goldfinches is very considerable The goldfinch decreased markedly in Britain during the later part of the 19th century, but is now becoming more common Though goldfinches may be observed in the coldest weather, most leave Britain in autumn, returning in spring, and resorting to gardens and orchards to breed The nest is beautifully neat, generally well hidden by the leafy bough on which it is built When the broods leave the nest they frequent pastures, commons, heaths and downs in flocks The goldfinch is very fond of the seeds of thistles and other weeds It has been introduced into New Zealand, where it has firmly established itself (*see* Thomson, *Naturalisation of Animals and Plants in New Zealand*) Eastward of the range of the present species its place is taken by *C canicеps,* wanting the black hood and white ear-coverts of the British bird Its home seems to be in Central Asia, but it moves southward in winter, being common at that season in Cashmere In America the term "goldfinch" is applied to *Astragalinus tristis,* a yellow bird with black wings, tail and crown This bird has a wild yet canary-like love song. (*See* FINCH)

GOLDFISH (*Carassius auratus*), a cyprinid fish, like the carp, a native of eastern Asia, but introduced into many other parts of the world It is closely related to the crucian carp of Europe and northern Asia, both species resemble the common carp in having a long dorsal fin, but differ from it in having no barbels The goldfish flourishes in ponds and feeds on weeds and small invertebrates In a wild state the coloration is generally greenish-brown, but specimens may occur with the brown or black pigment absent or restricted to some spots and patches, and bright orange in colour These golden fish have been bred by the Chinese for centuries, and many strange and even monstrous types have been produced Fish with silvery patches, or even pure white, are not uncommon, the telescope-fish, with protruding eyes, no dorsal fin and a large trilobed tail-fin, is one of the most extraordinary forms Goldfish were introduced from China into Japan, and for hundreds of years they have been cultivated in ponds by the Japanese, who have produced new types by cross-breeding, many of these have a long double tail-fin The most prized variety has a short rounded body, a broad head

covered with protuberances, no dorsal fin and a short double tail-fin; as much as £20–£25 may be given for an exceptional pair. Annual exhibits of this breed are held in Tokyo; fish which are entirely bright red are considered best, but white fish with red fins are much admired.

Escaping from ornamental pools in parks and gardens the goldfish has become naturalized in many ponds and streams of the eastern United States, notably in the Potomac river. In some localities it occurs in sufficient abundance to be marketed as a food fish Upon resuming life under natural conditions it reverts to its original greenish-brown color, and usually attains a length of from 6 to 12 inches

See S. Matsubara, "Goldfish and their Culture in Japan," *Bull. U.S. Fish Bureau* (1908); H. M. Smith *Japanese Goldfish* (Washington, 1909).

GOLDIE, SIR GEORGE DASHWOOD TAUBMAN (1846–1925), English administrator, the founder of Nigeria, was born on May 26, 1846, at the Nunnery, Isle of Man, being the youngest son of Lieut-Colonel John Taubman Goldie-Taubman, speaker of the House of Keys Sir George resumed his paternal name, Goldie, by royal licence in 1887 He was educated at the Royal Military academy, Woolwich, and for about two years held a commission in the Royal Engineers He travelled in all parts of Africa, gaining an extensive knowledge of the continent, and first visited the country of the Niger in 1877 He conceived the idea of adding to the British empire the then little known regions of the lower and middle Niger, and for over 20 years his efforts were devoted to the realization of this conception The method by which he determined to work was the revival of government by chartered companies within the empire—a method supposed to be buried with the East India company. The first step was to combine all British commercial interests in the Niger, and this he accomplished in 1879 when the United African company was formed. In 1881 Goldie sought a charter from the imperial government (the 2nd Gladstone ministry) Objections of various kinds were raised. To meet them the capital of the company (renamed the National African company) was increased from £125,000 to £1,000,000, stations were founded on the Niger and the French traders established on the lower river were bought out in 1884. Meantime the Niger coast line had been placed under British protection, and over 400 political treaties—drawn up by Goldie—were made with the chiefs of the lower Niger and the Hausa states. The scruples of the British Government being overcome, a charter was at length granted (July 1886), the National African company becoming the Royal Niger company, with Lord Aberdare as governor and Goldie as vice-governor In 1895, on Lord Aberdare's death, Goldie became governor of the company, whose destinies he had guided from the time of its foundation under its former name

The building up of Nigeria as a British state had to be carried on in face of further difficulties raised by French travellers with political missions, and also in face of German opposition From 1884 to 1890, Prince Bismarck was a persistent antagonist, and the strenuous efforts he made to secure for Germany the basin of the lower Niger and Lake Chad were even more dangerous to Goldie's schemes of empire than the ambitions of France E R Flegel, who had travelled in Nigeria during 1882–84 under the auspices of the British company, was sent out in 1885 by the newly-formed German Colonial society to secure treaties for Germany, which had established itself at Cameroon After Flegel's death in 1886 his work was continued by his companion Staudinger, while Hoenigsberg was despatched to stir up trouble in the occupied portions of the company's territory,—or, as he expressed it, "to burst up the charter" He was finally arrested at Onitsha, and, after trial by the company's supreme court at Asaba, was expelled from the country Bismarck then sent out his nephew, von Puttkamer, as German consul-general to Nigeria, with orders to report on this affair, and when this report was published in a White Book, Bismarck demanded heavy damages from the company. Meanwhile Bismarck maintained constant pressure on the British government to compel the Royal Niger company to a division of spheres of influence, whereby Great Britain would have lost a third, and the most valuable part, of the company's territory But he fell from power in March 1890, and in July following Lord Salisbury concluded the famous "Heligoland" agreement with Germany. After this event the aggressive action of Germany in Nigeria entirely ceased, and the door was opened for a final settlement of the Nigeria-Cameroon frontiers. These negotiations, which resulted in an agreement in 1893, were initiated by Goldie as a means of arresting the advance of France into Nigeria from the direction of the Congo By conceding to Germany a long but narrow strip of territory between Adamawa and Lake Chad, to which she had no treaty claims, a barrier was raised against French expeditions, semi-military and semi-exploratory, which sought to enter Nigeria from the east. Later French efforts at aggression were made from the western or Dahomeyan side, despite an agreement concluded with France in 1890 respecting the northern frontier

The hostility of certain Fula princes led the company to despatch, in 1897, an expedition against the Mohammedan States of Nupé and Illorin This expedition was organized and personally directed by Goldie and was completely successful Internal peace was thus secured, but in the following year the differences with France in regard to the frontier line became acute, and compelled the intervention of the British government In the negotiations which ensued Goldie preserved for Great Britain the whole of the navigable stretch of the lower Niger. It was, however, evidently impossible for a chartered company to hold its own against the state-supported protectorates of France and Germany, and in consequence, on Jan 1, 1900, the Royal Niger company transferred its territories to the British government for the sum of £865,000 The ceded territory together with the small Niger Coast Protectorate, already under imperial control, was formed into the two protectorates of northern and southern Nigeria (*see* further NIGERIA)

In 1903–04, at the request of the Chartered company of South Africa, Goldie visited Rhodesia and examined the situation in connection with the agitation for self-government by the Rhodesians In 1902–03 he was one of the royal commissioners who inquired into the military preparations for the war in South Africa (1899–1902) and into the operations up to the occupation of Pretoria, and in 1905–06 was a member of the royal commission which investigated the methods of disposal of war stores after peace had been made In 1905 he was elected president of the Royal Geographical society and held that office for three years From 1908 to 1919 he was an alderman of the London County Council, on which he served as chairman of the finance committee Goldie was created K C M G in 1887, and a privy councillor in 1898 From 1905 to 1914, and from 1915 to 1920 he was president of the National Defence Association He died in London on Aug 22, 1925

GOLDING, ARTHUR (*c* 1536–*c*. 1605), English translator, son of John Golding of Belchamp St Paul and Halsted, Essex, one of the auditors of the exchequer, was born probably in London about 1536 In 1549 he was already in the service of Protector Somerset He seems to have resided for some time in the house of Sir William Cecil, in the Strand, with his nephew, the poet, the 17th earl of Oxford, whose receiver he was, for two of his dedications are dated from Cecil House His chief work is his translation of Ovid *The Fyrst Fower Bookes of P Ovidius Nasos worke, entitled Metamorphosis, translation oute of Latin into Englishe meter* (1565), was supplemented in 1567 by a translation of the 15 books. Strangely enough the translator of Ovid was a man of strong Puritan sympathies, and he translated many of the works of Calvin Golding translated also the *Commentaries* of Caesar (1565), Theodore Beza's *Tragedie of Abraham's Sacrifice* (1577) and the *De Beneficiis* of Seneca (1578) He completed a translation begun by Sidney from Philippe de Mornay, *A Worke concerning the Trewnesse of the Christian Religion* (1587, 3rd ed., 1604).

See the reissue of Golding's translation of Theodore Beza's *Tragedie of Abraham's Sacrifice* in the University of Toronto Studies, Philological Series (1906), which contains a biographical notice and complete bibliography.

GOLDINGEN (Lettish, *Kuldiga*), a town of western Courland in Latvia, 55 m. by rail N E of Libau, and on Windau river, in 56° 58′ N and 22° E Pop (1925) 6,912. It has several small industries including leather, woollen goods, food products, needles and other metal industries, matches and other products of wood There are glass works and lime kilns in the neighbourhood, and ruins of a castle of the Teutonic Knights, built in 1248 and used in the 17th century as the residence of the dukes of Courland

GOLDMARK, KARL (1832–1915), Hungarian composer, was born at Keszthely-am-Plattensee, Hungary, on May 18, 1832, the son of a poor cantor in the local Jewish synagogue On a cheap violin and home-made flute, the future composer first gave rein to his musical ideas In 1844 he went to Vienna, and studied the violin at the conservatoire After the revolution of 1848 he obtained an engagement in the orchestra at Raab There, on the capitulation of Raab, he was to have been shot for a spy, and was only saved at the eleventh hour by the happy arrival of a former colleague In 1850 he left Raab for Vienna, where from his friend Mittrich he obtained his first real knowledge of the classics In 1857, being then engaged in the Karl-theatre orchestra, he gave a concert of his own works including his first quartet Then followed the "Sakuntala" and "Penthesilea" overtures, showing the influence of Wagner, and the delightful "Landliche Hochzeit" symphony, which carried his fame abroad. His first and best opera, *Die Konigin von Saba* (Vienna, 1875) was followed in November 1886, also at Vienna, by *Merlin,* much of which was afterwards rewritten A third opera, a version of Dickens's *Cricket on the Hearth,* was given by the Royal Carl Rosa Company in London in 1900 In opera Goldmark is most certainly at his best, and as an orchestral colourist he takes high rank He died at Vienna on Jan 2, 1915

See his reminiscences, *Erinnerungen aus meinen Leben* (Vienna, 1923)

GOLDONI, CARLO (1707–1793), Italian dramatist, the real founder of modern Italian comedy, was born at Venice, on Feb 25, 1707 His father Giulio was a native of Modena The first playthings of the future writer were puppets which he made dance, the first books he read were plays,—among others, the comedies of the Florentine Cicognini Later he received a still stronger impression from the *Mandragora* of Machiavelli At eight years old he had tried to sketch a play His father, meanwhile, had taken his degree in medicine at Rome and fixed himself at Perugia, where he made his son join him, but, having soon quarrelled with his colleagues in medicine, he departed for Chioggia, leaving his son to the care of a philosopher, Prof Caldini of Rimini The young Goldoni soon grew tired of his life at Rimini, and ran away with a Venetian company of players He began to study law at Venice, then went to continue the same pursuit at Pavia, but at that time he was studying the Greek and Latin comic poets much more and much better than books about law "I have read over again," he writes in his own *Memoirs,* "The Greek and Latin poets, and I have told myself that I should like to imitate them in their style, their plots, their precision, but I would not be satisfied unless I succeeded in giving more interest to my works, happier issues to my plots, better drawn characters and more genuine comedy" For a satire entitled *Il Colosso,* which attacked the honour of several families of Pavia, he was driven from that town, and went first to study with the jurisconsult Morelli at Udine, then to take his degree in law at Modena After having worked some time as clerk in the chanceries of Chioggia and Feltre, his father being dead, he went to Venice, to exercise there his profession as a lawyer

But the wish to write for the stage was always strong in him, and he tried to do so; he made, however, a mistake in his choice, and began with a tragedy, *Amalasunta,* which was represented at Milan and proved a failure In 1734 he wrote another tragedy, *Belisario,* which, though not much better, chanced nevertheless to please the public This first success encouraged him to write other tragedies, some of which were well received, but the author himself saw clearly that he had not yet found his proper sphere, and that a radical dramatic reform was absolutely necessary for the stage. He wished to create comedy of character in Italy, to follow the example of Molière, and to delineate the realities of social life in as natural a manner as possible His first essay of this kind was *Momolo Cortesan* (Momolo the Courtier), written in the Venetian dialect, and based on his own experience Other plays followed—some interesting from their subject, others from the characters; the best of that period are—*Le Trentadue Disgrazie d' Arlecchino, La Notte critica, La Bancarotta, La Donna di Garbo* While consul of Genoa at Venice, he was cheated by a captain of Ragusa, and founded on this incident a play *L'Impostore* At Leghorn he made the acquaintance of the comedian Medebac, and followed him to Venice, with his company, for which he began to write his best plays The whole social life of Venice is to be found in Goldoni's plays Once he promised to write 16 comedies in a year, and kept his word, among the 16 are some of his very best, such as *Il Caffè, Il Bugiardo, La Pamela* When he left the company of Medebac, he passed over to that maintained by the patrician Vendramin, continuing to write with the greatest facility But Vendramin was tyrannical, and the purists of the day were constantly attacking Goldoni's work (*see* Gozzi) Goldoni accepted the post of manager of the Italian theatre in Paris in 1761 Before leaving Venice he wrote *Una delle ultime sere di Carnevale* (One of the Last Nights of Carnival), an allegorical comedy in which he said good-bye to his country At the end of the representation of this play, the theatre resounded with applause, and with shouts expressive of good wishes Goldoni, at this proof of public sympathy, wept like a child

At Paris, during two years, he wrote comedies for the Italian actors, then he taught Italian to the royal princesses, and for the wedding of Louis XVI and of Marie Antoinette he wrote in French one of his best comedies, *Le Bourru bienfaisant,* which was a great success When he retired from Paris to Versailles, the king made him a gift of 6,000 francs, and fixed on him an annual pension of 1,200 francs It was at Versailles he wrote his *Memoirs,* which occupied him till he reached his 80th year The Revolution deprived him all at once of his modest pension, and reduced him to extreme misery, he dragged on his unfortunate existence till Feb 6, 1793 The day after, on the proposal of André Chenier, the Convention agreed to give the pension back to the poet, and as it was too late, a reduced allowance was granted to his widow

The best comedies of Goldoni are. *La Donna di Garbo, La Bottega di Caffè, Pamela nubile, Le Baruffe chiozzotte, I Rusteghi, Todero Brontolon, Gli Innamorati, Il Ventaglio, Il Bugiardo, La Casa nova, Il Burbero benefico, La Locandiera*

A collected edition of the plays (44 vols, Venice, 1788) was republished at Florence in 1827 The standard edition is that arranged by the city of Venice, *Opere complete* (20 vols, Venice, 1907–17). The *Memoirs* (best ed. by Mazzoni, 1907) were translated into English by John Black (Boston, 1877), with preface by W D Howells *See* A de Gubernatis, *Carlo Goldoni* (Florence, 1911), a course of lectures delivered at Rome in 1901–11, H C Chatfield-Taylor, *Goldoni* (1914).

GOLD PRODUCTION: *see* RESOURCES OF THE WORLD, NATURAL

GOLDS: *see* TUNGUSES

GOLDSBORO, a city of North Carolina, U S A, on the Neuse river, 50m S E of Raleigh, the county seat of Wayne county It is on Federal highways 70 and 171, and is served by the Atlantic Coast Line, the Norfolk Southern and the Southern railways The population was 11,296 in 1920 (43% negroes) and was estimated locally at 15,500 in 1928 It is an important market and shipping point for bright-leaf tobacco, cotton and early vegetables, and has over 30 substantial manufacturing establishments, with an output in 1925 valued at $5,109,914 The State Odd Fellows' orphan home and a State hospital for insane negroes are situated here Goldsboro was settled in 1838 and incorporated in 1841 Between 1910 and 1920 the population almost doubled Since 1920 it has had a commission-manager form of government In the campaign of 1865 the Union armies under Sherman and Schofield united here before the final advance to Greensboro

GOLDSCHMIDT, HERMANN (1802–1866), German painter and astronomer, was the son of a Jewish merchant, and was born at Frankfort on June 17, 1802 He settled in Paris, where he painted a number of pictures Between 1852 and 1861

he discovered 14 asteroids between Mars and Jupiter. His solar observations, made during the total eclipse on July 10, 1860, are included in the work of Mädler on the eclipse, published in 1861. Goldschmidt died at Fontainebleau on Aug 26, 1866

GOLDSMID, the name of a family of Anglo-Jewish bankers sprung from Aaron Goldsmid (d. 1782), a Dutch merchant who settled in England about 1763 Two of his sons, Benjamin Goldsmid (*c* 1753–1808) and Abraham Goldsmid (*c.* 1756–1810), set up as bill-brokers in London in 1777 and became great powers in the money market, during the Napoleonic war, through their dealings with the Government Abraham Goldsmid was in 1810 joint contractor with the Barings for a government loan, but owing to a depreciation of the scrip he was forced into bankruptcy and committed suicide, as his brother had done

Their nephew, Sir Isaac Lyon Goldsmid, Bart (1778–1859), connected with a firm of bullion brokers to the Bank of England and the East India Company, was made Baron da Palmeira by the Portuguese Government in 1846 for services rendered in settling a monetary dispute between Portugal and Brazil, but he is chiefly known for his efforts to obtain the emancipation of the Jews in England and for his part in founding University college, London The Jewish Disabilities bill owed its final passage to Goldsmid's energetic work He helped to establish the University college hospital in 1834, aided in the efforts to obtain reform in the English penal code, and financially assisted the building of the English southern railways and the London docks In 1841 he became the first Jewish baronet His second son, Sir Francis Henry Goldsmid, Bart (1808–1878), born in London, and the first Jew to become an English barrister, entered parliament in 1860 as member for Reading He was succeeded in the baronetcy by his nephew Sir Julian Goldsmid, Bart. (1838–1896)

Another distinguished member of the same family, Sir Frederic John Goldsmid (1818–1908), grandson of Benjamin Goldsmid (*see* above), was educated at King's college, London, and entering the Madras army in 1839 served in the China War of 1840–41, with the Turkish troops in eastern Crimea in 1855–56, and during the Egyptian campaign From 1865 to 1870 he was director-general of the Indo-European telegraph, and carried through the telegraph convention with Persia, and between 1870 and 1872, as commissioner, he settled with Persia the difficult questions of the Perso-Baluch and Perso-Afghan boundaries In 1881–82 he was in Egypt, as controller of the Daira Sanieh, and in 1883 he went to the Congo, on behalf of the king of the Belgians

GOLDSMITH, OLIVER (1728–1774), English poet, playwright, novelist and man of letters, came of a Protestant and Saxon family which had long been settled in Ireland He is usually said to have been born at Pallas or Pallasmore, Co Longford, but recent investigators have contended, with much probability, that his true birthplace was Smith-Hill House, Elphin, Roscommon, the residence of his mother's father, the Rev Oliver Jones His father, Charles Goldsmith, lived at Pallas, supporting with difficulty his wife and children on what he could earn, partly as a curate and partly as a farmer

Youth.—While Oliver was still a child his father was presented to the living of Kilkenny West, in the county of West Meath This was worth about £200 a year The family accordingly quitted their cottage at Pallas for a spacious house on a frequented road, near the village of Lissoy Here the boy was taught his letters by a relative and dependent, Elizabeth Delap, and was sent in his seventh year to a village school kept by an old quartermaster on half-pay, who professed to teach nothing but reading, writing and arithmetic, but who had an inexhaustible fund of stories about ghosts, banshees and fairies, about the great Rapparee chiefs, Baldearg O'Donnell and galloping Hogan, and about the exploits of Peterborough and Stanhope, the surprise of Monjuich and the glorious disaster of Brihuega This man must have been of the Protestant religion, but he was of the aboriginal race, and not only spoke the Irish language, but could pour forth unpremeditated Irish verses Oliver early became, and through life continued to be, a passionate admirer of the Irish music, and especially of the compositions of Carolan, some of the last notes of whose harp he heard It ought to be added that Oliver, though by birth one of the Englishry, and though connected by numerous ties with the Established Church, never showed the least sign of that contemptuous antipathy with which, in his days, the ruling minority in Ireland too generally regarded the subject majority. So far indeed was he from sharing in the opinions and feelings of the caste to which he belonged that he conceived an aversion to the Glorious and Immortal Memory, and, even when George III. was on the throne, maintained that nothing but the restoration of the banished dynasty could save the country

From the humble academy kept by the old soldier Goldsmith was removed in his ninth year. He went to several grammar-schools, and acquired some knowledge of the ancient languages His life at this time seems to have been far from happy. He had, as appears from the admirable portrait of him by Reynolds at Knole, features harsh even to ugliness The small-pox had set its mark on him with more than usual severity His stature was small, and his limbs ill put together Among boys little tenderness is shown to personal defects, and the ridicule excited by poor Oliver's appearance was heightened by a peculiar simplicity and a disposition to blunder which he retained to the last He became the common butt of boys and masters, was pointed at as a fright in the play-ground, and flogged as a dunce in the school-room When he had risen to eminence, those who had once derided him ransacked their memory for the events of his early years, and recited repartees and couplets which had dropped from him, and which, though little noticed at the time, were supposed a quarter of a century later, to indicate the powers which produced the *Vicar of Wakefield* and the *Deserted Village*

On June 11, 1744, being then in his 16th year, Oliver went up to Trinity college, Dublin, as a sizar The sizars paid nothing for food and tuition, and very little for lodging, but they had to perform some menial services from which they have long been relieved Goldsmith was quartered, not alone, in a garret of what was then No 35 in a range of buildings which has long since disappeared His name, scrawled by himself on one of its window-panes, is still preserved in the college library From such garrets many men of less parts than his have made their way to the woolsack or to the episcopal bench But Goldsmith, while he suffered all the humiliations, threw away all the advantages of his situation He neglected the studies of the place, stood low at the examinations, was turned down to the bottom of his class for playing the buffoon in the lecture-room, was severely reprimanded for pumping on a constable, and was caned by a brutal tutor for giving a ball in the attic storey of the college to some gay youths and damsels from the city

The Continent.—While Oliver was leading at Dublin a life divided between squalid distress and squalid dissipation, his father died, leaving a mere pittance In Feb 1749 the youth obtained his bachelor's degree, and left the university During some time the humble dwelling to which his widowed mother had retired was his home He was now in his 21st year, it was necessary that he should do something, and his education seemed to have fitted him to do nothing but to dress himself in gaudy colours, of which he was as fond as a magpie, to take a hand at cards, to sing Irish airs, to play the flute, to angle in summer and to tell ghost stories by the fire in winter He tried five or six professions in turn without success He applied for ordination, but, as he applied in scarlet clothes, he was speedily turned out of the episcopal palace He then became tutor in an opulent family, but soon quitted his situation in consequence of a dispute about pay Then he determined to emigrate to America His relations, with much satisfaction, saw him set out for Cork on a good horse, with £30 in his pocket But in six weeks he came back on a miserable hack, without a penny, and informed his mother that the ship in which he had taken his passage, having got a fair wind while he was at a party of pleasure, had sailed without him Then he resolved to study the law A generous uncle, Mr Contarine, advanced £50 With this sum Goldsmith went to Dublin, was enticed into a gaming-house and lost every shilling He then thought of medicine. A small purse was made up; and in his 24th year he was sent to Edinburgh At Edinburgh he passed 18 months in nominal attendance on lectures, and picked up some superficial

nformation about chemistry and natural history. Thence he went o Leyden, still pretending to study physic. He left that celebrated university, the third at which he had resided, in his 27th year, without a degree, with the merest smattering of medical knowledge, and with no property but his clothes and his flute His flute, however, proved a useful friend He rambled on foot hrough Flanders, France and Switzerland, playing tunes which everywhere set the peasantry dancing, and which often procured or him a supper and a bed He wandered as far as Italy His nusical performances, indeed, were not to the taste of the Italians; but he contrived to live on the alms which he obtained at he gates of convents It should, however, be observed that the stories which he told about this part of his life ought to be received with great caution, for strict veracity was never one of is virtues, and a man who is ordinarily inaccurate in narration s likely to be more than ordinarily inaccurate when he talks about is own travels Goldsmith, indeed, was so regardless of truth as o assert in print that he was present at a most interesting conversation between Voltaire and Fontenelle, and that this conversation took place at Paris Now it is certain that Voltaire never was within 100 leagues of Paris during the whole time which Goldsmith passed on the Continent

In London.—In Feb 1756 the wanderer landed at Dover, without a shilling, without a friend and without a calling He had ndeed, if his own unsupported evidence may be trusted, obtained a doctor's degree on the Continent, but this dignity proved utterly useless to him In England his flute was not in request, here were no convents, and he was forced to have recourse to a series of desperate expedients There is a tradition that he turned strolling player He pounded drugs and ran about London with phials for charitable chemists He asserted, upon one occasion, hat he had lived "among the beggars in Axe Lane" He was for a time usher of a school, and felt the miseries and humiliations of his situation so keenly that he thought it a promotion to be permitted to earn his bread as a bookseller's hack, but he soon found the new yoke more galling than the old one, and was glad o become an usher again He obtained a medical appointment in he service of the East India company, but the appointment was speedily revoked Why it was revoked we are not told The subject was one on which he never liked to talk It is probable hat he was incompetent to perform the duties of the place Then ie presented himself at Surgeons' Hall for examination, as "mate o an hospital" Even to so humble a post he was found unequal Nothing remained but to return to the lowest drudgery of literature Goldsmith took a room in a tiny square off Ludgate Hill, o which he had to climb from Sea-coal Lane by a dizzy ladder of flagstones called Breakneck Steps Green Arbour Court and the ascent have long disappeared Here, at 30, the unlucky adventurer sat down to toil like a galley slave Already, in 1758, during his first bondage to letters, he had translated Marteilhe's remarkable *Memoirs of a Protestant, Condemned to the Galleys of France for his Religion* In the years that now succeeded he sent to the press some things which have survived, and many which have perished He produced articles for reviews, magazines and newspapers, children's books, which, bound in gilt paper and adorned with hideous woodcuts, appeared in the window of Newbery's once far-famed shop at the corner of Saint Paul's churchyard, *An Inquiry into the State of Polite Learning in Europe,* which, though of little or no value, is still reprinted among his works, a volume of essays entitled *The Bee;* a *Life of Beau Nash*, a superficial and incorrect, but very readable, *History of England,* in a series of letters purporting to be addressed by a nobleman to his son, and some very lively and amusing sketches of London Society in another series of letters purporting to be addressed by a Chinese traveller to his friends

All these works were anonymous, but some of them were well known to be Goldsmith's, and he gradually rose in the estimation of the booksellers for whom he drudged He was, indeed, emphatically a popular writer For accurate research or grave disquisition he was not well qualified by nature or by education He knew nothing accurately, his reading had been desultory, nor had he meditated deeply on what he had read He had seen much of the world, but he had noticed and retained little more of what he had seen than some grotesque incidents and characters which had happened to strike his fancy But, though his mind was very scantily stored, with materials, he used what materials he had in such a way as to produce a wonderful effect There have been many greater writers, but perhaps no writer was ever more uniformly agreeable His style was always pure and easy, and, on proper occasions, pointed and energetic His narratives were always amusing, his descriptions always picturesque, his humour rich and joyous, yet not without an occasional tinge of amiable sadness About everything that he wrote, serious or sportive, there was a certain natural grace and decorum, hardly to be expected from a man a great part of whose life had been passed among thieves and beggars, street-walkers and merryandrews, in those squalid dens which are the reproach of great capitals

The Man of Letters.—As his name gradually became known, the circle of his acquaintance widened He was introduced to Johnson, who was then considered as the first of living English writers, to Reynolds, the first of English painters; and to Burke, who had not yet entered parliament, but had distinguished himself greatly by his writings and by the eloquence of his conversation With these eminent men Goldsmith became intimate In 1763 he was one of the nine original members of that celebrated fraternity which has sometimes been called the Literary Club, but which always disclaimed that epithet, and gloried in the simple name of the Club

By this date Goldsmith had quitted his miserable dwelling at the top of Breakneck Steps, and, after living for some time at No 6 Wine Office Court, Fleet street, had moved into the Temple. But he was still often reduced to pitiable shifts, the most popular of which is connected with the sale of his solitary novel, the *Vicar of Wakefield* Towards the close of 1764(?) his rent is alleged to have been so long in arrear that his landlady one morning called in the help of a sheriff's officer The debtor, in great perplexity, despatched a messenger to Johnson, and Johnson, always friendly, though often surly, sent back the messenger with a guinea, and promised to follow speedily He came, and found that Goldsmith had changed the guinea, and was railing at the landlady over a bottle of Madeira Johnson put the cork into the bottle, and entreated his friend to consider calmly how money was to be procured Goldsmith said that he had a novel ready for the press Johnson glanced at the manuscript, saw that there were good things in it, took it to a bookseller, sold it for £60 and soon returned with the money The rent was paid, and the sheriff's officer withdrew (Unfortunately, however, for this time-honoured version of the circumstances, it was later discovered that as early as Oct 1762 Goldsmith had already sold a third of the *Vicar* to one Benjamin Collins of Salisbury, a printer, by whom it was eventually printed for F Newbery, and it is difficult to reconcile this fact with Johnson's narrative)

Traveller and Vicar of Wakefield.—But before the *Vicar of Wakefield* appeared in 1766, came the great crisis of Goldsmith's literary life In Christmas week 1764 he published a poem, entitled the *Traveller* It was the first work to which he had put his name, and it at once raised him to the rank of a legitimate English classic The opinion of the most skilful critics was that nothing finer had appeared in verse since the fourth book of the *Dunciad* In one respect the *Traveller* differs from all Goldsmith's other writings In general his designs were bad, and his execution good In the *Traveller* the execution, though deserving of much praise, is far inferior to the design No philosophical poem, ancient or modern, has a plan so noble, and at the same time so simple An English wanderer, seated on a crag among the Alps, near the point where three great countries meet, looks down on the boundless prospect, reviews his long pilgrimage, recalls the varieties of scenery, of climate, of government, of religion, of national character, which he has observed, and comes to the conclusion, just or unjust, that our happiness depends little on political institutions, and much on the temper and regulation of our own minds

While the fourth edition of the *Traveller* was on the counters of the booksellers, the *Vicar of Wakefield* appeared, and rapidly

obtained a popularity which has lasted down to our own time, and which is likely to last as long as our language The fable is indeed one of the worst that ever was constructed. It wants, not merely that probability which ought to be found in a tale of common English life, but that consistency which ought to be found even in the wildest fiction about witches, giants and fairies. But the earlier chapters have all the sweetness of pastoral poetry, together with all the vivacity of comedy. Moses and his spectacles, the vicar and his monogamy, the sharper and his cosmogony, the squire proving from Aristotle that relatives are related, Olivia preparing herself for the arduous task of converting a rakish lover by studying the controversy between Robinson Crusoe and Friday, the great ladies with their scandal about Sir Tomkyn's amours and Dr Burdock's verses, and Mr Burchell with his "Fudge," have caused as much harmless mirth as has ever been caused by matter packed into so small a number of pages The latter part of the tale is unworthy of the beginning As we approach the catastrophe, the absurdities lie thicker and thicker, and the gleams of pleasantry become rarer and rarer

The success which had attended Goldsmith as a novelist emboldened him to try his fortune as a dramatist He wrote the *Good Natur'd Man,* a piece which had a worse fate than it deserved Garrick refused to produce it at Drury Lane It was acted at Covent Garden in Jan 1768, but was coldly received The author, however, cleared, by his benefit nights, and by the sale of the copyright, no less than £500, five times as much as he had made by the *Traveller* and the *Vicar of Wakefield* together The plot of the *Good Natur'd Man* is, like almost all Goldsmith's plots, very ill constructed But some passages are exquisitely ludicrous,—much more ludicrous indeed than suited the taste of the town at that time .A canting, mawkish play, entitled *False Delicacy,* had just been produced, and sentimentality was all the mode During some years more tears were shed at comedies than at tragedies; and a pleasantry which moved the audience to anything more than a grave smile was reprobated as low It is not strange, therefore, that the very best scene in the *Good Natur'd Man,* that in which Miss Richland finds her lover attended by the bailiff and the bailiff's follower in full court dresses, should have been mercilessly hissed, and should have been omitted after the first night, not to be restored for several years

The Deserted Village.—In May 1770 appeared the *Deserted Village* In mere diction and versification this celebrated poem is fully equal, perhaps superior, to the *Traveller;* and it is generally preferred to the *Traveller* by that large class of readers who think, with Bayes in the *Rehearsal,* that the only use of a plot is to bring in fine things More discerning judges, however, while they admire the beauty of the details, are shocked by one unpardonable fault which pervades the whole The fault which we mean is not that theory about wealth and luxury which has so often been censured by political economists The theory is indeed false; but the poem, considered merely as a poem, is not necessarily the worse on that account The finest poem in the Latin language—indeed, the finest didactic poem in any language—was written in defence of the silliest and meanest of all systems of natural and moral philosophy A poet may easily be pardoned for reasoning ill; but he cannot be pardoned for describing ill, for observing the world in which he lives so carelessly that his portraits bear no resemblance to the originals, for exhibiting as copies from real life monstrous combinations of things which never were and never could be found together. What would be thought of a painter who should mix August and January in one landscape, who should introduce a frozen river into a harvest scene? Would it be a sufficient defence of such a picture to say that every part was exquisitely coloured, that the green hedges, the apple-trees loaded with fruit, the waggons reeling under the yellow sheaves, and the sun burned reapers wiping their foreheads were very fine, and that the ice and the boys sliding were also very fine? To such a picture the *Deserted Village* bears a great resemblance It is made up of incongruous parts The village in its happy days is a true English village The village in its decay is an Irish village The felicity and the misery which Goldsmith has brought close together belong to two different countries and to two different stages in the progress of society. He had assuredly never seen in his native island such a rural paradise, such a seat of plenty, content and tranquillity, as his Auburn. He had assuredly never seen in England all the inhabitants of such a paradise turned out of their homes in one day and forced to emigrate in a body to America The hamlet he had probably seen in Kent; the ejectment he had probably seen in Munster; but by joining the two, he has produced something which never was and never will be seen in any part of the world

She Stoops to Conquer.—In 1773 Goldsmith tried his chance at Covent Garden with a second play, *She Stoops to Conquer.* The manager was, not without great difficulty, induced to bring this piece out The sentimental comedy still reigned, and Goldsmith's comedies were not sentimental The *Good Natur'd Man* had been too funny to succeed; yet the mirth of the *Good Natur'd Man* was sober when compared with the rich drollery of *She Stoops to Conquer,* which is, in truth, an incomparable farce in five acts On this occasion, however, genius triumphed. Pit, boxes and galleries were in a constant roar of laughter. If any bigoted admirer of Kelly and Cumberland ventured to hiss or groan, he was speedily silenced by a general cry of "turn him out," or "throw him over" Later generations have confirmed the verdict which was pronounced on that night

While Goldsmith was writing the *Deserted Village* and *She Stoops to Conquer,* he was employed on works of a very different kind—works from which he derived little reputation but much profit He compiled for the use of schools a *History of Rome,* by which he made £250; a *History of England,* by which he made £500, a *History of Greece,* for which he received £250, a *Natural History,* for which the booksellers covenanted to pay him 800 guineas These works he produced without any elaborate research, by merely selecting, abridging and translating into his own clear, pure and flowing language, what he found in books well known to the world, but too bulky or too dry for boys and girls He committed some strange blunders, for he knew nothing with accuracy Thus, in his *History of England,* he tells us that Naseby is in Yorkshire, nor did he correct this mistake when the book was reprinted He was very nearly hoaxed into putting into the *History of Greece* an account of a battle between Alexander the Great and Montezuma In his *Animated Nature* he relates, with faith and with perfect gravity, all the most absurd lies which he could find in books of travels about gigantic Patagonians, monkeys that preach sermons, nightingales that repeat long conversations "If he can tell a horse from a cow," said Johnson, "that is the extent of his knowledge of zoology" How little Goldsmith was qualified to write about the physical sciences is sufficiently proved by two anecdotes He on one occasion denied that the sun is longer in the northern than in the southern signs It was vain to cite the authority of Maupertuis "Maupertuis!" he cried, "I understand those matters better than Maupertuis" On another occasion he, in defiance of the evidence of his own senses, maintained obstinately, and even angrily, that he chewed his dinner by moving his upper jaw

Yet, ignorant as Goldsmith was, few writers have done more to make the first steps in the laborious road to knowledge easy and pleasant His compilations are widely distinguished from the compilations of ordinary bookmakers He was a great, perhaps an unequalled, master of the arts of selection and condensation In these respects his histories of Rome and of England, and still more his own abridgments of these histories, well deserved to be studied In general nothing is less attractive than an epitome; but the epitomes of Goldsmith, even when most concise, are always amusing, and to read them is considered by intelligent children not as a task but as a pleasure

Personality.—Goldsmith might now be considered as a prosperous man` He had the means of living in comfort, and even in what to one who had so often slept in barns and on bulks must have been luxury His fame was great and was constantly rising He lived in what was intellectually far the best society of the kingdom, in a society in which no talent or accomplishment was wanting, and in which the art of conversation was cultivated with splendid success There probably were never four

talkers more admirable in four different ways than Johnson, Burke, Beauclerk and Garrick; and Goldsmith was on terms of intimacy with all the four He aspired to share in their colloquial renown, but never was ambition more unfortunate It may seem strange that a man who wrote with so much perspicuity, vivacity and grace should have been, whenever he took a part in conversation, an empty, noisy, blundering rattle But on this point the evidence is overwhelming So extraordinary was the contrast between Goldsmith's published works and the silly things which he said, that Horace Walpole described him as an inspired idiot "Noll," said Garrick, "wrote like an angel, and talked like poor Poll" Chamier declared that it was a hard exercise of faith to believe that so foolish a chatterer could have really written the *Traveller* Even Boswell could say, with contemptuous compassion, that he liked very well to hear honest Goldsmith run on "Yes, sir," said Johnson, "but he should not like to hear himself." Minds differ as rivers differ There are transparent and sparkling rivers from which it is delightful to drink as they flow, to such rivers the minds of such men as Burke and Johnson may be compared But there are rivers of which the water when first drawn is turbid and noisome, but becomes pellucid as crystal and delicious to the taste, if it be suffered to stand till it has deposited a sediment, and such a river is a type of the mind of Goldsmith. His first thoughts on every subject were confused even to absurdity, but they required only a little time to work themselves clear. When he wrote they had that time, and therefore his readers pronounced him a man of genius; but when he talked he talked nonsense and made himself the laughing-stock of his hearers He was painfully conscious of his inferiority in conversation, he felt every failure keenly, yet he had not sufficient judgment and self-command to hold his tongue His animal spirits and vanity were always impelling him to try to do the one thing which he could not do After every attempt he felt that he had exposed himself, and writhed with shame and vexation, yet the next moment he began again

His associates seem to have regarded him with kindness, which, in spite of their admiration of his writings, was not unmixed with contempt In truth, there was in his character much to love, but very little to respect His heart was soft even to weakness he was so generous that he quite forgot to be just, he forgave injuries so readily that he might be said to invite them, and was so liberal to beggars that he had nothing left for his tailor and his butcher He was vain, sensual, frivolous, profuse, improvident One vice of a darker shade was imputed to him, envy But there is not the least reason to believe that this bad passion, though it sometimes made him wince and utter fretful exclamations, ever impelled him to injure by wicked arts the reputation of any of his rivals The truth probably is that he was not more envious, but merely less prudent, that his neighbours His heart was on his lips All those small jealousies, which are but too common among men of letters, but which a man of letters who is also a man of the world does his best to conceal, Goldsmith avowed with the simplicity of a child When he was envious, instead of affecting indifference, instead of damning with faint praise, instead of doing injuries slyly and in the dark, he told everybody that he was envious "Do not, pray, do not, talk of Johnson in such terms," he said to Boswell, "you harrow up my very soul" George Steevens and Cumberland were men far too cunning to say such a thing They would have echoed the praises of the man whom they envied, and then have sent to the newspapers anonymous libels upon him Both what was good and what was bad in Goldsmith's character was to his associates a perfect security that he would never commit such villainy He was neither ill-natured enough, nor long-headed enough, to be guilty of any malicious act which required contrivance and disguise

The Spendthrift.—Goldsmith has sometimes been represented as a man of genius, cruelly treated by the world, and doomed to struggle with difficulties, which at last broke his heart But no representation can be more remote from the truth He did, indeed, go through much sharp misery before he had done anything considerable in literature But after his name had appeared on the title-page of the *Traveller*, he had none but himself to blame for his distresses His average income, during the last seven years of his life, certainly exceeded £400 a year, and £400 a year ranked, among the incomes of that day, at least as high as £800 a year would rank a century later A single man living in the Temple, with £400 a year, might then be called opulent Not one in ten of the young gentlemen of good families who were studying the law there had so much But all the wealth which Lord Clive had brought from Bengal and Sir Lawrence Dundas from Germany, joined together, would not have sufficed for Goldsmith He spent twice as much as he had He wore fine clothes, gave dinners of several courses, paid court to venal beauties He had also, it should be remembered, to the honour of his heart, though not of his head, a guinea, or five, or ten, according to the state of his purse, ready for any tale of distress, true or false But it was not in dress or feasting, in promiscuous amours or promiscuous charities, that his chief expense lay He had been from boyhood a gambler, and at once the most sanguine and the most unskilful of gamblers For a time he put off the day of inevitable ruin by temporary expedients He obtained advances from booksellers by promising to execute works which he never began But at length this source of supply failed He owed more than £2,000, and he saw no hope of extrication from his embarrassments. His spirits and health gave way He was attacked by a nervous fever, which he thought himself competent to treat It would have been happy for him if his medical skill had been appreciated as justly by himself as by others Notwithstanding the degree which he pretended to have received on the Continent, he could procure no patients "I do not practise," he once said, "I make it a rule to prescribe only for my friends" "Pray, dear Doctor," said Beauclerk, "alter your rule, and prescribe only for your enemies" Goldsmith, now, in spite of this excellent advice, prescribed for himself The remedy aggravated the malady The sick man was induced to call in real physicians, and they at one time imagined that they had cured the disease Still his weakness and restlessness continued He could get no sleep He could take no food "You are worse," said one of his medical attendants, "than you should be from the degree of fever which you have Is your mind at ease?" "No, it is not," were the last recorded words of Oliver Goldsmith He died on April 4, 1774, in his 46th year. He was laid in the churchyard of the Temple, but the spot was not marked by any inscription and is now forgotten The coffin was followed by Burke and Reynolds Both these great men were sincere mourners Burke, when he heard of Goldsmith's death, had burst into a flood of tears Reynolds had been so much moved by the news that he had flung aside his brush and palette for the day

A short time after Goldsmith's death, a little poem appeared, which will, as long as our language lasts, associate the names of his two illustrious friends with his own It has already been mentioned that he sometimes felt keenly the sarcasm which his wild blundering talk brought upon him He was, not long before his last illness, provoked into retaliating He wisely betook himself to his pen, and at that weapon he proved himself a match for all his assailants together Within a small compass he drew with a singularly easy and vigorous pencil the characters of nine or ten of his intimate associates Though this little work did not receive his last touches, it must always be regarded as a masterpiece It is impossible, however, not to wish that four or five likenesses which have no interest for posterity were wanting to that noble gallery, and that their places were supplied by sketches of Johnson and Gibbon, as happy and vivid as the sketches of Burke and Garrick

Some of Goldsmith's friends and admirers honoured him with a cenotaph in Westminster Abbey Nollekens was the sculptor, and Johnson wrote the inscription It is much to be lamented that Johnson did not leave to posterity a more durable and a more valuable memorial of his friend A life of Goldsmith would have been an inestimable addition to the *Lives of the Poets* No man appreciated Goldsmith's writings more justly than Johnson, no man was better acquainted with Goldsmith's character and habits; and no man was more competent to delineate with truth and spirit the peculiarities of a mind in which great powers were found in

company with great weaknesses. But the list of poets to whose works Johnson was requested by the booksellers to furnish prefaces ended with Lyttelton, who died in 1773 The line seems to have been drawn expressly for the purpose of excluding the person whose portrait would have most fitly closed the series Goldsmith, however, has been fortunate in his biographers (M)

BIBLIOGRAPHY —Goldsmith's *Miscellaneous Works* were first published by W Osborne and T Griffin (1775) Bishop Percy wrote a memoir for S Rose's edition of Goldsmith's *Miscellaneous Works* (4 vols , 1806) For other editions *see* I A Williams, *Seven XVIII Century Bibliographies* (1924) The Oxford edition of Goldsmith's plays and *The Vicar of Wakefield* was issued in 1909 Some *New Essays* by him were edited by R S Crane (Chicago, 1927). Goldsmith's life has been written by Prior (1837), by Washington Irving (1844-49), and by John Forster (1848, 2nd ed 1854) The diligence of Prior deserves great praise, the style of Washington Irving is always pleasing, but the highest place must, in justice, be assigned to the eminently interesting work of Forster Subsequent biographies are by William Black (1878) , Austin Dobson (1888, American ed 1899) , R A King (1910) , and F F Moore (1910) , *see* also K C. Balderston, *The History and Sources of Percy's Memoir of Goldsmith* (1926) The above article by Lord Macaulay was slightly revised by Austin Dobson, as regards questions of fact for which there has been new evidence

GOLDSMITH BEETLE, a name applied to species of the sub-family Rutelinae, from their brilliant metallic lustre, and especially to *Cotalpa lanigera* of the eastern United States, a large hairy form, nocturnal in habit, remaining concealed often in willow trees, by day It is allied to the common dung and burying bettles

GOLDSMITHS' AND SILVERSMITHS' WORK: *see* SILVERSMITHS' AND GOLDSMITHS' WORK

GOLD-STICK IN WAITING, an officer of the British royal household who waits in close attendance upon the Sovereign and whose emblem of office is an ebony staff or stick with a gold head, engraved with the Sovereign's cypher and crown The office was instituted in 1678 and was held exclusively by "Colonels of the Regiment" of regiments of Life Guards until 1820 when the honour was extended to officers holding similar appointments in the Royal Horse Guards *Silver Stick in Waiting* is the officer who stands near the *Gold Stick* "ready to relieve him on occasions" and whose emblem of office is an ebony staff or stick with a silver head

See Sir George Arthur, *The Story of the Household Cavalry* (1909)

GOLD STRIPE: *see* STRIPE

GOLDSTÜCKER, THEODOR (1821–1872), German Sanskrit scholar, was born of Jewish parents at Konigsberg on Jan 18, 1821 He studied at Konigsberg, Bonn and Paris From 1847 to 1850 he resided at Berlin, and was recognized by Alexander von Humboldt, but his advanced political views caused the authorities to regard him with suspicion. In the latter year he removed to London, in 1852 he became professor of Sanskrit in University college He was one of the founders and chief promoters of the Sanskrit Text Society He died in London on March 6, 1872

As *Literary Remains* some of his writings were published in two volumes (1879), but his papers were left to the India Office

GOLDWELL, THOMAS (d 1585), English ecclesiastic, began his career as vicar of Cheriton in 1531, after graduating at All Souls college, Oxford As chaplain to Cardinal Pole he lived at Rome, was attainted in 1539, but returned to England on Mary's accession, and in 1555 became bishop of St Asaph On the death of Mary, Goldwell escaped from England and in 1561 became superior of the Theatines at Naples He was the only English bishop at the council of Trent, and in 1562 was again attainted In the following year he was appointed vicar-general to Carlo Borromeo, archbishop of Milan He died in Rome in 1585, the last of the English bishops who had refused to accept the Reformation

GOLDZIHER, IGNAZ (1850–1921), Jewish Hungarian orientalist, was born in Stuhlweissenburg on June 22, 1850 He was educated at the universities of Budapest, Berlin, Leipzig and Leyden, and became privatdocent at Budapest in 1872 He was the first Jewish scholar to become professor in the Budapest university (1894), and represented the Hungarian Government and the Academy of Sciences at numerous international congresses He received many foreign academic honours Goldziher investigated pre-Mohammedan and Mohammedan law, tradition, religion and poetry Among his chief works are. *Beitrage zur Literaturgeschichte der Schi'u* (1874), *Beitrage zur Geschichte der Sprachgelehrsamkeit bei den Arabern* (1871–73), *Der Mythos bei den Hebraern und seine geschichtliche Entwickelung* (Leipzig, 1876, Eng trans , R Martineau, 1877), *Muhammedanische Studien* (Halle, 1889–90, 2 vols), *Abhandlungen zur arabischen Philologie* (Leyden, 1896–99, 2 vols); *Buch v Wesen d Seele* (ed 1907)

GOLETTA, a town on the Gulf of Tunis in 36° 50′ N 10° 19′ E , a little south of the ruins of Carthage, and on the north side of the ship canal which traverses the shallow Lake of Tunis and leads to the city of that name Built on the narrow strip of sand which separates the lake from the gulf, Goletta is defended by a fort and battery The town contains a summer palace of the bey, the old seraglio, arsenal and custom-house, and many villas, gardens and pleasure resorts A short canal, 40 ft broad and 8½ ft deep, divides the town and affords communication between the ship canal and a dock or basin, 1,082 ft long and 541 ft broad An electric tramway which runs along the north bank of the ship canal connects Goletta with the city of Tunis (*q v*) Pop 7,407, mostly Jews and Italian fishermen

Beyond Cape Carthage, 5 m N of Goletta, is La Marsa, a summer resort overlooking the sea The bey has a palace here, and the French resident-general, the British consul, other officials, and many Tunisians have country-houses, surrounded by groves of olive trees

Before the opening of the ship canal in 1893 Goletta, as the port of Tunis, was a place of considerable importance The basin at the Goletta end of the canal now serves as a subsidiary harbour to that of Tunis The most stirring events in the history of the town are connected with the Turkish conquest of the Barbary states Khair-ed-Din Barbarossa having made himself master of Tunis and its port, Goletta was attacked in 1535 by the emperor Charles V , who seized the pirate's fleet, which was sheltered in the small canal, his arsenal, and 300 brass cannon The Turks regained possession in 1574 (*See* TUNISIA. *History*)

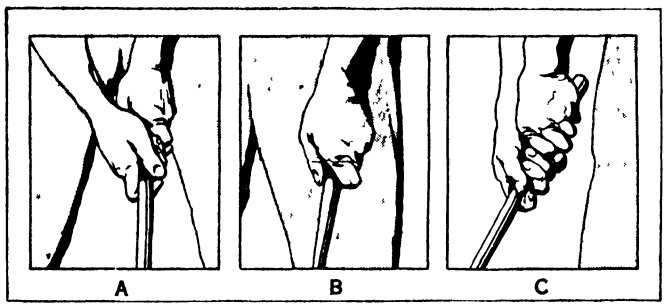
GOLF (in its older forms GOFF, GOUFF, or GOWFF, the last of which gives the genuine old pronunciation), a game which probably derives its name from the Ger *kolbe*, a club—in Dutch, *kolf*—which last is nearly in sound identical and might suggest a Dutch origin, which many pictures and other witnesses support.

From an enactment of James VI of Scotland (then James I of England), bearing date 1618, we find that a considerable importation of golf balls at that time took place from Holland, and thereby "na small quantitie of gold and silver is transported zierly out of his Hienes' kingdome of Scoteland" From this it might seem that the game was at that date still known and practised in Holland

History.—One of the most ancient and most interesting pictures in which the game is portrayed is the tailpiece to an illuminated *Book of Hours* made at Bruges at the beginning of the 16th century The original is in the British Museum The players, three in number, have but one club apiece The heads of the clubs are steel or steel covered They play with a ball each That which gives this picture a peculiar interest over the many pictures of Dutch schools that portray the game in progress is that most of them show it on the ice, the putting being at a stake In this *Book of Hours* they are putting at a hole in the turf, as in our modern golf It is scarcely to be doubted that the game is of Dutch origin, and that it has been in favour since very early days Further than that our knowledge does not go The early Dutchmen played golf, they painted golf, but they did not write it

It is uncertain at what date golf was introduced into Scotland, but in 1457 the popularity of the game had become so great as to interfere with the more important pursuit of archery In March of that year the Scottish parliament "decreted and ordained that *wapinshawingis* be halden be the lordis and baronis spirituale and temporale, four times in the zeir; and that the futeball and *golf be utterly cryit doun, and nocht usit;* and that the bowe-merkis be maid at ilk paroche kirk a pair of buttis, and *schuttin be usit ilk*

Sunday" Fourteen years afterwards, in May 1471, it was judged necessary to pass another act "anent wapenshawings," and in 1491 a final and evidently angry fulmination was issued on the general subject, with pains and penalties annexed It runs thus "Futeball and Golfe forbidden Item, it is statut and ordainit that in na place of the realme there be usit fute-ball, *golfe, or uther sik unprofitabill sportis,"* etc. This, be it noted, is an edict of James



FROM MAIDEN, "TEN LESSONS IN GOLF"

FIG 1 —THE GRIP

A The regular Vardon grip for the full shot B The application of the left hand to the club for all shots except the putt C A side view of the Vardon grip

IV , and it is not a little curious presently to find the monarch himself setting an ill example to his commons, by practice of this "unprofitabill sportis," as is shown by various entries in the accounts of the lord high treasurer of Scotland (1503–6)

About a century later, the game again appears on the surface of history, and it is quite as popular as before In the year 1592 the town council of Edinburgh "ordanis proclamation to be made threw this burgh, that na inhabitants of the samyn be seen at ony pastymes within or without the toun, upoun the Sabboth day, sic as golfe, etc " The following year the edict was re-announced, but with the modification that the prohibition was "in tyme of sermons "

Golf has from old times been known in Scotland as "The *Royal and Ancient* Game of Goff " James IV is the first who figures formally in the golfing record James V was also very partial to the game distinctively known as "royal", and there is some evidence to show that his daughter, the unhappy Mary Stuart, was a golfer It was alleged by her enemies that, as showing her shameless indifference to the fate of her husband, a very few days after his murder, she "was seen playing *golf* and pallmall in the fields beside Seton " That her son, James VI (afterwards James I of England), took an interest in golf we have evidence in his act—already alluded to—"anent *golfe ballis,"* prohibiting their importation except under certain restrictions Charles I was devotedly attached to the game Whilst engaged in it on the links of Leith, in 1642, the news reached him of the Irish rebellion He had not the equanimity to finish his match, but returned precipitately and in much agitation to Holyrood Afterwards, while prisoner to the Scots army at Newcastle, he found his favourite diversion in "the royal game " Sykes (Records of Northumberland) says "The King was nowhere treated with more honour than at Newcastle, as he himself confessed, both he and his train having liberty to go abroad and play at goff in the Shield Field, without the walls " Of his son, Charles II , as a golfer, nothing whatever is known, but James II was a known devotee After the restoration, James, then duke of York, was sent to Edinburgh in 1681–2 as commissioner of the king to parliament, and a historical monument of his prowess as a golfer remains in the "Golfer's Land," as it is still called, 77 Canongate The duke, challenged by two English noblemen of his suite to play a match against them, along with any Scotch ally he might select, chose as his partner one "Johne Patersone," a shoemaker The duke and the said Johne won easily, and half of the large stake the duke made over to his humble coadjutor, who therewith built himself the house mentioned above In 1834 William IV became patron of the St Andrews golf club (St Andrews being then, as now, the most famous seat of the game), and approved of its being styled "The *Royal and Ancient* Golf Club of St Andrews " In 1837, as further proof of royal favour, he presented to it a magnificent gold medal, which "should be challenged and played for annually", and in 1838, the queen dowager, duchess of St Andrews, became patroness of the club, and presented to it a handsome gold medal, —"The Royal Adelaide"—with a request that it should be worn by the captain, as president, on all public occasions In June 1863 the prince of Wales (afterwards Edward VII) signified his desire to become patron of the club, and in the following September was elected captain by acclamation

In more recent days, golf has become increasingly popular; in 1880 the man who travelled about England with a set of golf clubs was an object of some astonishment to his fellow-travellers In those days the commonest of questions in regard to the game was, "You have to be a fine rider, do you not, to play golf?" so confounded was it in the popular mind with the game of polo At Blackheath a few Scotsmen resident in London had long played golf In 1864 the Royal North Devon club was formed at Westward Ho, and this was the first of the seaside links laid out for golf in England In 1869 the Royal Liverpool club established itself in possession of the second English course of this quality at Hoylake, in Cheshire A golf club was formed in connection with the London Scottish Volunteer corps, which had its house on the Putney end of Wimbledon Common on Putney Heath, the progress of the game was slow, though steady, for many years A few more clubs were formed, the numbers of golfers grew, but it could not be said that the game was yet popular in England All at once the qualities of the ancient Scottish game seemed to strike home, and from that moment its popularity has been increasingly great The English links to rise into most immediate favour was that of the Royal St George's golf club, near Sandwich, on the coast of Kent To the London golfer it was the first course of the first class that was reasonably accessible, and the fact made something like an epoch in English golf Already there was a chain of links all round the coast, besides numerous inland courses, but since 1890 their increase has been extraordinary, and the number which has been formed in the colonies and abroad is also very large

The immense amount of golf-playing that this denotes, the large industry in the making of clubs and balls, in the upkeep of links, in the actual work of club-carrying by the caddies, and in the instruction given by the professional class, is obvious Golf has taken a strong hold on the affections of the people in many parts of Ireland, and the fashion for golf in England has reacted strongly on Scotland itself, the ancient home of the game Besides the industry that such a growth in the game denotes in the branches mentioned above, there is to be taken into account the visiting population that it brings to all lodging-houses and hotels within reach of a tolerable golf links, so that many a fishing village has arisen into a moderate watering-place by virtue of the attractions offered by its golf course Therefore to the Briton, golf has developed into something in the nature of an important business, a business that can make towns and has a considerable effect on the receipts of railway companies

Moreover, ladies have learned to play golf Although this is a crude and brief sentence, it does not state the fact too widely nor too forcibly, for though it is true that before 1885 many played on the short links of St Andrews, North Berwick, Westward Ho, and elsewhere, still it was virtually unknown that they should play on the longer courses which, till then, had been in the undisputed possession of the men Women now play on the same course as the men They have their annual championship, which they play on the long links of the men, sometimes on one, sometimes on another, but always on courses of the first quality, demanding the finest display of golfing skill

The claim that England made to a golfing fellowship with Scotland was conceded very strikingly by the admission of three English greens, first those of Hoylake and of Sandwich, and in 1909 Deal, into the exclusive list of the links on which the open championship of the game is decided Before England had so fully assimilated Scotland's game this great annual contest was waged at St Andrews, Musselburgh and Prestwick in successive years The ancient green of Musselburgh somewhat worn out with hard service, and moreover, as a nine-holes course inadequately accom-

modating the numbers who compete in the championships to-day, was superseded by Muirfield as a championship arena

While golf was making itself a force in the southern kingdom, the professional element—men who had learned the game from childhood had become past-masters, were capable of giving instruction, and also of making clubs and balls and looking after the greens on which golf was played—was at first taken from the northern side of the Border But when golf had been started long enough in England for the little boys employed as "caddies" to grow to sufficient strength to drive the ball as far as their masters, it was inevitable that out of their number some should develop an exceptional talent for the game This, in fact, actually happened, and English golfers have proved themselves so adept at Scotland's game that there are as many English as Scottish professional golf players, and their number is increasing

Golf also "caught on," to use the American expression, in the United States To the American of 1890 golf was largely an unknown thing Since then, however, golf has become a greater factor in the life of the upper and upper-middle classes in the United States than it ever has been in England or Scotland Golf to the English and the Scots meant only one among several of the sports and pastimes that take the man and the woman of the upper and upper-middle classes into the country and the fresh air To the American of like status golf came as the one thing to take him out of his town and give him a reason for exercise in the country.

So much enthusiasm and so much golf in America have not failed to make their influence felt in the United Kingdom Naturally and inevitably they have created a strong demand for professional instruction, and for professional advice and assistance in the laying out and upkeep of the many new links that have been created in all parts of the States, sometimes out of the least promising material By the offer of great prizes for exhibition matches, and of wages that are to the British rate on the scale of the dollar to the shilling, they have attracted many of the best Scottish and English professionals to pay them longer or shorter visits as the case may be, and thus a new opening has been created for the energies of the professional golfing class

The Game.—The game of golf consists in hitting the ball over a stretch of country, preferably of that sand-hill nature which is found by the sea-side, and finally hitting or "putting" it into a little hole of some 4in diameter cut in the turf The place of the hole is commonly marked by a flag Eighteen is the recognized number of these holes on a full course, and they are at varying distances apart For the various strokes required to achieve the hitting of the ball over the hills, and finally putting it into the small hole, different "clubs" have been devised to suit the different positions in which the ball may be found At the start for each hole the ball may be placed on a favourable position (*e g* "tee'd" on a small mound of sand) for striking it, but after that it may not be touched, except with the club, until it is hit into the next hole It is easily to be understood that when the ball is lying on the turf behind a tall sand-hill, or in a bunker, a differently-shaped club is required for raising it over such an obstacle from that which is needed when it is placed on the tee to start with, and again, that another club is needed to strike the ball out of a cup or out of heavy grass It is this variety that gives the game its charm Each player plays with his own ball, with no interference from his opponent, and the object of each is to hit the ball from the starting-point into each successive hole in the fewest strokes The player who at the end of the round (*i e*, of the course of 18 holes) has won the majority of the holes is the winner of the round; or the decision may be reached before the end of the round by one side gaining more holes than there remain to play

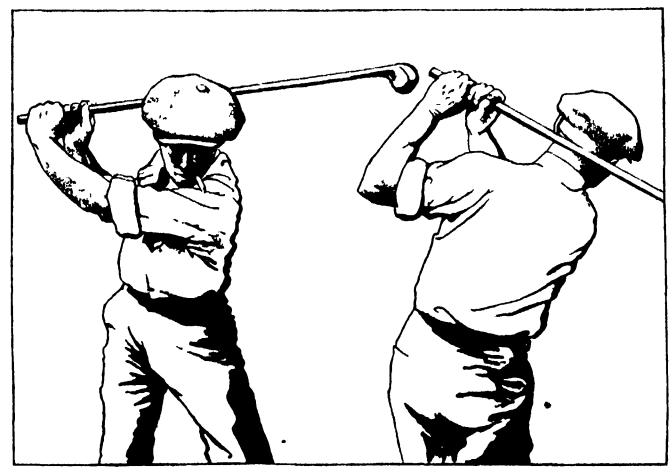
The British amateur championship is decided by a tournament in matches thus played, each defeated player retiring, and his opponent passing on into the next round In the open championship, and in most medal competitions, the scores are differently reckoned—each man's total score (irrespective of his relative merit at each hole) being reckoned at the finish against the total score of each other player in the competition There is also a species of competition called "bogey" play, in which each man plays against a "bogey" score—a score fixed for each hole in the round before starting—and his position in the competition relatively to the other players is determined by the number of holes that he is to the good or to the bad of the "bogey" score at the end of the round. The player who is most holes to the good, or fewest holes to the bad, wins the competition Golf occupies the almost unique position of being the only sport in which even a single player can enjoy his game, his opponent in this event being "Colonel Bogey"—more often than not a redoubtable adversary

The open championship of golf was started in 1860 by the Prestwick club giving a belt to be played for annually under the condition that it should become the property of any who could win it thrice in succession The champions in the first three years were —

1860. W Park, Musselburgh 174, at Prestwick
1861 Tom Morris, sen, Prestwick 163, at Prestwick
1862 Tom Morris, sen, Prestwick 163, at Prestwick

Tom Morris, jun, won the belt finally, according to the conditions, in 1868–69–70 In 1871 there was no competition; but by 1872 the three clubs of St Andrews, Prestwick, and Musselburgh had subscribed for a cup which should be played for over the course of each subscribing club successively, but should never become the property of the winner In later years the course at Muirfield was substituted for that at Musselburgh, and Hoylake and Sandwich were admitted into the list of championship courses Up to 1891, inclusive, the play of two rounds, or 36 holes, determined the championship, but from 1892 the result has been determined on 72 holes (for list of champions *see* page 503)

There have been some slight changes of detail and arrangement as time has gone on, in the rules of the game (the latest edition of the rules should be consulted) A new class of golfer has arisen, requiring a code of rules framed rather more exactly than the older code The Scottish golfer, who was "teethed" on a golf club, as Mr Andrew Lang has described it, imbibed all the traditions of the game with his natural sustenance Very few rules sufficed for him But when the Englishman, and still more the American (less in touch with the traditions), began to play golf as a new game, they began to ask for a code of rules that should be lucid on every point—an ideal perhaps impossible to realize It was found, at least, that the code put forward by the Royal and Ancient Club of



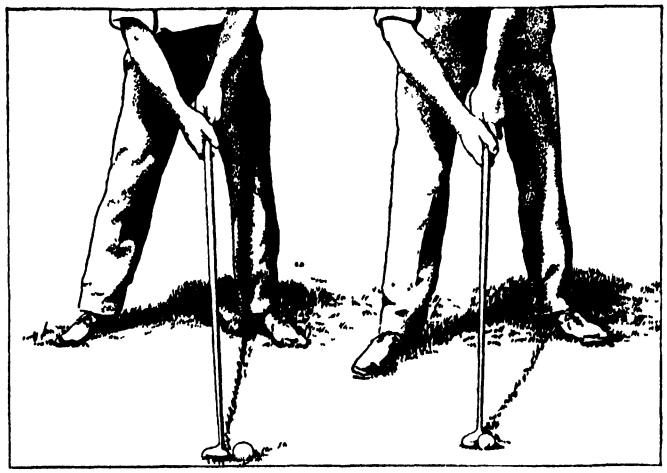
FROM MAIDEN, "TEN LESSONS IN GOLF"

FIG 2.—WRIST ACTION

The correct position of the hands at the top of the swing is illustrated at left At right is shown the finish. Note that the right hand appears to hold loosely and the left firmly

St Andrews did not realize it adequately Nevertheless the new golfers were very loyal indeed to the club that had held, by tacit consent, the position of fount of golfing legislation The Royal and Ancient Club was appealed to by English golfers to step into the place, analogous to that of the Marylebone Cricket Club in cricket, that they were both willing and anxious to give it It was a place that the club at St Andrews did not in the least wish to occupy, but the honour was thrust so insistently upon it that there was no declining The latest effort to meet the demands for some more

satisfactory legislation on the thousand and one points that continually arise for decision consists of the appointment of a standing committee, called the "Rules of Golf Committee" Its members all belong to the Royal and Ancient Club; but since this club draws its membership from all parts of Britain and Ireland, this restriction is quite consistent with a very general representation of the views of north, south, east, and west—from Westward



FROM MAIDEN, "TEN LESSONS IN GOLF"

FIG 3 —TWO STANCES FOR WOOD CLUB PLAY

At the left, the "square" stance, the feet parallel with the line of the shot; the ball opposite the left heel. At the right, the "open" stance, with the left foot drawn back somewhat farther from the line of flight

Ho and Sandwich to Dornoch, and all the many first-rate links of Ireland—on the committee Ireland has some of the best links in the British Isles, and yields to neither Scotland nor England in enthusiasm for the game This committee, after a general revision of the rules into the form in which they now stand, consider every month, either by meeting or by correspondence, the questions that are sent up to it by clubs or by individuals; and the committee's answers to these questions have the force of law until they have come before the next general meeting of the Royal and Ancient Club at St Andrews, which may confirm or may reject them at will The women of Great Britain manage otherwise They have a golfing union which settles questions for them, but since this union itself accepts as binding the answers given by the Rules of Golf Committee, they arrive at the same conclusions by a slightly different path Nor does the American union, governing the play of men and women alike in the States, really act differently The Americans naturally reserve to themselves freedom to make their own rules, but in practice they conform to the legislation of Scotland, with the exception of a more drastic definition of the status of the amateur player, and certain differences as to the clubs used

A considerable modification had been effected on the implements of the game The tendency of the modern wooden clubs is to be short in the heads as compared with the clubs of, say, 1880 or 1885 The advantage claimed for this shape is that it masses the weight behind the point on which the ball is struck Better material in the wood of the club is a consequence of the increased demand for these articles and the increased competition among their makers Whereas under the old conditions a few workers at the few greens then in existence were enough to supply the golfing wants, now there is a very large industry in golf club and ball making, which not only employs workers in the local club-makers' shops all the kingdom over, but is an important branch of the commerce of the stores and of the big athletic outfitters both in Great Britain and in the United States By far the largest modification in the game since the change to gutta-percha balls from balls of leather-covering stuffed with feathers, is due to the American invention of the india-rubber cored balls Practically it is as an American invention that it is still regarded, although the British law courts decided, after a lengthy trial (1905), that there had been "prior users" of the principle of the balls' manufacture, and therefore that the patent of Mr. Haskell, by whose name the first balls of the kind were called, was not good. The rubber-cored ball, which is now everywhere in use, is a hard core of gutta-percha or some other substance, round which is wound, by machinery, india-rubber thread or strips at a high tension, and over all is an outer coat of gutta-percha Some makers have tried to dispense with the kernel of hard substance, or to substitute for it kernels of some fluid or gelatinous substance, but in general the above is a sufficient, though rough, description of the mode of making these balls Their superiority over the solid gutta-percha lies in their superior resiliency The effect is that they go much more lightly off the club They also go remarkably well off the iron clubs, and thus make the game easier by placing the player within an iron shot of the hole at a distance at which he would have to use a wooden club if he were playing with a solid gutta-percha ball They also tend to make the game more easy by the fact that if they are at all mis-hit they go much better than a gutta-percha ball similarly inaccurately struck As a slight set-off against these qualities, the ball, because of the greater liveliness, is not quite so good for the short game as the solid ball, but on the whole its advantages distinctly overbalance its disadvantages

When these balls were first put on the market they were sold at 2s each and even, when the supply was quite unequal to the demand, at a great deal higher price, rising to as much as a guinea a ball But the normal price, until about a year after the decision in the British courts of law affirming that there was no patent in the balls, was always 2s for the best quality of ball Subsequently there was a reduction to 1s. for the balls made by many of the manufacturing companies, though in 1910 the rise in the price of rubber sent up the cost The rubber-cored ball does not go out of shape so quickly as the gutta-percha solid ball and does not show other marks of ill-usage with the club so obviously It has had the effect of making the game a good deal easier for the second and third class players, favouring especially those who were short drivers with the old gutta-percha ball To the best players it has made the least difference, nevertheless those who were best with the old ball are also best with the new, its effect has merely been to bring the best closer to each other

The expenditure of clubs on their courses has increased and tends to increase Demands are more insistent than they used to be for a well kept course, for perfectly mown greens, renewed teeing grounds and so on, and probably the modern golfer is a good deal more luxurious in his clubhouse wants than his father used to be This means a big staff of servants and workers on the green, and to meet this a rather heavy subscription is required Such a subscription as five guineas added to a ten or 15-guinea entrance fee is not uncommon, and even this is very moderate compared with the subscriptions to some of the clubs in the United States, where $150 to $250 a year is not unusual and admission costs in some cases amount to $2,500 But on the whole, golf is very economical, as compared with almost any other sport which engages the attention of Britons, and it is a pastime for all the year round and for all the life of a man or woman.

GOLF SINCE 1910

Since 1910 the popularity of golf has increased steadily in Great Britain, while in the United States of America it has spread like a prairie fire There could be no more striking evidence than the fact that the profession of the golf architect has now become an exceedingly busy and prosperous one Tracts of woodland, where it would once have been deemed impossible to make a course, have been hacked and hewn into shape, tree stumps have been blown up with dynamite, and on one famous course in America, the Lido, sand has been sucked up from the sea by giant engines and spread over a flat marsh in picturesque hills and valleys The designing of courses has developed into an art

This, which may be called the second great boom in the history of the game, began with the coming of the rubber-cored ball and is no doubt largely due to it The ball made the game easier and pleasanter for the average man to play, but it has had its disadvantages The ball goes so far that there has been a constant cry that courses are too short Consequently clubs have had to remake their courses, taking in more ground with great attendant

expense. Some attempts have been made, though not with any conspicuous success, to limit the ball's activities. In 1920, there was passed a rule, still in force, which lays down that the weight of the ball shall not be greater than 1 62oz avoirdupois and the size not less than 1·62in. in diameter The "implements committee" of the U S. Golf Association, after exhaustive experiments, proposed a further slight limitation At the autumn meeting of the Royal and Ancient Club in 1925 it was proposed that a ball thus further limited should be used in the open and amateur championships of 1926, but the proposal was rejected by a large majority The American authorities are still anxious to take some definite step towards limiting the ball, but at the moment it seems doubtful whether any concerted action will be taken

GOLF IN FRANCE AND ELSEWHERE

Before coming to British golf, something must be said of that in other countries. As long ago as 1907, Arnaud Massy, originally a Biarritz fisherman, won the British open championship He has never repeated that feat, though he tied with Vardon in 1911 and has several times beaten strong fields of British players in the French championship and did so once again in 1925 There has been no other French professional as good as Massy, but there has been a number of very good ones, such as the late Louis Tellier, Gassiat, Laffitte, Daugé, and one most remarkable one-armed player, Yves Bocatzou The French amateurs have hardly yet reached the same standard, but France has produced one extremely good lady player, Mlle Simone de la Chaume She is already a very fine player, and in 1927 won the British ladies' championship, though it should be added that neither Miss Wethered nor Miss Leitch was competing

There are to-day some very good courses in France Paris has La Boulie, Chantilly, St Cloud, and Fontainebleau Le Touquet, near Etaples, is excellent, a mixture of seaside sand and inland pine trees; and Wimereux, lately remodelled, promises well. In the Riviera English visitors have made courses of varying quality Cannes has one very pleasant one among pine trees at Napoules and the new Cannes country club, rather farther off at Mougins, is probably better Sospel, in a mountain valley above Mentone, is very charming, and others that are at least pretty and worth playing on are Costebelle, Valescure, and Cagnes, near Nice On the Cote d'Argent there is La Nivelle, near St Jean de Luz, where Massy is the professional, and Biarritz Moreover, close to Biarritz there is a new course, Chiberta, which, if time and the blazing sun are kind to it, should be a course of a higher class than any of those mentioned Nor must Pau be forgotten It is a club of now almost venerable age, one of the oldest out of Scotland The golf is good and interesting and, what is more, can be played in reasonable peace and quiet Switzerland and Italy have courses which are at least very beautiful. Canada, if it has not yet quite attained to the American standard of skill, is almost as keen and spends almost as much money on its courses and club houses Australia has some good courses, notably perhaps Seaton, near Adelaide, and Kensington, near Sydney, and it has bred at least one first-class professional, Joseph Kirkwood, who has several times done well in the British open championship and is now one of the leading professionals in America

Japan has taken to the game with enthusiasm, although the turf of the country is not of the best kind It possesses a golf paper, *Golfdom*, and has some good players, although none has yet reached the standard of its lawn-tennis players In short, in its world-wide character the game is only second to lawn tennis

THE GAME IN GREAT BRITAIN

In Great Britain golf has become steadily more and more popular, and nowhere more markedly than in its original home, Scotland There, it is essentially the people's game, and there are many municipal courses on which it can be played at the minimum of expense In England, it is still largely the game of the comparatively well-to-do, but municipal golf is on the increase, and wherever it arises it is an instant success, as witness the public course in Richmond Park, which is crowded with all sorts and conditions of players There are to-day far more golfers than there used to be who have begun the game as boys. It is not a school game but many boys play in their holidays; and, considering this fact, it is rather surprising that Great Britain does not breed more good young players The universities of Oxford and Cambridge are full of golfers, but only a few of them are really good and the standard of university teams is not noticeably higher than it used to be The number of players who may fairly be called good has of course increased greatly throughout the country and championship fields have correspondingly increased.

British Amateurs.—It has already been said that when the game was resumed after the World War the leading British professionals were a little past their best Much the same may be said as regards the amateurs Mr John Ball, Mr Hilton, and others of their generation had naturally begun to think of retiring and their places were left open Two very brilliant young players, too young to be heard of before the war, at once made their presence felt after it, Mr Cyril Tolley and Mr Roger Wethered Of all British golfers in late years, these two have been the most essentially dramatic, and have taken the largest share of public attention Both can hit the ball enormous distances, both are on their day almost unapproachably good and both can be, on an off day, disappointing They lack the consistency of such a player as Mr. John Ball, but the game as played by them is an exciting and attractive one Each has won the amateur championship once Mr. Tolley has won the French open championship against a strong field, and Mr Wethered did the best thing which any British amateur has done for a long time when he tied for the open championship with Jock Hutchison

A golfer of a rather different type, Sir Ernest Holderness, has twice won the amateur championship since the war and, though he has not the magnetic powers of a Tolley or a Wethered, he is beyond doubt a very fine player In the matter of consistency and steadiness he challenges comparison with the best of the older amateurs In 1925 another eminently consistent player, Mr. Robert Harris, won the amateur championship. It was a most popular victory, for Mr Harris has now been among the leading amateurs for a long time, he was in the semi-final of the amateur championship as long ago as 1907 and in the final in 1913 and 1923 In 1926, Mr Sweetser, the American, won The year 1927 saw no American invasion but produced a new and entirely worthy



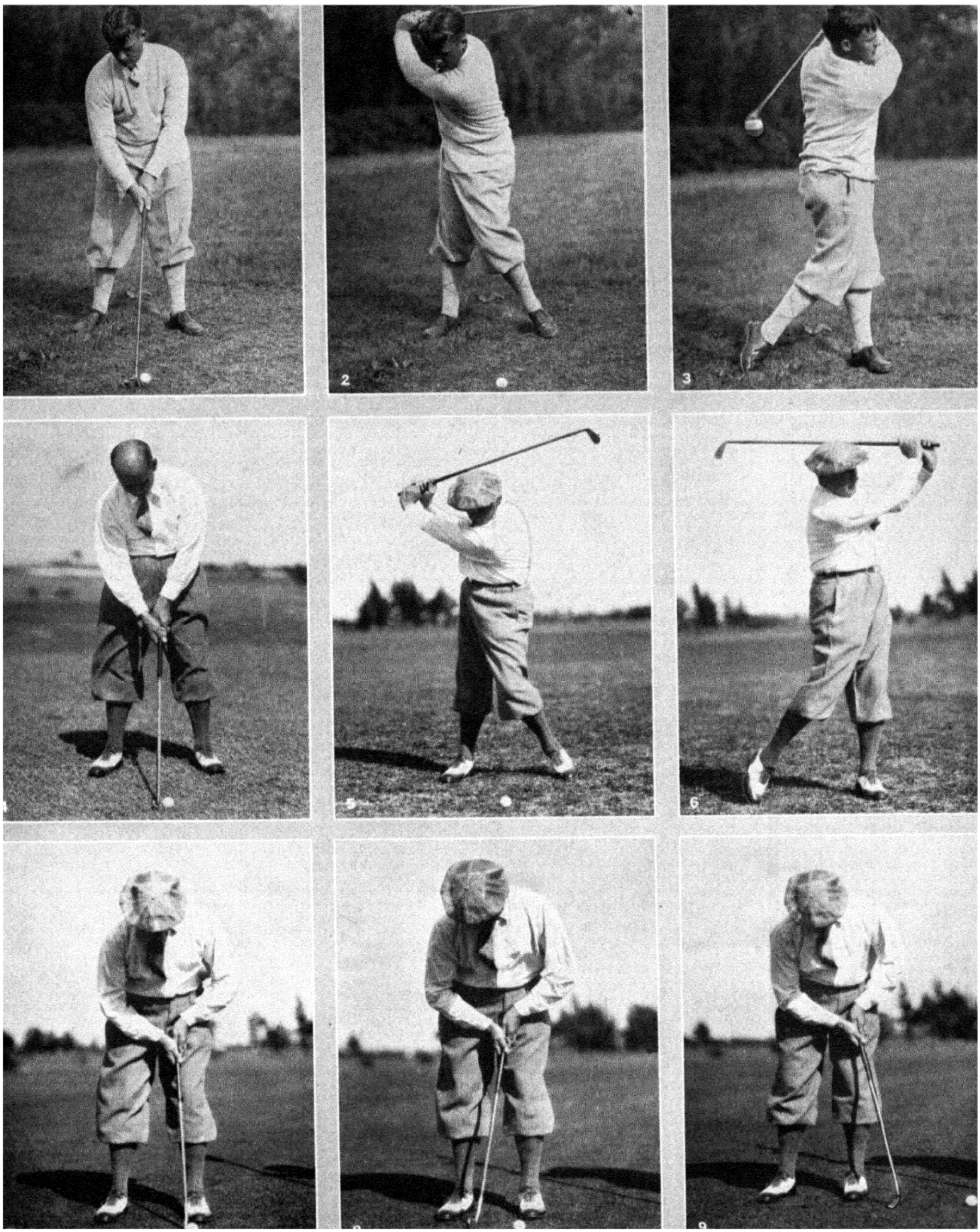
FROM MAIDEN, "TEN LESSONS IN GOLF"

FIG 4.—THE PUTTING POSITION

In this stroke, the wrists are exactly opposed, the palms held facing one another, and the club sent on through the ball straight down the line of the putt. The back swing here is for a putt of twenty feet

champion in Dr Tweddell of Stourbridge who, though an Englishman, learnt much of his golf in Scotland He is an extremely sound and painstaking golfer and his victory will probably be good for golf because he is a player who is essentially straight and accurate There is some danger lest too much importance should be attached to length and young golfers should indulge in an orgy of slogging On the whole the amateur standard is going up; but there is still room for a combination of the older and younger virtues

British Professionals.—No one or two professionals have definitely succeeded to the throne left vacant by the "triumvirate" —Vardon, Braid, and Taylor Duncan appeared likely to do so when he played so wonderfully well in 1920, but he has since been



BY COURTESY OF (1, 2, 3) EDWIN LEVICK, (4, 5, 6, 7, 8, 9) GEORGE S. PIETZCKER

GOLFING STROKES: DRIVING, IRON CLUB PLAY AND PUTTING STROKES

1, 2, 3. Wood Club Play, demonstrated by Bobby Jones: (1) Addressing the ball. (2) Top of swing. (3) Follow through
4, 5, 6. Iron Club Play, demonstrated by Mike Brady: (4) Addressing the ball. (5) Top of swing. (6) Follow through
7, 8, 9. Putting Iron Play: (7) Addressing the putt. (8) Putt, back swing. (9) Putt, follow through

somewhat fitful and inconstant He is a magnificent golfer but lacks something of solidity and stolidity Much the same may be said of Abe Mitchell, who has never yet won the open championship, though he has been very successful in tournaments by match play It is almost impossible to imagine anything better than Mitchell's golf when things are going well; his brother professionals always expect him to win, but he, too, seems to want that



FROM MAIDEN, "TEN LESSONS IN GOLF

FIG 5 —THE CHIP SHOT

In the normal chip-and-run most of the weight is on the left foot and the hands are held slightly in front of the ball at the address, as in the illustration. For the chip-and-drag the weight is more on the right foot and the hands are just behind the ball

power of rising superior to circumstances, which Hagen so conspicuously possesses The two Whitcombes, George Gadd, Ockenden, Havers, and many others all play exceedingly well without quite rising to the greatest heights In 1925, however, there appeared suddenly another player, Compston, who adds great determination and character to great physical strength and may possibly be the man for whom the British golfing world has been waiting He was unquestionably the player of the year and appears, far from relaxing his efforts after a victory, to go from strength to strength Late in the year he was defeated by Abe Mitchell, who played golf of overpowering brilliancy, but this did not discourage him, after seeming to go back for a while, he played perhaps the best golf of his life towards the end of 1927.

Golf for Ladies.—In its ladies' golf Great Britain is strongest For the first few years after the war Miss Cecil Leitch was the outstanding figure She has all the qualities of a great player, it is possible to criticize her rather unorthodox methods, but not their results She is still as good as ever, but she has been surpassed by Miss Joyce Wethered, who to equal strength and courage adds a sounder method Indeed, she is so sound in everything she does that it is impossible to suggest even the smallest loophole in her armour She won the English close championship five times in succession and the open championship three times in four years, the last time after a terrific struggle with Miss Leitch, in which both played superbly She has now no worlds left to conquer and has, for a while at any rate, retired from public competition Miss Leitch has also not played quite so regularly in championships, but these two may still be said to dominate ladies' golf

WINNERS OF BRITISH CHAMPIONSHIP FROM 1900

Year	Open	Amateur	Ladies
1900	J H Taylor	H H Hilton	Miss R K Adair
1901	J Braid	H H Hilton	Miss M A Graham
1902	A Herd	C Hutchings	Miss M Hezlet
1903	H Vardon	R Maxwell	Miss R K Adair
1904	J White	W J Travis	Miss L Dod
1905	J Braid	A G Barry	Miss B Thompson
1906	J Braid	J Robb	Mrs Kennion
1907	A Massy	John Ball	Miss M Hezlet
1908	J Braid	E A Lassen	Miss M Titterton
1909	J H Taylor	R Maxwell	Miss D Campbell
1910	J Braid	John Ball	Miss Grant Suttie
1911	H Vardon*	H H Hilton	Miss D Campbell
1912	E Ray	John Ball	Miss G Ravenscroft
1913	J H Taylor	H H Hilton	Miss M Dodd
1914	H Vardon	J L C Jenkins	Miss C Leitch
1915–1919		No competitions	
1920	G Duncan	C J H Tolley	Miss C Leitch
1921	J Hutchison†	W I Hunter	Miss C Leitch
1922	W Hagen	E Holderness	Miss J Wethered
1923	A G Havers	R H Wethered	Miss D. Chambers
1924	W Hagen	E. Holderness	Miss J. Wethered
1925	J M Barnes	R Harris	Miss J. Wethered
1926	Robert T ("Bobby") Jones	Jesse Sweetser	Miss C Leitch
1927	R. T Jones	W Tweddell P T Perkins	Mlle Simone de la Chaume
1928	W Hagen		Mlle Manet Leblanc

*After tie with A Massy
†After tie with R H Wethered

Glossary of Technical Terms Used in the Game

Ace —A hole scored in one stroke

Addressing the Ball —Putting oneself in position to strike the ball

All Square —Term used to express that the score stands level, neither side being a hole up

Approaching —Playing or attempting to play a ball on to the putting green

Away —The player whose ball lies furthest from the hole is said to be away

Back spin —Rotating of the ball in flight backward, imparted by causing the clubhead to strike the ball a descending blow, as in a draw shot in billiards

Baff —To strike the ground with the club when playing, and so loft the ball unduly

Baffy — A short wooden club, with laid-back face, for lofting shots

Bent —Rushes Also a certain species of grass of fine texture used for putting greens

Best-Ball Match —A match in which a single player competes against the better ball of two others

Birdie —A hole scored in a stroke less than par

Bisque —A handicap stroke given under the condition that the player may use it at his option on any hole, but with the provision that he must announce his choice to do so on any hole, before striking off from the tee for the next hole

Bogey —The number of strokes which a good average player should take to each hole This imaginary player is usually known as "Colonel Bogey" and plays a fine game

Bone —A piece of horn, wood fibre, or hard composition placed in the sole of the club at its front edges to protect it from injury

Borrow —In putting to play to the right or left of the direct line from ball to the hole in order to compensate for roll or slant in the putting green

Brassy —A wooden club with a brass sole

Bulger —A driver in which the face "bulges" into a convex shape. The head is shorter than in the older-fashioned driver

Bunker —A sand-pit, either natural or artificial, preferably the former The word is loosely used also for any hollow (in which a club may not be grounded) devised to endanger the approach to the hole

Bye —The holes remaining after one side has become more holes up than remain for play

Caddie —The person who carries the clubs Diminutive of "cad"; (from Fr *cadet*, cf laddie)

Carry — The distance between where a ball is hit and where it first strikes the ground

Cleek —The non-headed club that is capable of the farthest drive of any of the clubs with iron heads

Club —The implement with which the ball is struck

Cop —The top or parapet of a bunker

Course —The terrain over which the game is played All ground on which play is permitted, including fairway, rough, hazards and putting greens *See* also *Links*

Cup — A depression in the ground causing the ball to lie badly

Cuppy —Referring to the position of the ball, a small depression in the ground, as a cuppy lie

Dead —A ball is said to be "dead" when so near the hole that the putting it in in the next stroke is a "dead" certainty A ball is said to "fall dead" when it pitches with hardly any run

Divot —A piece of turf cut out in the act of playing, which, be it noted, should always be replaced before the player moves on

Dormy —One side is said to be "dormy" when it is as many holes to the good as remain to be played—so that it cannot be beaten

Draw —An effect of making the ball curve or veer to the left *See* also *Hook and Pull*

Driver —The longest driving club, used when the ball lies very well and a long shot is needed

Driving Iron —An iron club with little loft, similar to the cleek, but having a slightly shorter and thicker blade

Eagle —A hole scored in two less than par

Face —The surface of the club with which the ball is struck

Fairway —The expanse of ground, extending in whole or in part from the tee to the putting green, especially prepared for play with excellent turf on which the grass is kept cut

Flat —Referred to the club, as a "flat lie," means that the angle between the sole of the club and the shaft is decidedly obtuse

Follow Through —The continuation of the sweep of the club after the ball has been struck

Foozle.—Any very badly missed or bungled stroke.

"Fore!"—A cry of warning to people in front

Fourball Match.—A match in which two players to a side are engaged, each playing his own ball

Foursome—A match in which four persons engage with two balls, two on each side playing alternately with the same ball A four-ball match implies that each of the four players uses his own ball only, and they may all play against each other or may play in pairs, the best ball of each pair scoring

Gobble—Said of a boldly hit putt, which finds the hole, but which must have gone considerably beyond the hole, had it failed to go in

Green—(*a*) The links as a whole, (*b*) the "putting-greens" around the holes

Grip—(*a*) The part of the club shaft which is held in the hands while playing, (*b*) the grasp itself—*e g* "a firm grip," "a loose grip," are common expressions

Half—An expression used to indicate a handicap allowance, meaning a stroke on every other hole, also one used to indicate that two players scored alike on a hole

Half-Shot—A shot played with something less than a full swing

Halved—A hole is "halved" when both sides have played it in the same number of strokes A round is "halved" when each side has won and lost the same number of holes

Handicap—The strokes which a player received either in match play or competition

Hanging—Said of a ball that lies on a slope inclining downwards in regard to the direction in which it is wished to drive

Hazard—Limited space or area in which the privileges of play are restricted, including bunkers, water courses, ponds, sand, etc , also recognized roadways and paths

Head—The knob or crook part of the club as distinguished from the shaft or handle Heads are made of wood, iron, and sometimes metallic compounds

Heel—To hit the ball on the "heel" of the club, *i e* the part of the face nearest the shaft, and so send the ball to the right, with the same result as from a slice

Hole—The circular opening in the ground into which the ball is played, being 4¼ in. in diameter and 4 in deep, also a unit of play including teeing ground, putting green and all intermediate ground

Hole-out—To make the final stroke in playing the ball into the hole

Honour—The privilege (which its holder is not at liberty to decline) of striking off first from the tee.

Hook.—To cause the ball to swerve to the left of its original line of flight

Hose or Hosel—The socket on iron clubs into which the shaft is fitted

Iron.—An iron-headed club intermediate between the cleek and lofting mashie. There are driving irons and lofting irons according to the purposes for which they are intended

Jigger—An iron club with narrow blade, in classification intermediate between a midiron and a mashie

Lie—(*a*) The angle of the club-head with the shaft (*e g* a "flat lie," "an upright lie,"), (*b*) the position of the ball on the ground (*e.g* a "good lie," "a bad lie")

Like, The—The stroke which makes the player's score equal to his opponent's in course of playing a hole

Like-as-we-Lie—Said when both sides have played the same number of strokes

Line—The direction in which the hole towards which the player is progressing lies with reference to the present position of his ball.

Links—Ground on which golf is played, more properly used of a seaside course

Loft—The angle of declination from 90° on the face of a club, also to hit the ball on a high short trajectory, usually over some intervening obstacle

Lofter—An iron club with considerable loft on the face, for lofting the ball

Long Game—The strokes where distance is an important factor, as distinguished from play where control of distance is a problem

Loose Impediments—Any detached object lying in the immediate vicinity of the ball, not fixed in the earth

Mashie—An iron club with a short head The *lofting mashie* has the blade much laid back, for playing a short lofting shot The *driving mashie* has the blade less laid back, and is used for longer, less lofted shots

Mashie-Iron—A heavy mashie with a somewhat longer shaft than the mashie

Mashie-Niblick—An intermediate iron club between the mashie and niblick

Match-Play—Play in which score is reckoned by holes won and lost

Medal-Play—Play in which the score is reckoned by the total of strokes taken on the round

Midiron—An iron head club for medium distances, having less loft than a cleek or driving iron, and more than a mashie

Mid-Mashie—A deep-face mashie with a slightly longer shaft than a mashie

Nassau—A basis of scoring, in which three points are involved, one on the first nine holes, one on the second nine, and one on the full eighteen

Neck—The bent or crooked part of the club where the shaft joins on to the head.

Niblick—A short stiff club with a short, laid back, iron head, used for getting the ball out of a very bad lie

Number One—A late tendency to number iron clubs rates them as follows Number one, driving iron, number two, midiron, number three, mid-mashie or mashie-iron, number four, mashie, number five, mashie-niblick, number six, niblick

Nose—The outward point of the club face, called also the toe

Odd, The—A stroke more than the opponent has played

Par—Theoretically perfect play, calculated on the number of strokes required to reach the green, plus two putts Distance is the chief factor in determining the par for a hole Following are the divisions all distances up to 250 yds , par 3 , 251 to 445, par 4 , 446 to 600, par 5 , over 600, par 6

Pitch—To lob or loft a ball into the air

Pitch-and-run—To so play the ball that a part of the desired distance is to be covered by the roll of the ball after it strikes the ground

Press—To strive to hit harder than you can hit with accuracy

Pull—To hit the ball with a pulling movement of the club, so as to make it curve to the left

Push-Shot—A stroke with an iron club in which the player keeps the weight well forward on the left foot, holds the wrists firm, and causes the clubhead to strike the ball a descending blow

Putt—To play the short strokes near the hole (pronounced as in "but")

Putter—The straight-faced club used for playing the short strokes near the hole Some have a wooden head, some a metal head

Quarter-Shot—A stroke in which the club is taken back practically half the distance from its position in the address to a vertical one overhead

Rough—Ground to left and right of the fairway, also at times intervening between the tee and fairway, on which vegetation is allowed to grow without being cut, long grass and weeds

Rub-of-the-Green—Any chance deflection that the ball receives as it goes along

Run—The distance the ball rolls after striking the ground

Run Up—To send the ball low and close to the ground in approaching the hole—opposite to lofting it up

Scare—That portion of wood clubs where the head and shaft are spliced together, the union being bound by closely wound thread or cord

Sclaff—To strike the ground back of the ball before striking it

Scratch Player—Player who receives no odds in handicap competitions

Scruff—To cut just through the roots of the grass in playing the ball

Shaft—The handle of the club, as distinguished from the head

Short Game—Approach shots and putts

Single—A match between two players

Slice—To hit the ball with a cut across it, so that it flies curving to the right, also the flight of ball so struck

Socket—The opening in the neck of an iron club into which the shaft is fitted, also to hit the ball back on this part of the club, or the heel



FROM MAIDEN "TEN LESSONS IN GOLF"

FIG 6—THE MEDIUM PITCH

In the medium pitch, the ball is opposite to the left foot, most of the weight is on the right foot, and the ball is hit fairly in the back, the club being carried through without turning the hands over to the left The left arm must be kept straight all through the stroke

Sole—The bottom of the club on which it rests when set in position on the ground.

Spoon—A wooden head club with considerable loft and a shaft shorter than the driver or brassie

Spring—The resilience in the shaft of a club

Square—Said of a match, when the players are even

Stance—The position of the player's feet in hitting the ball Stances are designated as open, square and closed In the square stance, the toes of the feet are in a line parallel with the proposed line of play In the open stance, the left foot is drawn back from the line In the closed stance, this foot is advanced beyond the line

Stroke—The hitting or trying to hit the ball A forward movement of the club made with the intent to hit the ball, even though the ball is

not struck, constitutes a stroke.

Swing.—The sweep of the club in the operation of hitting the ball.

Tee.—The little mound of sand on which the ball is generally placed for the first drive to each hole.

Teeing-Ground—The place marked as the limit, outside of which it is not permitted to drive the ball off This marked-out ground is also sometimes called "the tee."

Third—An expression in handicapping, meaning that one of the



FROM MAIDEN, "TEN LESSONS IN GOLF"

FIG 7—THE FULL PITCH

For the full pitch, the ball is played back of the left heel and the weight is more on the left foot The hands are lifted freely but the club should not go any farther back than here shown The left arm is kept straight The grip is firm with the left hand and light with the right

players is allowed a stroke on one-third of the holes, or six strokes in 18 holes

Three-Quarter Swing—A stroke in which the club on the back-swing is carried back approximately half-way between a vertical position and a horizontal one back of the head

Three-Ball Match—A match in which three players compete against the other, each playing his own ball

Three-Some—A match in which one player competes against two others of a side, the two playing alternate strokes with the same ball

Through-the-Green—Conditions governing play from the time the ball is played from the tee until it reaches the green, except in hazards Through-the-green covers play both in fairway and in the rough

Toe—The outward point of the head of the club, also called nose

Top—To hit the ball above the centre, so that it does not rise much from the ground

Under-Cut—Also called "cut", same as *Back Spin*

Up—A player is said to be "one up," 'two up," etc, when he is so many holes to the good of his opponent

Upright—Referring to the lie of clubs, means that the angle between the head of the club and the shaft is less obtuse than in a flat lie

Whipping—The thread or twine used in wrapping the space where the head and shaft of the club are joined together

Wrist-Shot—A shot less in length than a half-shot, but longer than a putt (I BN, H G H, B D)

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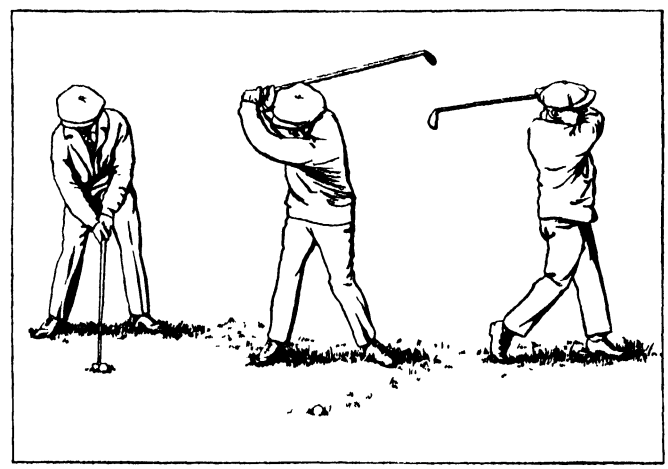
UNITED STATES

Golf first began to attract serious attention in the United States sometime during the early and middle '80s when such pioneers as Charles B MacDonald, Robert Lockhart, T A Bell and George Wright carried clubs and balls into the country The early history of golf in the United States is shrouded in a fog of doubt Out of this fog two facts seem well established One is that the first actual *bona fide* golf club, organized as such, was the St Andrews golf club of Yonkers, N Y, which in 1888 constructed and played over a six-hole course The other is that the Chicago golf club was the first to construct a full 18 hole course This club, whose course was designed and constructed by Charles B MacDonald, had 18 holes ready for play at Wheaton, Ill, in 1893 In the late '80s J Hamilton Gillespie, a young Scotchman heading a land syndicate, made a start at Sarasota, Fla, and about the same time T A Bell laid out four holes on a farm belonging to his father in what is now a part of the city of Burlington, Ia Bell claims to have been the first man to carry golf clubs into the United States The first competition which assumed the nature of a national championship was played at the Newport (R I) golf club, on Sept 3–4, 1894 It was a stroke play competition over 36 holes and was won by W G Lawrence with a total of 188 strokes, Charles B MacDonald finishing second with 189 In October of the same year a match play meeting was held at the St Andrews golf club It was won by L B Stoddart, who defeated MacDonald by one hole in the final match Before the season of 1895 opened, the U S Golf Association was formed and held the first formal championship at the Newport golf club in October of that year It was won by MacDonald, who defeated C E Sands of St. Andrews in the final match Five clubs made up the charter members of the association They were the Newport golf club, Newport, R I, the Shinnecock Hills golf club, Southampton, L I, the Country club, Brookline, Mass, St Andrews golf club and the Chicago golf club

The year 1895 also saw the first open championship as well as the first championship for women The former was held at the Newport golf club at 36 holes It was won by Horace Rawlins with a total of 173 strokes The women's championship was played at the Meadowbrook club, L I, and was won by Mrs C S Brown,



FROM MAIDEN, "TEN LESSONS IN GOLF"

FIG 8—THE FULL IRON SHOT

Note that the left heel is hardly off the turf at the top of the swing, the left foot supporting not less than half the weight (it supports more than half at the address) and continuing to grip the ground firmly Left arm is straight, hands lifted high and both exactly under the club, which must not be carried below the horizontal

who scored 132 for the 18 holes It is further noteworthy that 1895 saw a marked growth in the number of golf clubs in the country From about 40 at the beginning of the year the number had increased to more than 100 by the end

Growth of the Game.—Naturally enough, in the early days of the game its leading exponents both in administration and playing skill were men and women who had first taken to it in the British Isles. For several years players so trained were the successful competitors for championship honours both among amateurs and

professionals But by 1900 Walter J Travis, who developed his game in the United States, though an Australian by birth, succeeded in winning the amateur championship He repeated this triumph in 1901 and 1903, and since that time only once has a foreign-born player won the title, Harold H Hilton of England winning at the Apawamis club of Rye, N Y , in 1911 In professional circles, a longer period was required to develop a native-born champion The first instructors were mostly Scots with a few English, and these dominated the open championship until 1912, when John J. McDermott became the first American-born player to win the open championship

Meantime, as far back as 1904, Walter J Travis had won the British amateur championship at Sandwich, a feat which in the early days was the outstanding achievement of American golf McDermott's victory in 1912 marked another step in the general advance, and the following year another event took place entitled to rank along with the fine performance of Travis This was the victory of Francis Ouimet, a 20-year-old amateur, in the open championship. Harry Vardon and Ted Ray, famous British professionals, competed in the championship and up until quite near the finish seemed destined to make sure of the title with a tie for first place But Ouimet, a late starter, finished brilliantly to tie with the two visitors. In the play-off on the following day, under unfavourable conditions due to rain, he defeated his two competitors, scoring 72 against 77 by Vardon and 78 by Ray Travis's victory at Sandwich had provided a big stimulus to the growth of the game in 1904 and the succeeding years, but Ouimet's performance added still greater impetus, and the game took on a big expansion in all sections of the country Its growth was moving by leaps and bounds until the entry of the United States into the World War checked it temporarily But not, however, until Robert T Jones, familiarly known throughout the golfing world as "Bobby," made his first entry into big competitions.

At the age of 14 Jones entered his first amateur championship at the Merion cricket club in 1916 A preliminary qualifying test of 36 holes was played before match play was begun On the first 18 holes, he led the entire field His showing on the second round was not so flattering, but he qualified easily, and won his first two matches His opponent in the second of these was Eben M Byers, who had held the title in 1906 When beaten in the third match, he bowed to none other than Robert A Gardner, the defending champion Eight years later Jones returned to Merion to win his first amateur title A year previous, he had won the open championship at the Inwood Country club in Long Island, and had finished second in defending this title at the Oakland Hills Country club of Detroit, earlier in the summer, before his triumph at Merion He again won the amateur in 1925, and also tied for the open with Willie Macfarlane, a Scottish-born professional, but lost in the play-off, which went 36 holes, the two still being level at the end of the first 18

In 1926, Jones won the British open championship, and incidentally set up a record for the preliminary qualifying play with rounds of 66 and 68 at the Lytham and St Anne s club A few weeks later, he again won the U S open at the Scioto Country club of Columbus, O , so that for a brief period he held three national titles at the same time the British open, the U S open and the U S amateur However, he was beaten by George Von Elm in the autumn of 1926 in defending the last-named title at the Baltusrol golf club, Short Hills, N J In 1927, after regaining this, he returned to Scotland and won the British open for the second year in succession—the first time this was done since James Braid won in 1908 Incidentally his total for the 72 holes of play at St Andrews was 285, six strokes better than the second player, and six strokes better than the best previous title-winning total on the historic course At the age of 25 Jones had won the U S amateur three times, the open twice and the British open twice, and besides had been the runner-up twice in the amateur and twice in the open, a record unequalled in the annals of modern golf, considering his age and the limited time in which it was compiled

Owing to the World War there were no national championships during 1917–18, though certain other lesser championships were held. But beginning in 1919, the national events were resumed, and with this resumption came still another very extensive growth of the game and a marked advance in the level of play judged on an international basis.

Municipal Golf.—One of the most marked developments in golf in the United States has been in municipal and public courses The first of these was opened at Van Cortlandt Park, N Y , in 1895 In 1927 more than 150 cities were operating over 200 such courses, and there were half as many more proprietary courses, operated on daily fee, or pay-as-you-play, plans Figures available on about one-half of the actual public courses show that approximately 5,000,000 rounds were played on these during the year, so that, whereas, conditions under which the game was imported from Scotland and England have resulted in the costs of private club memberships, especially in the vicinity of the larger cities, becoming excessively high, some headway has been made in providing playing facilities to persons of modest means in many localities

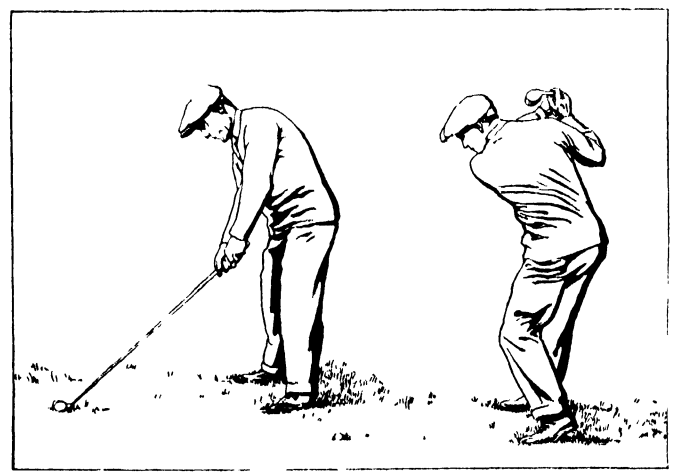
Apart from its influence on the competitive aspects of golf in an international way, the United States has contributed one very important factor to the development of the game generally—the rubber-cored ball This was the invention of Mr. Coburn Haskell, who first conceived the idea in the summer of 1898, but it was more than two years before it began to attract any considerable attention, and it was not until 1902, when Alex Herd, Scotch professional, won the British open championship, that the new ball scored its first triumph in a major championship Since that time it has become the medium of play throughout the world

(G R)

GOLFING STROKES

The Swing—General.—The swing may be of three types (1) The flat swing, in which the club, if carried back as far as possible, would strike the player across the shoulders (2) The upright swing, which would reach the back of the player's neck (3) The medium swing, between the two, and best for players of approximately normal physique The flat swing is suited to short, stout players; the upright to tall and slender ones

The Arms—For all strokes greater than the putt and chip-shot, the left arm is maintained approximately straight throughout



FROM MAIDEN, "TEN LESSONS IN GOLF"

FIG 9 —THE "MEDIUM SWING"

This is the address and top of the swing for a full wood shot The hands are held low at the address, and at the top of the swing the left heel is fairly off the turf, the right elbow is close to the side, the left arm is straight, and the toe of the club pointing toward the ground

the back swing and until after the ball has been struck Some experts ease the back swing by a slight bend in the left elbow, but the bent elbow must be straightened early in the downward stroke The right elbow is not permitted to move far away from the right side in the back swing, it travels around the body In beginning all strokes the arms should make an obtuse angle with the club-shaft; never a straight line with it

The Wrists—At the "address," or preparation to strike the ball, the wrists are above the shaft, and at the top of a full stroke

are directly beneath the shaft, so that the head of the club is pointed toward the ground. This is the "winding" action of the wrists which provides much of the power in the stroke, the wrists unwinding as the club-head approaches impact

The Swing—Details:—*Grip*—The most popular is the overlapping or Vardon grip, in which the little finger of the right hand overlaps the index finger of the left A variation interlocks these fingers In the plain grip there is no overlapping or interlocking In all grips the left thumb is against the shaft and is buried by the right palm The shaft is held by the fingers and not grasped in the palms; the golf stroke is as delicate as that in billiards The left hand should be sufficiently on top of the shaft for the first two knuckles to be seen at the address The right hand is more or less under Any of these grips will be found suited to all strokes save putting Most good players alter the putting grip so that the palms face each other and the wrist-joints are opposed, to gain the pendulum effect in the stroke



FROM "OUTDOOR SOUTH

FIG 10—UNWINDING THE WRISTS
The position of the hands is shown at this stage of the downward stroke, just before the wrists "unwind" It is this "turn-over" which imparts the lash at impact and yields most of the range in the longer shots

The Stance.—The stance, or manner in which the player's feet are disposed with relation to the ball, is of three kinds In the "open" stance the left foot is farther from the line of play than the right, so that he faces very slightly toward the objective In the "square" stance the feet are parallel with the line of play. In the "closed" stance the right foot is a few inches to the rear of the line of the left The "square" stance is best tried at the outset, and altered, if need be, as the player gets on in the game The ball normally is placed in line with the left heel or slightly inside it The distance at which to stand from the ball may be gauged by placing the club-head against the ball, the end of the shaft reaching to the left knee

Pivoting or Body-turn—The back swing is achieved properly with a liberal action of the body, the hips rotating or pivoting away from the ball, and the shoulders turning with them, as the club is taken back The left hip inaugurates both the backward and the forward motion of the club, and the principal force or "hit" in the stroke is applied only after the hips have moved toward the objective The weight is supposed to move slightly on to the right leg in the back swing and be transferred freely to the left as the stroke moves toward impact, finishing well on the left leg

Timing.—Of vital importance in the golfing stroke, this means bringing the club-head against the ball at the instant of achieving greatest velocity The club-head is not swung against the ball, but is whipped against it with a sort of lash, as if the shaft were flexible and not rigid

The Principal Strokes.—*Putting*—Putting is a game within a game, in that the stance, the grip and even the stroke may be at variance with those of all the other shots A sound and conservative method places the ball opposite the left foot, the weight inclining to that leg, the hands so placed on the club as to bring the wrist-joints in precise opposition, the club taken back with the left hand and brought on the ball with the right.

The Chip-shot—This tiny stroke, played with a lofted club from just off the putting surface, ordinarily is executed from the usual stance but with the feet closer together, as little power is required The wrists are firm and the hands are swung decisively, the ball being struck crisply in the back with sufficient force to carry it over intervening grass or hazards to the closely clipped putting surface, where it finishes with a relatively long roll

The Pitch—There are two main types of pitch shot Normally, the ball is played nearly opposite the left heel, with the mashie, mashie-niblick, spade or niblick, the natural loft of the club producing the high trajectory or "pitch" When it is required to stop the ball promptly on touching the turf, backspin or reverse English is applied by playing the ball on a line midway between the feet or even back toward the right, the stroke thus being more downward, as the chop-stroke in tennis In all pitch shots and in iron play the "divot" or chip of turf is taken after the ball has left the club's face, from a location immediately in front of where the ball rested

Iron Play—There are two leading divisions in iron play. In one, the ball is placed just back of the line of the left heel and is struck quite fairly in the back just before the club-head has reached the lowest point in its arc This permits considerable roll at the end of the shot, and when it is necessary to achieve a more sudden stop the ball is played farther back toward the line of the right foot, a more downward stroke is employed, and the backspin thus applied results in a lower flight and a shorter roll. This sometimes is called the "push shot"

Wood Club Play—With the wood clubs the player stands farther from his ball, since the clubs are longer, and should find the normal position of the ball about opposite his left heel The swing with the wood club is more free than with the irons, but it is best not to permit the club at the top of the swing to drop below the horizontal A straight left arm tends to check the back swing within reasonable limits More emphatically than with the irons or pitching clubs, the ball is struck with the woods fairly in the back

Bunker and Rough—The "explosion shot" from sand is accomplished with the niblick, the blade being sent full force into the sand about an inch behind the ball, which literally is blasted upward and forward without the club touching it This is the usual recovery from a bunker near the green, though if the ball be lying on top of the sand it may be chipped or pitched In the rough, or heavy grass, the general method is to strike the ball with an ascending club-head, so as to extricate it from the clinging obstruction with as little opposition as possible (O B K)

GOLGOTHA, a skull, from the Aramaic *Gulgulta* (גולגולתא Targ Onqelos of Ex xvi 16, with the second "l" omitted for euphony to Greek ears) The name of the spot where Christ was crucified (Matt xxvii 33, Mk xv 22, John xix 17), outside Jerusalem Perhaps so called from a knoll on the north of the city, not far from the Damascus gate, which now resembles a skull, cavities in its face forming eyes, nose, and mouth, if we may assume that the form of this has not changed since those days But this is very doubtful, *see* F L N Bower in *Ch Qu Review* xci (1920) p 125 *See* further *Dict of Christ and the Gospels, s v* (A L W)

GOLIAD, an incorporated village of south-eastern Texas, on the San Antonio river and the Southern Pacific railway, 85m. S E of San Antonio, the county seat of Goliad county. The population in 1928 was about 1 500 Goliad is surrounded by a rich farming and grazing country The interesting Spanish mission of La Bahia, moved here in 1747 from the Guadaloupe river, is still in a good state of preservation The name Goliad, in use since 1829, is probably an anagram of the name of the Mexican patriot Hidalgo (1757–1811) During the struggle between Mexico and Spain the Mexican leader Bernardo Gutierrez was besieged here On the outbreak of the Texan War of Liberation Goliad was garrisoned by a small force of Mexicans, who were soon forced to surrender, and on Dec 20, 1835, a preliminary "declaration of independence" was published here In 1836, when Santa Anna began his advance, Goliad was occupied by 350 American troops under Col James W Fannin In obeying orders to withdraw and join Gen Houston, they were overtaken on Coletto Creek, and after a sharp fight (March 19–20) were obliged to surrender, whereupon they were marched back to Goliad, and were shot down (March 27) by Santa Anna's command

GOLIARD, a name applied to those wandering students (*vagantes*) and clerks in England, France and Germany, during the 12th and 13th centuries, who were better known for their rioting, gambling and intemperance than for their scholarship. The derivation of the word is uncertain, but it was connected by them with a mythical "Bishop Golias," also called *"archipoeta"*

and *"primas"*—especially in Germany—in whose name their satirical poems were mostly written. The jocular references to the rules of the "gild" of goliards should not be taken too seriously, though their aping of the "orders" of the Church, especially their contrasting them with the mendicants, was denounced by Church synods Their satires were almost uniformly directed against the Church, attacking even the pope. In 1227 the Council of Trèves forbade priests to permit the goliards to take part in chanting the service In 1229 they played a conspicuous part in the disturbances at the University of Paris, in connection with the intrigues of the papal legate During the century which followed they formed a subject for the deliberations of several Church councils, notably in 1289, when it was ordered that "no clerks shall be jongleurs, goliards or buffoons," and in 1300 (at Cologne) when they were forbidden to preach or engage in the indulgence traffic This legislation only became effective when the "privileges of clergy" were withdrawn from the goliards

Along with their satires went many poems in praise of wine and riotous living A remarkable collection of them, now at Munich, from the monastery at Benedictbeuren in Bavaria, was published by Schmeller (3rd ed , 1895) under the title *Carmina Burana* Many of these, which form the main part of song-books of German students to-day, have been delicately translated by John Addington Symonds in a small volume, *Wine, Women and Song* (1884)

The word "goliard" itself outlived these turbulent bands which had given it birth, and passed over into French and English literature of the 14th century in the general meaning of jongleur or minstrel, quite apart from any clerical association It is thus used in *Piers Plowman,* where, however, the *goliard* still rhymes in Latin, and in Chaucer

See O Hubatsch, *Die lateinischen Vagantenlieder des Mittelalters* (Gorlitz, 1870), B Spiegel, *Die Vaganten und ihr Orden* (Spires, 1892), M Haeczner, *Goliardendichtung und die Satire im 13ten Jahrhundert in England* (Leipzig, 1905); the article in *La grande Encyclopédie,* Helen Waddell, *The Wandering Scholars* (1927); also K Breul, *The Cambridge Songs* (1915)

GOLIATH, the name of the giant by slaying whom David achieved renown (1 Sam xvii) The Philistines had come up to make war against Saul and this warrior came forth day by day to challenge to single combat Only David ventured to respond, and armed with a sling and pebbles he overcame Goliath The Philistines, seeing their champion killed, lost heart and were easily put to flight The giant's arms were placed in the sanctuary, and it was his famous sword which David took with him in his flight from Saul (1 Sam xxi 1–9) From another passage we learn that Goliath of Gath was slain by a certain Elhanan of Bethlehem in one of David's conflicts with the Philistines (2 Sam xxi 18–22)—the parallel 1 Chron xx 5, avoids the contradiction by reading the "brother of Goliath " But this old popular story has probably preserved the more original tradition, and if Elhanan is the son of Dodo in the list of David's mighty men (2 Sam xxiii 9, 24) the resemblance between the two names may have led to the transference

GOLITSUIN, BORIS ALEKSYEEVICH (1654–1714), Russian statesman, came of a princely family, claiming descent from Prince Gedymin of Lithuania Boris became court chamberlain in 1676 He was the young tsar Peter's chief supporter when, in 1689, Peter resisted the usurpations of his sister Sophia, and the head of the loyal council which took refuge in the Troitsa monastery and won over the boyars of the opposite party In 1690 he was created a boyar and shared with Naruishkin, Peter's uncle, the conduct of home affairs After the death of the tsaritsa Natalia, Peter's mother, in 1694, his influence increased further He accompanied Peter to the White Sea (1694–95), took part in the Azov campaign (1695); and was one of the triumvirate who ruled Russia during Peter's first foreign tour (1697–98) The Astrakhan rebellion (1706), which affected all the districts under his Government, shook Peter's confidence in him, and seriously impaired his position. In 1707 he was superseded in the Volgan provinces by Andrei Matvyeev, and in 1713 entered a monastery He was a typical representative of Russian society of the end of the 17th century in its transition from barbarism to civilization. In many respects he was far in advance of his age. He was highly educated, spoke Latin fluently, frequented the society of scholars and had his children carefully educated. Yet he was an habitual drunkard, it was his drunkenness which ruined him in the estimation of Peter the Great, despite his previous services.

See S Soloviev, *History of Russia* (Rus), vol xiv (Moscow, 1858); R. N Bain, *The First Romanovs* (1905).

GOLITSUIN, DMITRY MIKHAILOVICH (1665–1737), Russian statesman, was sent in 1697 to Italy to learn "military affairs", in 1704 he was appointed to the command of an auxiliary corps in Poland against Charles XII ; from 1711 to 1718 he was governor of Byelogorod In 1718 he was appointed president of the newly erected *Kammer Kollegium* and a senator In May 1723 he was implicated in the disgrace of the vice-chancellor Shafirov and was deprived of all his offices and dignities, which he only recovered through the mediation of the empress Catherine I Golitsuin remained in the background till the fall of Menshikov, 1727 During the last years of Peter II (1728–30) his high aristocratic theories had full play On the death of Peter II. he conceived the idea of limiting the autocracy by subordinating it to the authority of the supreme privy council, of which he was president He drew up a form of constitution which the empress Anne was forced to sign at Mittau before leaving for St. Petersburg Anne lost no time in repudiating this constitution, and never forgave its authors Golitsuin lived in retirement till 1736, when he was arrested on suspicion of being concerned in the conspiracy of his son-in-law Prince Constantine Cantimir He was really prosecuted for his anti-monarchical sentiments A court, largely composed of his antagonists, condemned him to death, but the empress commuted the sentence to lifelong imprisonment in Schlusselburg and confiscation of all his estates He died in prison on April 14, 1737, after three months of confinement

See R. N Bain, *The Pupils of Peter the Great* (1897).

GOLITSUIN, VASILY VASILEVICH (1643–1714), Russian statesman, spent his early days at the court of Tsar Alexius where he gradually rose to the rank of boyar In 1676 he was sent to the Ukraine to keep in order the Crimean Tatars and took part in the Chigirin campaign The revolution of May 1682 placed Golitsuin at the head of the *Posolsky Prikaz,* or Ministry of Foreign Affairs, and during the regency of Sophia, sister of Peter the Great, whose lover he became, he was the principal minister of State (1682–1689) and "keeper of the great seal " His foreign policy was distinguished by the peace with Poland in 1683, whereby Russia recovered Kiev By the terms of the same treaty, he acceded to the grand league against the Porte, but his two expeditions against the Crimea (1687 and 1689), "the First Crimean War," were unsuccessful and made him extremely unpopular In the civil war between Sophia and Peter (Aug –Sept 1689), Golitsuin half-heartedly supported his mistress, and shared her ruin He was banished successively to Kargopol, Mezen and Kologora, where he died on Apr 21, 1714 Golitsuin was unusually well educated He understood German and Greek, and could express himself fluently in Latin He was a great friend of foreigners, who generally alluded to him as "the great Golitsuin "

See R N Bain, *The First Romanovs* (1905), A Brückner, *Furst Golizin* (Leipzig, 1887), S Soloveiv, *History of Russia* (Rus), vols. xiii–xiv (Moscow, 1858, etc).

GOLITZIN, BORIS BORISOVICH, Prince (1862–1916), Russian physicist, was born on Feb 18 (old style) 1862 in St Petersburg (Leningrad) He was educated in the naval school and naval academy In 1887 he left the active service for scientific studies and went to Strassburg In 1891 he was appointed *privat-docent* at the University of Moscow and in 1893 professor of physics at Dorpat The same year he was elected fellow of the Academy of Sciences in St Petersburg and in 1908 a member of the same His early research was in spectroscopy, but his world-known work is on the methods of earthquake observations and on the contruction of seismographs, which are used in all Russian and in many foreign observatories His valuable book, *Lectures*

on Seismometry, was published in 1912 and translated into German in 1914 He received the degree of D Sc. from the University of Manchester in 1910. In 1911 he was elected president of the International Seismological association In 1913 he was appointed director of the Central Physical (now Geophysical) observatory at St. Petersburg and achieved good results in the organization of the meteorological service throughout Russia, especially during the World War, but his work was cut short by his death from pneumonia on May 4, 1916, at New Peterhof, near St. Petersburg (A. Foe)

GOLIUS or GOHL, JACOBUS (1596–1667), Dutch orientalist, born at The Hague, studied at the University of Leyden, where in Arabic and other Eastern languages he was a pupil of Erpenius. In 1622 he accompanied the Dutch embassy to Morocco, and on his return he was chosen to succeed Erpenius (1624) He then spent five years travelling in Syria and Arabia The remainder of his life was spent at Leyden where he held the chair of mathematics as well as that of Arabic He died on Sept 28, 1667. His most important work is the *Lexicon Arabico-Latinum* (Leyden, 1653), which, based on the *Sihah* of Al-Jauhari, was only superseded by the corresponding work of Freytag In 1656 he published a new edition, with considerable additions, of the *Grammatica Arabica* of Erpenius After his death, there was found among his papers a *Dictionarium Persico-Latinum* which was published, with additions, by Edmund Castell in his *Lexicon heptaglotton* (1669).

GOLLANCZ, SIR HERMANN (1852–), Jewish rabbi, son of the Rev S M Gollancz, studied at University college, London He became an authority on the Hebrew language and literature, and in 1897 the Chief Rabbis in Galicia conferred on him the highest Rabbinical diplomas, "Hatarath Horaah" He was for 21 years Goldsmid professor of Hebrew at University college, and presented his library to the college at the end of this period (1902–24) From 1892 to 1923 he was preacher at the Bayswater synagogue, and was then appointed emeritus minister for his record service of 51 years In that year he received a knighthood He interested himself in many philanthropic works, and founded several synagogues for the working classes He was a member of the royal commission on the birth-rate (1913–16), and other Government inquiries

His publications include many translations from Hebrew and Aramaic and articles contributed to learned reviews

GOLLANCZ, SIR ISRAEL (1864–), British scholar, was born in London of a Jewish family on July 13, 1864 He was educated at the City of London school and at University college, London and Christ's college, Cambridge From 1892 to 1895 he was Quain student and lecturer in English at University college, London and in 1896 was appointed university lecturer in English at Cambridge, becoming in 1906 university professor of English language and literature at King's college, London He became secretary of the British Academy on its foundation in 1903 and was knighted in 1919 He was general editor of the *Temple Classics* and *King's Library* series and of the *Book of Homage to Shakespeare* which appeared in 1916 His published works include *Cynewulf's Christ* (1892), an edition of C Lamb's *Specimens of Elizabethan Dramatists* (1893), *Exeter Book of Anglo-Saxon Poetry* (1895); *Hamlet in Iceland* (1898), and *The Caedmon Manuscript of Anglo-Saxon Biblical Poetry* (1927)

GOLLNOW, a town in the Prussian province of Pomerania, on the right bank of the Ihna, 14 m N N E of Stettin, with which it has communication by rail and steamer Pop (1925) 11,589 Gollnow was founded in 1190, and was raised to the rank of a town in 1268 It was for a time a Hanse town, and came into the possession of Prussia in 1720, having belonged to Sweden since 1648. It manufactures chairs and cement.

GOLOVIN, FEDOR ALEKSYEEVICH, Count (d 1706), Russian statesman During the regency of Sophia, sister of Peter the Great, he was sent to the Amur to defend the new Muscovite fortress of Albazin against the Chinese In 1689 he concluded with the Celestial empire the Treaty of Nerchinsk, by which the line of the Amur, as far as its tributary the Gorbitsa, was retroceded to China In Peter's grand embassy to the West in 1697 Golovin occupied the second place immediately after Lefort. It was his chief duty to hire foreign sailors and obtain everything necessary for the construction and complete equipment of a fleet. On Lefort's death, in March 1699, he succeeded him as admiral-general The same year he was created the first Russian count, and was also the first to be decorated with the newly-instituted Russian order of St. Andrew The conduct of foreign affairs was at the same time entrusted to him, and from 1699 to his death he was "the premier minister of the tsar" Golovin supplemented the Treaty of Carlowitz, by which peace with Turkey had only been secured for three years, by concluding with the Porte a new treaty at Constantinople (June 13, 1700), by which the term of the peace was extended to 30 years and, besides other concessions, the Azov district and a strip of territory extending thence to Kuban were ceded to Russia

See R. N Bain, *The First Romanovs* (1905) (R N. B.)

GOLOVKIN, GAVRIIL IVANOVICH, Count (1660–1734), Russian statesman, was attached (1677), while still a lad, to the court of the tsarevitch Peter, afterwards Peter the Great, with whose mother Natalia he was connected, and vigilantly guarded him during the regency of Sophia He accompanied the young tsar abroad on his first foreign tour, and worked by his side in the dockyards of Saardam In 1706 he took over the direction of foreign affairs, and was created the first Russian grand-chancellor on the field of Poltava (1709) Golovkin held this office for 25 years Under Catherine I he became a member of the supreme privy council, the empress also entrusted him with her last will whereby she appointed the young Peter II her successor and Golovkin one of his guardians. On the death of Peter II in 1730 he declared in favour of Anne, duchess of Courland, in opposition to the aristocratic Dolgorukis and Golitsuins, and his determined support of the autocracy wrecked the proposed constitution, which would have converted Russia into a limited monarchy Under Anne he was a member of the first cabinet formed in Russia He was one of the wealthiest, and at the same time one of the stingiest, magnates of his day His ignorance of any language but his own made his intercourse with foreign ministers very inconvenient

See R N Bain, *The Pupils of Peter the Great* (1897)

GOLOVNÏN, VASILY MIKHAILOVICH (1776–1831), Russian vice-admiral, born on April 8 (new style April 20), 1776 in the province of Ryazan, received his education at the Cronstadt naval school and from 1801 to 1806 served as a volunteer in the English navy In 1807 he was commissioned by the Russian Government to survey the coasts of Kamchatka and of Russian America, including also the Kurile islands Golovnin sailed round the Cape of Good Hope, and on Oct 5, 1809, arrived in Kamchatka In 1810, whilst attempting to survey the coast of the island of Kunashiri, he was seized by the Japanese, and was kept prisoner until Oct 13, 1813 Golovnin was presently appointed to the command of a voyage of circumnavigation He started from St Petersburg on Sept. 7, 1817, sailed round Cape Horn, and arrived in Kamchatka in the following May He returned to Europe by way of the Cape of Good Hope, landing at St Petersburg on Sept 17, 1819 He died on July 12, 1831 Golovnin's works include *Journey to Kamchatka* (2 vols, 1819), *Journey Round the World* (2 vols, 1822), and *Narrative of my Captivity in Japan, 1811–1813* (2 vols, 1816) The last has been translated into French, German and English (1824)

A complete edition of his works was published at St Petersburg in five volumes in 1864, with maps and charts, and a biography of the author by N Grech.

GOLTZ, BOGUMIL (1801–1870), German humorist and satirist, was born at Warsaw on March 20, 1801, and died at Thorn on Nov 12, 1870 Goltz wrote *Buch der Kindheit* (Frankfort, 1847, 4th ed, Berlin, 1877), in which he gives a charming and idyllic description of the impressions of his own childhood Among his other works must be noted *Ein Jugendleben* (1852); *Der Mensch und die Leute* (1858), *Zur Charakteristik und Naturgeschichte der Frauen* (1859), *Zur Geschichte und Charakteristik des deutschen Genius* (1864), and *Die Weltklugheit und die Lebensweisheit* (1869) Goltz was a follower, in some respects,

of Rousseau He desired to see a freer, more natural system of education which should develop a robuster type of manhood.

See T. Kuttenkeuler, *Bogumil Goltz . . .* (1913).

GOLTZ, COLMAR, FREIHERR VON DER (1843–1916), Prussian soldier and military writer, was born at Bielkenfeld, East Prussia, on Aug. 12, 1843, and entered the Prussian infantry in 1861 In 1864 he entered the Berlin military academy, but was temporarily withdrawn in 1866 to serve in the Austrian war, in which he was wounded at Trautenau In 1867 he joined the topographical section of the general staff, and at the beginning of the Franco-German War of 1870–71 was attached to the staff of Prince Frederick Charles He took part in the battles of Vionville and Gravelotte and in the siege of Metz After its fall he served under the Red Prince in the campaign of the Loire, including the battles of Orleans and Le Mans He was appointed in 1871 professor at the military school at Potsdam, and the same year was promoted captain and placed in the historical section of the general staff He then wrote *Die Operationen der II Armee bis zur Capitulation von Metz* and *Die Sieben Tage von Le Mans,* both published in 1873 In 1874 he was appointed to the staff of the 6th division, and while so employed wrote *Die Operationen der II Armee an der Loire* and *Léon Gambetta und seine Armeen,* published in 1875 and 1877 respectively Both are impartially written, and the latter was translated into French the same year The views expressed in it led to his being sent back to regimental duty for a time, but he soon returned to the military history section In 1878 von der Goltz was appointed lecturer in military history at the military academy at Berlin, where he remained for five years and attained the rank of major He published, in 1883, *Rossbach und Jena* (new and revised ed., *Von Rossbach bis Jena und Auerstadt,* 1906), *Das Volk in Waffen* (Eng trans *The Nation in Arms*), both of which quickly became military classics, and during his residence in Berlin contributed many articles to the military journals In June 1883 his services were lent to Turkey to reorganize the military establishments of the country He spent 12 years in this work, the result of which appeared in the Greco-Turkish War of 1897, and he was made a pasha and in 1895 a *mushir* or field-marshal On his return to Germany in 1896 he became a lieutenant-general and commander of the 5th division, and in 1898, head of the Engineer and Pioneer Corps and inspector-general of fortifications In 1900 he was made general of infantry and in 1902 commander of the I Army Corps In 1907 he was made inspector-general of the newly created sixth army inspection at Berlin, in 1908 colonel-general, and in 1911 field-marshal He retired in 1913

In Aug 1914 he was appointed governor-general of Belgium, then occupied by German forces In November of the same year he was attached to the Turkish headquarters as aide-de-camp-general to the Sultan In April 1915 he was placed in the chief command of the I Turkish army in Mesopotamia, and succeeded in investing General Townshend's British forces at Kūt-el-Amāra in Dec 1915 He died on April 19, 1916, at Baghdād and was said to have been poisoned by the Young Turks His latest work was *Kriegsgeschichte Deutschlands im 19ten Jahrhundert* (2 vol., 1910–14)

In addition to the works already named and frequent contributions to military periodical literature, he wrote *Kriegführung* (1895, later ed *Krieg- und Heerführung,* 1901, Eng trans *The Conduct of War*), *Der thessalische Krieg* (1898), *Ein Ausflug nach Macedonien* (1894), *Anatolische Ausfluge* (1896), a map and description of the environs of Constantinople, *Von Jena bis Pr Eylau* (1907), a most important historical work, carrying on the story of *Rossbach und Jena* to the peace of Tilsit, etc

See v Schmiterlow, *Gen.-Feldm. Freiherr Colmar von der Goltz Pasha, Leben und Briefe* (1926)

GOLTZ, RÜDIGER, COUNT VON DER (1865–), German lieutenant-general, was born at Zullichau on June 28, 1864 He commanded a division of the *Landwehr* at the battle of the Masurian Lakes in Feb 1915 In the spring of 1918 he led the Baltic Division into Finland and was appointed chief-in-command in the Baltic countries in Nov 1918 In 1919 he was leading a volunteer army professedly against the Bolshevists, but he was suspected of scheming to use his Baltic volunteers as an instrument for the royalist and reactionary movement and his recall was demanded Sections of these troops (*Das Baltikum*) actually took part in the military occupation of Berlin which attended the Kapp *coup* in March 1920, and were with difficulty disbanded He then took part in the youth movement, and in 1924 became president of the United Patriotic Associations Count von der Goltz wrote *Meine Sendung in Finnland und im Baltikum* (1920)

GOLTZIUS, HENDRIK (1558–1617), Dutch painter and engraver, was born in 1558 at Mulebrecht, in the duchy of Julich. After studying painting on glass for some years under his father, he was taught the use of the burin by Dirk Volkertsz Coornlert, a Dutch engraver He was employed by Philip Galle to engrave a set of prints of the history of Lucretia Marriage with a rich widow at the age of 21 enabled him to set up in independent business at Haarlem, where he spent the rest of his life, except for a tour in Germany and Italy in 1590 He died at Haarlem on Jan 1, 1617

His portraits, mostly miniatures, are masterpieces of their kind, both on account of their exquisite finish, and as fine studies of individual character Of his larger heads, the life-size portrait of himself is probably the most striking example Six scenes from the life of the Virgin are called his "master-pieces," from their being attempts to imitate the style of the old masters In his command of the burin Goltzius is not surpassed even by Durer, his eccentricities and extravagances are counterbalanced by the beauty and freedom of his execution He began painting at the age of 42, but none of his works in this branch of art display any special excellences

His prints amount to more than 300 plates, and are fully described in Bartsch's *Peintre-graveur,* and Weigel's supplement to the same work *See* Karel van Mander, *Schilderboeck* (1604).

GOLUCHOWSKI, the name of an ancient family of Polish aristocracy, two members of which played an important part in Austrian politics Count AGENOR GOLUCHOWSKI, the elder (1812–75), studied at Lemberg, served in the Galician *Statthalterei* under Stadion, and did excellent work on the Galician agrarian reform of 1847 In Nov 1848 he became a member of Schwarzenberg's cabinet and was governor of Galicia, 1848–59, 1866–68 and 1871–75 From 1859–61 he was Austrian minister of the interior, during which period he secured for Galicia a degree of autonomy not enjoyed by any other Austrian crownland, while as governor of Galicia he secured the introduction of Polish as official language He was the principal author of the federalist "October Diploma" of 1860 (*see* AUSTRIA) An excellent administrator, Goluchowski transformed the policy of the Austrian Poles from romantic revolutionism to their eminently successful later policy of co-operation with the Austrian Government in return for national concessions in Galicia, and was thus one of the true forerunners of Polish independence

His son AGENOR GOLUCHOWSKI, the younger (1849–1921) was born on March 25, 1849, entered the Austro-Hungarian diplomatic service, served in Berlin, Paris and Budapest (1887–93) and became Austro-Hungarian minister of foreign affairs in May 1895 The appointment caused surprise, but Goluchowski enjoyed Francis Joseph's personal confidence, and his policy was peaceable and practical, and generally conducted with an eye on economic necessities In particular he showed a conciliatory spirit towards Russia for which he was often blamed by more bellicose spirits He was author of the Austro-Russian agreement of 1897, which temporarily ended the two Powers' rivalry in the Balkans and of the Macedonian reform plans of 1902 and 1903 (Murzsteg programme) At the same time, he contrived to pacify Italy's fears by guaranteeing the *status quo* (1898) and stood loyally by the German alliance It was to Goluchowski that the German emperor William II addressed the famous telegram after Algeciras, saying that he had proved a "brilliant second" and could rely on the Imperial gratitude—a promise redeemed to Goluchowski's more aggressive successor, Aerenthal, in 1908 As a Pole and a Slav, Goluchowski was unpopular with the Magyars who believed him to be inspiring Francis Joseph's opposition to the use of Magyar in the army He resigned office on Oct. 11, 1906, to

ease the crisis in Hungary and did not return to office He died in Lemberg on March 29, 1921. (C A M)

GOMAL or GUMAL, the name of a river of Afghanistan, and of a mountain pass on the Dera Ismail Khan border of the North West Frontier Province of British India The Gomal river rises in the unexplored regions to the south-east of Ghazni and runs to the Indus Its chief tributary is the Zhob Within British territory the Gomal bounds the North West Frontier Province and Baluchistan, and more or less the Pathan and Baluch races The Gomal pass is the most important pass on the Indian frontier between the Khyber and the Bolan It connects Dera Ismail Khan with the Gomal valley in Afghanistan, and has formed for centuries the outlet for the *povindah* trade In 1889 the Government of India decided that the Zhob valley should, like the Bori valley, be brought under British protection and control, and the Gomal pass should be opened After the Waziristan expedition of 1894 Wana was occupied by British troops in order to dominate the Gomal and Waziristan, but on the formation of the North West Frontier Province in 1901 it was occupied by the South Waziristan militia

Since the Waziri rising during the third Afghan War in 1919 Wana has been abandoned, but the Gomal route is still protected

GOMARUS, FRANZ (1563–1641), Dutch theologian, was born at Bruges on Jan 30, 1563 He studied at Strasbourg, Neustadt, Oxford and Cambridge He was pastor of a Reformed Dutch church in Frankfort from 1587 till 1593, when the congregation was dispersed by persecution From 1594 to 1611 he was professor of theology at Leiden There he became the leader of the opponents of Arminius, who from that circumstance came to be known as Gomarists He disputed with Arminius before the assembly of the estates of Holland in 1608, and was one of five Gomarists who met five Arminians or Remonstrants in the same assembly of 1609 On the death of Arminius, Konrad Vorstius (1559–1622), who sympathized with his views, was appointed to succeed him, and Gomarus left Leiden for Middleburg, where he became preacher at the Reformed church, and taught theology and Hebrew in the newly founded *Illustre Schule* Later he was professor at Saumur, then at Groningen, where he died on Jan 11, 1641 He took a leading part in the synod of Dort (1618) His works were collected and published in one volume folio, in Amsterdam in 1645 He was succeeded at Groningen in 1643 by his pupil Samuel Maresius (1599–1673)

GOMEL (Homel), town in White Russian S S R , lat 52° 25′ N , long 31° 0′ E , on the Sozh river, a tributary of the Dnieper Pop (1926) 82,952 It is situated on the great north road from Kiev, and is an important railway junction from which five lines radiate, one linking westward with Warsaw It also has steamer routes to Kiev and Mogilev Its industries include iron founding, the making of agricultural machinery, saw-milling, the preparation of bristles, brewing and confectionery It is situated in a forest and marsh-dotted county of the same name, drained by numerous tributaries of the Dnieper Its western position gives it a less extreme climate, average January temperature −6 5° C, average July temperature 18 5° C The rivers are frozen for 130 to 140 days

The town is first mentioned in 1142, when it belonged to the Prince of Chernigov It was alternately in the occupation of Poland and Russia until 1772, when it was finally annexed by Russia In 1648 it was captured by the Cossack chieftain Bogdan Chmielnicki (*q v*)

GOMER, in the table of nations, Gen x , the eldest "son" of Japheth, and in Ezek xxxviii 6 a part of Gog's army, represents the people known to the Greeks as Cimmerians, and in the cuneiform inscriptions called Gi-mi-ra-a-a Their earliest known home is the district north of the Black Sea They appeared on the Assyrian horizon first in the reign of Sargon, when they overthrew the kingdom of Urartu and settled there About 700 B C they migrated into Asia Minor, subduing the kingdom of Phrygia under Midas, and that of Lydia under Gyges.

GOMER, wife of Hosea *See* HOSEA

GOMERA, an island forming part of the Spanish archipelago of the Canary islands (*q v*) Pop (1920) 22,870, area, 144 sq m Gomera lies 20 m W S W of Teneriffe Its greatest length is about 23 m Dromedaries are bred on Gomera in large numbers San Sebastian (4,833) is the chief town and a port It was visited by Columbus on his first voyage of discovery in 1492

GOMES, MANUEL TEIXEIRA (1862–), Portuguese politician, was born at Portimão, in the province of Algarve, in 1862, and educated at the University of Coimbra From 1910–23 he was Portuguese minister to Great Britain, and in 1923 he became president of the Portuguese republic This office he resigned on Dec 10, 1925, on grounds of health, being succeeded by Dr. Bernadino Machado

GOMEZ, DIOGO (*fl* 1440–1482), Portuguese explorer and writer, is known to have been receiver of the royal customs in 1440 Sixteen years later, Prince Henry the Navigator sent him in command of three vessels along the west African coast with the commission to explore and to reach the Indies Strong currents beyond the Rio Grande obliged Gomez to put back to the Gambia, which he ascended to the negro town of "Cantor," where he established profitable commercial relations with negro chiefs In 1462 another African voyage resulted in a fresh discovery of the Cape Verde islands, already found by Cadamosto (*q v*). Four years later Gomez was appointed judge at Cintra

His chronicle, which deals with the life and exploring ventures of Prince Henry and gives an elaborate account of negro life and trade along the Gambia, exists only in one ms , viz , *Cod Hisp* 27 in the Staats-Bibliothek, Munich The original Latin text was printed by Schmeller, "Über Valentim Fernandez Alemão," in the *Abhandlungen der philosoph -philolog Kl der bayerisch Akademie der Wissenschaften,* vol iv (Munich, 1847) *see* also J Mees, *Histoire de la decouverte des iles Açores* (Ghent, 1901) , R H Major, *Life of Prince Henry the Navigator* (1868) , C R Beazley, *Prince Henry the Navigator* (1895) and Introduction to Azurara's *Discovery and Conquest of Guinea* (1899)

GOMM, SIR WILLIAM MAYNARD (1784–1875), British soldier, was gazetted to the 9th Foot at the age of ten, in recognition of the services of his father, Lieut -Colonel William Gomm, who was killed in the attack on Guadaloupe (1794) He joined his regiment in 1799, and fought in Holland under the duke of York, and subsequently was with Pulteney's Ferrol expedition On the general staff he was with Cathcart at Copenhagen, with Wellington in the Peninsula, and on Moore's staff at Corunna He was also on Chatham's staff in the disastrous Walcheren expedition of 1809 In 1810 he rejoined the Peninsular army as Leith's staff officer, and took part in all the battles of 1810, 1811 and 1812, winning his majority after Fuentes d'Onor and his lieutenant-colonelcy at Salamanca His careful reconnaissances and skilful leading were invaluable to Wellington in the Vittoria campaign, and to the end of the war he was one of the most trusted men of his staff His reward was a transfer to the Coldstream Guards and the K C B In the Waterloo campaign he served on the staff of the 5th British Division From 1839 to 1842 he commanded the troops in Jamaica He was sent out to be commander-in-chief in India in 1846, arriving only to find that his appointment had been cancelled in favour of Sir Charles Napier, whom, however, he eventually succeeded (1850–55) In 1854 he became general and in 1868 field marshal In 1872 he was appointed constable of the Tower, and he died in 1875 Five "Field Marshal Gomm" scholarships were afterwards founded in his memory at Keble college, Oxford

See his *Letters and Journals* (ed F C Carr-Gomm, 1881)

GOMME, SIR GEORGE LAURENCE (1853–1916), knighted 1911, English archaeologist, was born in London on Dec 17, 1853, and educated at the City of London school As a boy he entered the service of the Metropolitan Board of Works, but in 1891 he was appointed statistical officer to the London County Council, becoming in 1900 clerk to the council Few men have possessed a more profound knowledge of the past and present history of London, and his book *The Making of London* (1912) is a classic on the subject He died at Long Crendon, Bucks , on Feb 25, 1916

GOMPERS, SAMUEL (1850–1924), American labour leader, was born in London on Jan 27, 1850 He emigrated to New York in 1863 and became a prominent member of the Cigar-

makers' International Union, which he represented at the conventions of the American Federation of Labor, of which he became president in 1882 He served intermittently in this capacity until 1894, when the opposition of the Socialists secured his defeat, he was re-elected in the following year and thereafter was re-elected every year till his death. His power within the organization increased yearly and he was largely responsible not only for its victory over the Knights of Labor but also for the general adoption of the "craft" principle in U S trade unionism In 1894 he became editor of the Federation's organ, *The American Federationist,* and in 1907 was sentenced to 12 months' imprisonment for contempt of court in disobeying an injunction prohibiting *The Federationist* from blacklisting the Buck Stove and Range Co of St Louis, a sentence eventually set aside by the U S Supreme Court Although in theory opposed to all war, after the outbreak of the World War he resisted any pacifist tendency in the trade unions He was appointed a member of the advisory commission of the U S Council of National Defence in 1917 Gompers represented the American Federation of Labor at the Peace Conference in Paris 1918–19, and was appointed chairman of the Peace Conference Commission on Labour Legislation He was also actively concerned in the organization of the Pan-American Federation of Labor, and was largely responsible for the decision of the A F to hold aloof from the International Federation of Trade Unions, 1919 He consistently opposed socialistic movements among the unions, fought the I W W. and chartered craft unions (as opposed to industrial unions) wherever possible. He opposed compulsory arbitration in labour disputes For many years he was the most prominent figure in U S labour and had a worldwide reputation as a conservative labour leader This policy excited the bitterest opposition in certain circles, but it cannot be denied that he was the most powerful influence in American trade unionism. He died at San Antonio, Texas, on Dec. 13, 1924

See J. R. Commons and others, *History of Labour in the United States* (1918), and Samuel Gompers, *Seventy Years of Life and Labour* (1925).

GOMPERZ, THEODOR (1832–1912), German philosopher and classical scholar, was born at Brunn on March 29, 1832 He studied at Brunn and at Vienna under Herman Bonitz He became professor of classical philology in 1873. In 1882 he was elected a member of the Academy of Science He received the D Ph *honoris causa* from Konigsberg, and the D Litt from Dublin and Cambridge, and became correspondent for several learned societies He died Aug 29, 1912, at Baden, Austria

His principal works are. *Demosthenes der Staatsmann* (1864), *Philodemi de ira liber* (1864), *Traumdeutung und Zauberei* (1866), *Herkulanische Studien* (1865–1866), *Beitrage zur Kritik und Erklarung griech Schriftsteller* (7 vols, 1875–1900), *Neue Bruchstucke Epikurs* (1876), *Die Bruchstucke der griech Tragiker und Cobets neueste kritische Manier* (1878), *Herodoteische Studien* (1883), *Ein bisher unbekanntes griech. Schriftsystem* (1884), *Zu Philodems Buchern von der Musik* (1885), *Über den Abschluss des herodoteischen Geschichtswerkes* (1886), *Platonische Aufsatze* (3 vols, 1887–1905), *Zu Heraklits Lehre und den Uberresten seines Werkes* (1887), *Zu Aristoteles' Poetik* (2 parts, 1888–96), *Über die Charaktere Theophrasts* (1888), *Nachlese zu den Bruchstucken der griech Tragiker* (1888), *Die Apologie der Heilkunst* (1890), *Philodem und die asthetischen Schriften der herculanischen Bibliothek* (1891), *Die Schrift vom Staatswesen der Athener* (1891), *Die jungst entdeckten Überreste einer den Platonischen Phadon enthaltenden Papyrusrolle* (1892), *Aus der Hekale des Kallimachos* (1893), *Essays und Erinnerungen* (1905). He supervised a translation of J S Mill's complete works (12 vols, Leipzig, 1869–80), and wrote a life (Vienna, 1889) of Mill His *Griechische Denker Geschichte der antiken Philosophie* (vols. 1 and ii, Leipzig, 1893 and 1902) was translated into English by L. Magnus and G G Berry (1901–12).

GONAGUAS ("borderers"), descendants of a cross between the Hottentots and the Kafirs, before the arrival of the whites in South Africa, and in some districts scarcely distinguishable from other natives but for their broken speech.

GONCALVES DIAS, ANTONIO (1823–1864), Brazilian lyric poet, was born near the town of Caxias, in Maranhão He studied law at the university at Coimbra, in Portugal, and in 1845 decided to try his fortune as an author at Rio de Janeiro Here he wrote for the newspaper press, ventured to appear as a dramatist, and in 1846 established his reputation by a volume of poems—*Primeiros Cantos*—which were remarkable for their autobiographic impress, and placed their author at the head of the lyric poets of his country. In 1848 he followed up his success by *Segundos Cantos e sextilhas de Frei Antão,* and in the following year, in fulfilment of the duties of his new post as professor of Brazilian history in the Imperial College of Pedro II at Rio de Janeiro, he published an edition of Berredo's *Annaes historicos do Maranhão* and added a sketch of the migrations of the Indian tribes. A third volume of poems, *Ultimos Cantos,* published in 1851, was practically the poet's farewell to the service of the muse, for he spent the next eight years engaged under Government patronage in studying public instruction in the north and the educational institutions of Europe. On his return to Brazil in 1860 he joined an exploring expedition but was forced in 1862 by the state of his health to try the effects of another visit to Europe He died in Sept. 1864. While in Germany he published at Leipzig a complete collection of his lyrical poems, which went through several editions, the four first cantos of an epic poem called *Os Tymbiras* (1857) and a *Diccionario da lingua Tupy* (1858)

A complete edition of the works of Dias has been published in Rio de Janeiro *See* Wolf, *Brésil littéraire* (Berlin, 1863), Innocencio de Silva, *Diccionario bibliographico portuguez,* viii 157, Sotero dos Reis, *Curso de litteratura portugueza e brazileira,* iv (Maranhão, 1868), José Verissimo, *Estudos de literatura brazileira, segunda serie* (Rio, 1901).

GONCHAROV, IVAN ALEXANDROVICH (1812–1891), Russian novelist, was the son of a rich merchant in the town of Simbirsk. At the age of ten he was placed in one of the gymnasiums at Moscow, from which he passed into the Moscow university He then entered the civil service, being first employed as secretary to the governor of Simbirsk, and afterwards in the ministry of finance at St Petersburg (Leningrad) Absorbed in bureaucratic work, Goncharov paid no attention to the social questions then ardently discussed by his contemporaries, Herzen, Aksakov and Bielinsky His first original work was *Obyknovennaya Istoria,* "A Common Story" (1847, Eng trans by C Garnett, 1890, 2nd ed 1917). In 1856 he sailed to Japan as secretary to Admiral Putiatin, returning by the then tedious land route through Siberia He published a description of the voyage under the title of "The Frigate *Pallada.*" In 1857 appeared his masterpiece, *Oblomov* (Eng trans by C J Hogarth, 1915), which was immediately recognized as a classic He had been at work on it for ten years What Prince Mirsky has called the "indolent and impotent determinism of the hero" was recognized as of general significance in Russian life, especially in the life of the country gentry Dobrolubov said of it, "Oblomovka (the country-seat of the Oblomovs) is our fatherland something of Oblomov is to be found in every one of us." Pisarev, another celebrated critic, declared that "Oblomovism," as Goncharov called the sum total of qualities with which he invested the hero of his story, "is an illness fostered by the nature of the Slavonic character and the life of Russian society." In 1858 Goncharov was appointed a censor, and in 1868 he published another novel called *Obryv* (Eng trans., *The Precipice,* 1915), on which he had worked for 20 years This contains a charming picture of a great Russian household, ruled by a despotic and benevolent grandmother, but aroused great hostility among the intelligentsia by the unsympathetic portrait of the nihilist Goncharov was convinced that Turgenev borrowed from *The Precipice,* and wrote an account of his wrongs, in a ms which only saw the light in recent years He died on Sept 15–27, 1891

See A A Mazon, *Un Maître du roman russe: Ivan Gontcharov* (1914)

GONCOURT, DE, a name famous in French literary history EDMOND LOUIS ANTOINE HUOT DE GONCOURT was born at Nancy on May 26, 1822, and died at Champrosay on July 16, 1896 JULES ALFRED HUOT DE GONCOURT, his brother, was born in Paris on Dec 17, 1830, and died in Paris on June 20, 1870

Writing always in collaboration, until the death of the younger, it was their ambition to be not merely novelists, inventing a new kind of novel, but historians; not merely historians, but the historians of a particular century, and of what was intimate and what

is unknown in it; to be also discriminating, indeed innovating, critics of art, but of a certain section of art, the 18th century, in France and Japan; and also to collect pictures and bibelots, always of the French and Japanese 18th century. Their histories (*Portraits intimes du XVIIIe siècle* [1857], *La Femme au XVIIIe siècle* [1862], *La du Barry* [1878], etc) are made entirely out of documents, autograph letters, scraps of costume, engravings, songs, the unconscious self-revelations of the time, their three volumes on *L'Art du XVIIIe siècle* (1859–75) deal with Watteau and his followers in the same scrupulous, minutely enlightening way, with all the detail of unpublished documents, and when they came to write novels, it was with a similar attempt to give the inner, undiscovered, minute truths of contemporary existence, the *inédit* of life. The same morbidly sensitive noting of the *médit,* of whatever came to them from their own sensations of things and people around them, gives its curious quality to the nine volumes of the *Journal,* 1887–96, which will remain, perhaps, the truest and most poignant chapter of human history that they have written. Their novels, *Soeur Philomène* (1861), *Renée Mauperin* (1864), *Germinie Lacerteux* (1865), *Manette Salomon* (1865), *Madame Gervaisais* (1869), and, by Edmond alone, *La Fille Elisa* (1878), *Les Frères Zemganno* (1879), *La Faustin* (1882), *Chérie* (1884), are, however, the work by which they will live as artists Learning something from Flaubert, and teaching almost everything to Zola, they invented a new kind of novel, and their novels are the result of a new vision of the world, in which the very element of sight is decomposed, as in a picture of Monet Seen through the nerves, in this conscious abandonment to the tricks of the eyesight, the world becomes a thing of broken patterns and conflicting colours, and uneasy movement A novel of the Goncourts is made up of an infinite number of details, set side by side, every detail equally prominent While a novel of Flaubert, for all its detail, gives above all things an impression of unity, a novel of the Goncourts deliberately dispenses with unity in order to give the sense of the passing of life, the heat and form of its moments as they pass It is written in little chapters, sometimes no longer than a page, and each chapter is a separate notation of some significant event, some emotion or sensation which seems to throw sudden light on the picture of a soul To the Goncourts humanity is as pictorial a thing as the world it moves in; they do not search further than "the physical basis of life," and they find everything that can be known of that unknown force written visibly upon the sudden faces of little incidents, little expressive moments. The soul, to them, is a series of moods, which succeed one another, certainly without any of the too arbitrary logic of the novelist who has conceived of character as a solid or consistent thing. Their novels are hardly stories at all, but picture-galleries, hung with pictures of the momentary aspects of the world French critics have complained that the language of the Goncourts is no longer French, no longer the French of the past; and this is true It is their distinction—the finest of their inventions—that, in order to render new sensations, a new vision of things, they invented a new language

(A Sy)

In his will Edmond de Goncourt left his estate for the endowment of an academy, the formation of which was entrusted to Alphonse Daudet and Léon Hennique. The society was to consist of ten members, each of whom was to receive an annuity of 6,000 francs, and a yearly prize of 5,000 francs was to be awarded to the author of some work of fiction Nine of the members of the new academy were nominated in the will They were: Alphonse Daudet, J K Huysmans, Léon Hennique, Octave Mirbeau, the two brothers, "J. H." Rosny, Gustave Geffroy and Paul Margueritte On Jan 19, 1903, after much litigation, the academy was constituted, with Elémir Bourges, Lucien Descaves and Léon Daudet as members in addition to those mentioned in de Goncourt's will, the place of Alphonse Daudet having been left vacant by his death in 1897

On the brothers de Goncourt *see* the *Journal des Goncourt* already cited; M. A Belloc (afterwards Lowndes) and M L Shedlock, *Edmond and Jules de Goncourt, with Letters and Leaves from their Journals* (1895); Alidor Delzant, *Les Goncourt* (1889) which contains a valuable bibliography; *Lettres de Jules de Goncourt* (1888), preface by H Céard, R Doumic, *Portraits d'écrivains* (1892), Paul Bourget, *Nouveaux Essais de psychologie contemporaine* (1886), Émile Zola, *Les Romanciers naturalistes* (1881).

GONDA, a town and district of British India, in the Fyzabad division of the United Provinces. Pop (1921) 13,228 The district of Gonda has an area of 2,809 sq m It consists of an alluvial plain with very slight undulations, studded with groves of mango trees, and divided into three belts known as the *tarai* or swampy tract, the *uparhar* or uplands, and the *tarhar* or wet lowlands, all three being fertile and closely tilled Several rivers flow through the district, but only two, the Gogra and Rapti, are of any importance On the outbreak of the Mutiny, the raja of Gonda, after honourably escorting the government treasure to Fyzabad, joined the rebels His estates, along with those of the rani of Tulsipur, were confiscated, and conferred as rewards upon the maharajas of Balrampur and Ajodhya, who had remained loyal In 1921 the population was 1,473,098

GONDAL, a town and native State of India, in the western Indian States agency of Bombay, in the centre of the peninsula of Kathiawar The area of the State is 1,024 sq m , pop (1921) 167,071 The tribute is £7,000 Grain and cotton are the chief products, and cotton and wool stuffs and gold embroidery are made The chief, whose title is Thakur Sahib, is a Jadeja Rajput. The State has long had progressive administration and compulsory female education has recently been introduced It is traversed by a railway connecting it with Bhanagar, Rajkot and the sea-board The town of Gondal, the state capital and residence of the chief, is 23 m by rail S of Rajkot, pop (1921) 17,418. It contains a fine college, an orphanage, a high school for girls, and an asylum

GONDAR, one of the former capitals of Abyssinia, situated on a basaltic ridge some 7,500 ft above the sea, about 21 m N E. of Lake Tana, a splendid view of which is obtained from the castle. Two streams, the Angreb on the east side and the Gaha or Kaha on the west, flow from the ridge, and meeting below the town, pass onwards to the lake Gondar was a small village when at the beginning of the 16th century it was chosen by the Negus Sysenius (Seged I) as the capital of his kingdom His son Fasilidas, or A'lem-Seged (1633–1667), was the builder of the castle which bears his name Later emperors built other castles and palaces, the latest in date being that of the Negus Yasu II , erected about 1736, at which time Gondar appears to have been at the height of its prosperity Thereafter it suffered greatly from the civil wars which raged in Abyssinia, and was more than once sacked, most recently in 1868 by the emperor Theodore, and in 1887 by the dervishes under Abu Anga, who inflicted very great injury, destroying many churches, damaging the castles and carrying off much treasure The population, estimated by James Bruce in 1770 at 10,000 families, had dwindled in 1905 to about 7,000 persons Since the pacification of the Sudan by the British (1886–1889) there has been some revival of trade between Gondar and the regions of the Blue Nile Among the inhabitants are numbers of Mohammedans, and there is a settlement of Falashas Cotton, cloth, gold and silver ornaments, copper wares, fancy articles in bone and ivory, excellent saddles and shoes are among the products of the local industry

Unlike any other buildings in Abyssinia, the castles and palaces of Gondar resemble, with some modifications, the mediaeval fortresses of Europe, the style of architecture being the result of the presence in the country of numbers of Portuguese Fasilidas's castle was built by Indian workmen, under the superintendence of Abyssinians who had learned something of architecture from the Portuguese adventurers The castle has two storeys, is 90 ft by 84 ft , has a square tower and circular domed towers at the corners The most extensive ruins are a group of royal buildings enclosed in a wall These ruins include the palace of Yasu II , which has several fine chambers Christian Levantines were employed in its construction and it was decorated in part with Venetian mirrors, etc In the same enclosure is a small castle attributed to Yasu I The exterior walls of the castles and palaces named are little damaged and give to Gondar a unique character among African towns Of the 44 churches, all in the circular

Abyssinian style, which are said to have formerly existed in Gondar or its immediate neighbourhood, Major Powell-Cotton found only one intact in 1900

See E Ruppell, *Reise in Abyssinien* (Frankfort-on-the-Main, 1838–1840), T von Heuglin, *Reise nach Abessinien* (Jena, 1868), G Lejean, *Voyage en Abyssinie* (Paris, 1872), Achille Raffray, *Afrique orientale, Abyssinie* (Paris, 1876), P H G Powell-Cotton, *A Sporting Trip through Abyssinia*, chaps 27–30 (London, 1902), and Rosita Forbes, *From Red Sea to Blue Nile* (1925) Views of the castle are given by Heuglin, Raffray, Powell-Cotton and Rosita Forbes

GONDJA, a people greatly resembling the Dagomba (to whom they were formerly subject), living in the Salaga and Bole districts of the Northern Territories, Gold Coast

GONDOKORO, a stopping place for steamers on the east bank of the upper Nile, in 4° 54′ N, 31° 43′ E 1,077 m by river south of Khartum and 13 miles below Rejef where, up stream from Khartum, the Nile ceases to be navigable The station, which is very unhealthy, is at the top of a cliff 25 ft above the river-level

Gondokoro was first visited by Europeans in 1841–1842, when expeditions sent out by Mohammed Ali, pasha of Egypt, ascended the Nile as far as the foot of the rapids above Gondokoro It soon became an ivory and slave-trading centre In 1851 an Austrian Roman Catholic mission was established here, but it was abandoned in 1859 It was at Gondokoro that J H Speke and J A Grant, descending the Nile after their discovery of its source, met, on Feb 15, 1863, Samuel Baker and his wife who were journeying up the river In 1871 Baker, then governor-general of the equatorial provinces of Egypt, established a military post at Gondokoro, which he named Ismailia, after the then khedive Baker made this post his headquarters, but Colonel (afterwards General) C G Gordon, who succeeded him in 1874, abandoned the station on account of its unhealthy site, removing to Lado, 11 miles down stream Gondokoro fell into the hands of the Mahdists in 1885 After the destruction of the Mahdist power in 1898 it was occupied by British troops and formed the northernmost post on the Nile of the Uganda protectorate In 1914 however the administration was transferred to the Sudan Government which gained control of the whole stretch of the Nile navigable from Khartum

GONDOMAR, DIEGO SARMIENTO DE ACUÑA, Count of (1567–1626), Spanish diplomatist, born in Gondomar, Galicia, on Nov 1, 1567 He inherited wide estates in Galicia and in Old Castile from his father, corregidor of Granada and governor of the Canary islands In 1583 Philip II gave him military command of the Portuguese frontier and coast of Galicia Corregidor of Toro in 1593, he was sent in 1603 to superintend the distribution of the treasure brought from America by two galleons driven to take refuge at Vigo, and on his return was appointed on the board of finance In 1609 he repelled a naval attack on Galicia made by the Dutch In the Casa del Sol at Valladolid, where he resided, he collected a library which the marquis of Malpica, his descendant, ceded to Charles III, it is now in the royal library at Madrid

His reputation as a diplomatist rests on his two periods of service as ambassador in England (1613–18 and 1619–22) The excellence of his latinity pleased the literary tastes of James I, whose character he judged with remarkable insight He flattered the king's love of books and of peace, and he made skilful use of his desire for an alliance between the prince of Wales and a Spanish infanta Sarmiento's aim was to keep James from aiding the Protestant States against Spain and the house of Austria, and to avert English attacks on Spanish possessions in America His success made him odious to the anti-Spanish and Puritan parties The active part he took in promoting the execution of Sir Walter Raleigh aroused particular animosity He was attacked in pamphlets and figured as the principal person in Thomas Middleton's *A Game of Chess,* a political play suppressed by order of the council Count of Gondomar in 1617, he returned home on leave for his health, through Flanders and France, on a diplomatic mission in 1618 He resumed office in London in 1619; on his retirement in 1622 he was appointed on the royal council and sent on a complimentary mission to Vienna He died near Haro in the Rioja on Oct 2, 1626

See S R Gardiner, *History of England* (London, 1883–84), P de Gayangos, introduction to *Cinco Cartas político-literarias de Don Diego Sarmiento de Acuña, Conde de Gondomar* . (Madrid, 1869, Soc. de Bibliófilos Españoles), R. H Lyon, *Gondomar* (Oxford, 1910)

GONDWANA, the historical name for a large tract of hilly country in India which roughly corresponds with the greater part of the present Central Provinces The name is derived from the aboriginal tribe of Gonds, who ruled the country from the 12th to the beginning of the 18th century in three or four separate kingdoms. They maintained a barbaric civilization and though nominally subject to the Moguls they were not much disturbed, but when the Mahratta invaders appeared in the 18th century the Gond kingdoms succumbed and the aboriginal population fled for safety to the hills Gondwana was included in the dominions of the Bhonsla Raja of Nagpur which passed to the British between 1818 and 1853



FROM RUSSEL, "TRIBES AND CASTES OF CENTRAL INDIA"

MĀRIA GOND IN DANCING COSTUME
The Gonds are an aboriginal hill race of Central India

The Gonds, who call themselves Koitur or "highlanders," are the most numerous tribe of Dravidian race in India In 1921 they numbered 2,110,000 Their language, akin to the Southern languages of India, is unwritten and, except for missionary productions, there is no literature, but it is still the spoken language of 7% of the population of the Central Provinces The Rajgonds, claiming to have Rajput blood, are on the skirts of Hinduism, but most of the Gonds are animistic in belief They are a courageous race, and, when unspoilt by contact with civilization, extremely honest

The term "Gondwana" is likewise used by geologists as a name for certain rock formations

GONDWANALAND. This name, derived from Gondwana, a district of Central India, was given by Suss to the inferred Palaeozoic continent, that at its greatest extension spanned the South Atlantic and Indian oceans—incidentally including Sclater's *Lemuria* linking India, Madagascar, and Africa, and Ihering's *Arch-hellenis* uniting Africa with Brazil It embraced all (except north-west) Africa, Madagascar, peninsular India, Australia, Tasmania, Antarctica, Falklands, and all South America except the extreme west and north-west Its unstable margins were between the Devonian and Jurassic, intermittently and widely transgressed by the oceans; the sea bounding it on the north, wherein deposition went on continuously down to the Tertiary, being called the "Tethys"—with the Mediterranean as a remnant

Sedimentation upon Gondwanaland itself was predominantly of "continental" type, the widespread strata—Gondwana beds—being often coal-bearing and frequently still horizontal Highly folded banded ironstones and jaspilites characterise the Proterozoic Noteworthy are those deposits betraying glacial conditions during several epochs—in the late pre-Cambrian, early Devonian and especially late Carboniferous (so-called Permian or Permocarboniferous), the last-named occupying enormous stretches within the west and south-east of Australia, Tasmania, (possibly New Zealand), peninsular India (and the Salt Range), southern Madagascar, South Africa (possibly the Congo), Falklands, south-eastern Brazil, Uruguay, Paraguay, and central and western Argentina Those moraine deposits are regarded as the products of continental ice-caps of vast extent and huge thickness, that developed over relatively low-lying ground, moving outwards over distances measurable in hundreds of miles and passing into the ocean in places, as indicated by beds with marine fossils This intense refrigeration (with milder inter-glacial periods) began in the mid-Carboniferous in New South Wales and only ended there in the Permian, attaining its maximum throughout the regions cited towards the

close of the Carboniferous

The causes are obscure and much debated The boulder-beds with striated erratics and underlying grooved rock-surfaces disclose the ice-movement, which was away from the South Pole except in Africa. The succeeding Permian sediments contain the workable coals of the Southern hemisphere The Triassic is signalled by diastrophism and transgression; and later by widespread aridity, as in Europe In the early Jurassic, floods of basalt (sometimes rhyolite) terminated sedimentation and the strata beneath were riddled with intrusive dolerite in South Africa, Tasmania, Antarctica, and Brazil

The breaking up of Gondwanaland dates from that time, though not accomplished until late in the Cretaceous—a process currently ascribed to the foundering of segments of the continent or of narrow "land bridges" Under Wegener's "Displacement Hypothesis," however, the continent is supposed to have fractured and the crustal blocks, floating on a liquefied basic substratum (basalt), to have drifted apart, pushing up before them the marine sediments bordering Gondwanaland, and elevating them as the Tertiary folded chains of the Andes, Morocco, Alps, Iranian chains, Himalayas, New Zealand, which encircle its relics Magma was squeezed into or erupted through the rising arches, as in the Andes The Great Rift Valley of Africa with its prolonged volcanicity and the lavas of the Deccan (India) and Abyssinia bespeak zones of tension in the crust

Distinctive of the Gondwana beds is the "Southern" or *Glossopteris Flora*—with its few "Northern" Carboniferous elements in South America and South Africa that survived the intense glaciation—ousted in late Triassic times by the *Thinnfeldia Flora,* with return to floral uniformity throughout the globe in the Jurassic Reptilia and amphibia belonging to the orders Anomodontia, Therocephalia, Therodontia, and Saurischia characterise the Permo-Triassic, especially that of the Karroo (spreading partly into Russia), the Triassic Cynodontia being apparently ancestral to the Mammalia Post-Cretaceous vertebrate evolution followed diverging lines in the fragments of Gondwanaland, producing the Edentata of Patagonia, Proboscidea of Africa and Asia, and Monotremata of Australasia As noted by Blanford, the distribution and affinities of their existing faunas point to the former continental unity of these areas For example the lemurs of Africa, Madagascar and India, manati of West Africa and the Amazon, freshwater fishes, birds of *Struthio*-type, blind snakes, geckos, scorpions, decapod Crustacea, *Helicidae,* isopod *Phreatoicus* and oligochete *Phreodrilludae*, could not have crossed the oceans Similar evidence is obtainable from the present floras and the actuality of this former continent appears unquestionable (A L DU T)

GONFALON, a banner or standard of the middle ages (the late French and Italian form, also found in other Romanic languages, of *gonfanon,* which is derived from the O H Ger *gundfano, gund,* war, and *fano,* flag, *cf* Mod Ger *Fahne,* and English "vane") It took the form of a rectangular ensign, often slit into streamers at the foot, and swinging from a cross-bar attached to a pole This is the most frequent use of the word The title of "gonfalonier," the bearer of the gonfalon, was in the middle ages both military and civil It was borne by the counts of Vexin, as leaders of the men of St Denis, and when the Vexin was incorporated in the kingdom of France the title of *Gonfalonier de Saint Denis* passed to the kings of France, who thus became the bearers of the "oriflamme," as the banner of St Denis was called Gonfalonier was the title of civic magistrates of various degrees of authority in many of the city republics of Italy, notably of Florence, Siena and Lucca. At Florence the functions of the office varied At first the gonfaloniers were the leaders of the various military divisions of the inhabitants In 1293 was created the office of gonfalonier of justice, who carried out the orders of the signiory By the end of the 14th century the gonfalonier was the chief of the signiory At Lucca he was the chief magistrate of the republic At Rome two gonfaloniers must be distinguished, that of the church and that of the Roman people; both offices were conferred by the pope The first was usually granted to sovereigns, who were bound to defend the church and lead her armies The second bore a standard with the letters S P Q.R. on any enterprise undertaken in the name of the church and the people of Rome, and also at ceremonies, processions, etc This was granted by the pope to distinguished families

GÓNGORA Y ARGOTE, LUIS DE (1561–1627), Spanish lyric poet, was born at Cordova His father, Francisco de Argote, was *corregidor* of that city, but the poet early adopted the surname of his mother, Leonora de Góngora, who was descended from an ancient family He was educated at the university of Salamanca, and was already known as a poet in 1585, when Cervantes praised him in the Galatea Ordained priest in 1599, he settled from 1612 onwards at Madrid, where, as a contemporary remarks, he "noted and stabbed at everything with his satirical pen" In 1626 a severe illness, which impaired his memory, compelled his retirement to Cordova, where he died (1627) The collection of his poems consists of numerous sonnets, odes, ballads, songs for the guitar and of certain larger poems, such as the *Soledades* and the *Polifemo* Too many of them exhibit that tortuous elaboration of style (*estilo culto*) with which the name of Góngora is inseparably associated, but though Góngora has been justly censured for affected Latinisms, unnatural transpositions, strained metaphors and frequent obscurity, it must be admitted that he was a man of rare genius—a fact cordially acknowledged by those of his contemporaries who were most capable of judging It was only in the hands of those who imitated Góngora's style without inheriting his genius that *culteranismo* became absurd Besides his lyrical poems, Góngora is the author of a play entitled *Las Firmezas de Isabel* and of two incomplete dramas, the *Comedia venatoria* and *El Doctor Carlino*

See E Churton, *Góngora* (1862), L P Thomas, *Góngora et le gongorisme considérés dans leurs rapports avec le marinisme* (1911), M Artigas, "D Luis de Góngora and Argote," *Biografía y estudio crítico* (1925)

GONIOMETER, an instrument for measuring the angles of crystals, there are two kinds—the contact goniometer and the reflecting goniometer

The Contact Goniometer (or **Hand-goniometer**).—This consists of two metal rules pivoted together at the centre of a graduated semicircle (fig 1) The instrument is placed with its plane perpendicular to an edge between two faces of the crystal to be measured, and the rules are brought into contact with the faces, this is best done by holding the crystal up against the light with the edge in the line of sight The angle between the rules,

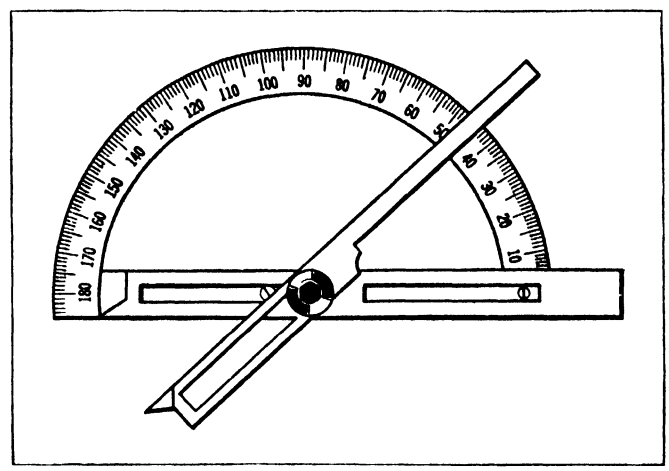


FIG 1.—CONTACT GANIOMETER

as read on the graduated semicircle, then gives the angle between the two faces The rules are slotted, so that they may be shortened and their tips applied to a crystal partly embedded in its matrix The instrument represented in fig 1 is employed for the approximate measurement of large crystals with dull and rough faces

The Reflecting Goniometer.—This is an instrument of far greater precision, and is always used for the accurate measurement of the angles when small crystals with bright faces are available As a rule, the smaller the crystal the more even are its faces, and

when these are smooth and bright they reflect sharply defined images of a bright object. By turning the crystal about an axis parallel to the edge between two faces, the image reflected from a second face may be brought into the same position as that formerly occupied by the image reflected from the first face; the angle through which the crystal has been rotated, as determined by a graduated circle to which the crystal is fixed, is the angle between the normals to the two faces.

Several forms of instruments depending on this principle have been devised One consists of a graduated circle reading degrees and minutes, which turns with a milled head about a horizontal axis. The crystal is attached with a mixture of beeswax and pitch to a holder and by means of pivoted arcs is adjusted so that the edge between two faces (a zone-axis) is parallel to, and coincident with, the axis of the instrument The crystal-holder and adjustment-arcs, together with the milled head are carried on an axis which passes through the hollow axis of the graduated circle, and may thus be rotated independently of the circle In use, the goniometer is placed directly opposite to a window, with its axis parallel to the horizontal window-bars, and as far distant as possible The eye is placed quite close to the crystal, and the image of a slit in a dark screen as seen in the crystal-face is made to coincide with a chalk mark on the floor as seen directly; this is done by turning the milled head, the reading of the graduated circle having previously been observed Without moving the eye, the crystal is then rotated until the image from a second face is brought into the same position; the difference between the first and second readings of the graduated circle will then give the angle between the normals of the two faces

Several improvements have been made on this goniometer. The adjustment-arcs have been modified; a mirror of black glass fixed to the stand beneath the crystal gives a reflected image of the signal, with which the reflection from the crystal can be more conveniently made to coincide, a telescope provided with cross-wires gives greater precision to the direction of the reflected rays of light; and with the telescope a collimator has sometimes been used. A still greater improvement was effected by placing the graduated circle in a horizontal position Many forms of the *horizontal-circle goniometer* have been constructed; they are provided with a telescope and collimator, and in construction are essentially the same as a spectrometer, with the addition of arrangements for adjusting and centring the crystal The instrument shown in fig 2 has four concentric axes, which enable the crystal-holder A, together with the adjustment-arcs B and centring-slides D, to be raised or lowered, or to be rotated independently of the circle H, further, either the crystal-holder or the telescope T may be rotated with the circle, while the other remains fixed The crystal is placed on the holder and adjusted so that the edge (zone-axis) between two faces is coincident with the axis of the instrument Light from an incandescent gas-burner passes through the slit of the collimator C, and the image of the slit (signal) reflected from the crystal face is then viewed in the telescope. The clamp and the slow-motion screw F enable the image to be brought exactly on the cross-wires of the telescope, and the position of the circle with respect to the vernier is read through the lens The crystal and the circle are then rotated together until the image from a second face is brought on the cross-wires of the telescope, and the angle through which they have been turned is the angle between the normals to the two faces While measuring the angles between the faces of crystals the telescope remains fixed by the clamp β, but when this is released the instrument may be used as a spectrometer or refractometer for determining, by the method of minimum deviation, the indices of refraction of an artificially cut prism or of a transparent crystal when the faces are suitably inclined to one another.

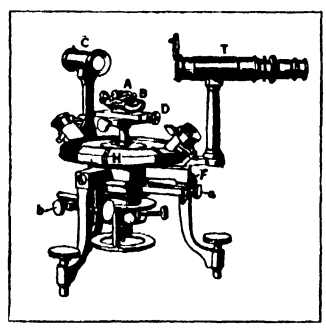


FIG 2.—HORIZONTAL-CIRCLE GONIOMETER

With a one-circle goniometer, such as is described above, it is necessary to mount and re-adjust the crystal afresh for the measurement of each zone of faces (*i.e.*, each set of faces intersecting in parallel edges); with very small crystals this operation takes a considerable time, and the minute faces are not readily identified again Further, in certain cases, it is not possible to measure the angles between zones, nor to determine the position of small faces which do not lie in prominent zones on the crystal These difficulties have been overcome by the use of a two-circle goniometer or theodolite-goniometer, which is a combination of a vertical-circle goniometer In these instruments the crystal is set up and adjusted with the axis of a prominent zone parallel to the axis of either the horizontal or the vertical circle As a rule, only in this zone can the angles between the faces be measured directly; the positions of all the other faces, which need be observed only once, are fixed by the simultaneous readings of the two circles These readings, corresponding to the polar distance and azimuth, or latitude and longitude readings of astronomical telescopes, must be plotted on a projection before the symmetry of the crystal is apparent; and laborious calculations are necessary in order to determine the indices of the faces and the angles between them, and the other constants of the crystal, or to test whether any three faces are accurately in a zone

These disadvantages are overcome by adding still another graduated circle to the instrument, with its axis perpendicular to the axis of the vertical circle, thus forming a three-circle goniometer With such an instrument measurements may be made in any zone or between any two faces without re-adjusting the crystal, further the troublesome calculations are avoided, and, indeed, the instrument may be used for solving spherical triangles

Goniometers of special construction have been devised for measuring crystals during their growth in the mother-liquid, for cutting section-plates and prisms from crystals (precious stones) accurately in any desired direction The instrument commonly employed for measuring the optic axial angle of biaxial crystals is really a combination of a goniometer with a polariscope For the optical investigation of minute crystals under the microscope, various forms of stage-goniometer with one, two or three graduated circles have been constructed An ordinary microscope fitted with cross-wires and a rotating graduated stage serves the purpose of a goniometer for measuring the plane angles of a crystal face or section, being the same in principle as the contact goniometer

For fuller descriptions of goniometers *see* text-books of Crystallography and Mineralogy, especially P H Groth, *Physikalische Krystallographie* (4th ed, Leipzig, 1905) *See* also C Leiss, *Die optischen Instrumente der Firma R Fuess, deren Beschreibung, Justierung und Anwendung* (Leipzig, 1899) (L J S)

GONTAUT, MARIE JOSÉPHINE LOUISE, DUCHESSE DE (1773–1857), was born in Paris on Aug 3, 1773, daughter of Augustin François, comte de Montaut-Navailles, who had been governor of Louis XVI and his two brothers when children Joséphine de Gontaut shared the lessons given by Madame de Genlis to the Orleans family, with whom her mother broke off relations after the outbreak of the Revolution Mother and daughter emigrated to Coblenz in 1792; thence they went to Rotterdam, and finally to England, where Joséphine married the marquis Charles Michel de Gontaut-Saint-Blacard (d 1822) They returned to France at the Restoration, and resumed their place at court. Madame de Gontaut became lady-in-waiting to Caroline, duchess of Berry, and later governess to the children of France She remained faithful to the Bourbon cause all her life In 1827 she was created duchesse de Gontaut She followed the exiled royal family to Prague, but in 1834 Pierre Louis, duc de Blacas, thought her comparatively liberal views dangerous for the prince and princess and she received a brusque congé from Charles X. Her twin daughters, Joséphine (1796–1844) and Charlotte (1796–1818), married respectively Ferdinand de Chabot, prince de Léon and afterwards duc de Rohan, and François, comte de Bourbon-Busset. She wrote in her old age some naive memoirs She died in Paris in 1857.

See her *Memoirs* (Eng. ed., 2 vols., 1894), and *Lettres inédites* (1895).

GONVILLE, EDMUND (d 1351), founder of Gonville Hall, now Gonville and Caius College, at Cambridge, England, is thought to have been the son of William de Gonvile, and the brother of Sir Nicholas Gonvile. The foundation of Gonville Hall at Cambridge was effected by a charter granted by Edward III. in 1348. It was called, officially, the Hall of the Annunciation of the Blessed Virgin, but was usually known as Gunnell or Gonville Hall. Its original site was in Free-school Lane, where Corpus Christi college now stands Gonvile apparently wished it to be devoted to training for theological study, but after his death the foundation was completed by William Bateman, bishop of Norwich and founder of Trinity Hall, on a different site and with considerably altered statutes (*See* also CAIUS, JOHN)

GONZAGA, an Italian princely family named after the town where it probably had its origin Its known history begins with Luigi I (1267–1360), who, after fierce struggles, supplanted his brother-in-law Rinaldo Bonacolsi as lord of Mantua in 1328, with the title of captain-general, and afterwards of vicar-general of the empire, adding the designation of count of Mirandola and Concordia, which fief the Gonzagas held from 1328 to 1354 In 1335 his son Guido wrested Reggio from the Scaligeri and held it until 1371 Luigi was succeeded by Guido (d 1369), the latter's son Luigi II came next in succession (d 1382), then Giovan Francesco I (d 1407), then Giovan Francesco II (d 1444) who received for his military services to the emperor Sigismund the title of marquess of Mantua (1432), an investiture which legitimatized the usurpations of the house of Gonzaga His grandson, Federigo I (d. 1484), served under various foreign sovereigns, including Bona of Savoy and Lorenzo de' Medici, subsequently he upheld the rights of the house of Este against Pope Sixtus IV and the Venetians, whose claims were a menace to his own dominions of Ferrara and Mantova His son Giovan Francesco III (d 1519) commanded the allied Italian forces against Charles VIII at the battle of Fornovo; he afterwards fought in the kingdom of Naples and in Tuscany, until captured by the Venetians in 1509 With the help of his wife, the famous Isabella d'Este, he promoted the fine arts and letters

He was succeeded by his son Federigo II (d 1540), captain-general of the papal forces. After the peace of Cambrai (1529) his ally and protector, the emperor Charles V, raised his title to that of duke of Mantua in 1530; in 1536 the emperor decided the controversy for the succession of Monferrato between Federigo and the house of Savoy in favour of the former His son Guglielmo subdued a revolt in Monferrato and was presented with that territory by the emperor Maximilian II His grandson Vincenzo II (d 1627) appointed as his successor Charles, the son of Henriette, the heiress of the French family of Nevers-Rethel, who was only able to take possession of the ducal throne after a bloody struggle, his dominions were invaded and he himself reduced to the sorest straits His great grandson, Ferdinand Charles, acquired Guastalla by marriage in 1678, but lost it soon afterwards, he involved his country in useless warfare, with the result that in 1708 Austria annexed the duchy On July 5, 1708, he died in Venice, and with him the Gonzagas of Mantua came to an end

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GONZAGA, THOMAZ ANTONIO (1744–*c.* 1809), Portuguese poet, was born at Oporto, and brought up at Bahia, Brazil, where his father was *disembargador* of the appeal court After completing his legal studies at Coimbra he remained there for some time, and compiled a treatise on natural law. In 1782 he was made *disembargador* of the appeal court at Bahia; in 1785, on the eve of his marriage with the "Marilia" of his verses, he was arrested on a charge of complicity in the conspiracy of Tiradentes, and after three years' imprisonment was exiled to Mozambique. His last years were darkened by melancholia, deepening into madness, and he died in exile His reputation as a poet rests on a little volume of bucolics entitled *A Marilia de Dirceo* (Dirceo being his Arcadian pen name), which includes all his published verses and is divided into two parts, corresponding with those of his life. The first extends to his imprisonment and breathes only love and pleasure, while the main theme of the second part, written in prison, is his *saudade* for *Marilia* and past happiness Gonzaga borrowed his forms from Anacreon and Theocritus, but the matter, except for an occasional imitation of Petrarch, the natural, elegant style and the harmonious metrification, are all his own *Marilia* is the most celebrated collection of erotic poetry dedicated to a single person in the Portuguese tongue.

BIBLIOGRAPHY —The Paris edition of 1862 in 2 vols. is in every way the best, although the authenticity of the verses in its 3rd part, which do not relate to *Marilia,* is doubtful A popular edition of the first two parts was published in 1888 A French version of *Marilia* by Monglave and Chalas appeared in Paris in 1825, an Italian by Vegezzi Ruscalla at Turin in 1844, a Latin by Dr Castro Lopes at Rio in 1868, and there is a Spanish one by Vedia *See* Innocencio da Silva, *Diccionario Bibliographico Portuguez* vol vii, p 320, also Dr T Braga, *Filinto Elysio e os Dissidentas da Arcadia* (Oporto, 1901).

GONZALEZ-CARVAJAL, TOMAS JOSE (1753–1834), Spanish poet and statesman Intendant (1795) of the colonies recently founded in Sierra Morena and Andalusia, and director (1813) of the University of San Isidro, he was imprisoned (1815–20) for establishing a chair of international law Reinstated by the revolution of 1820, he was exiled by the counter-revolution of 1823–27 He died a member of the supreme council of war As an author, he is known for his metrical translations of the poetical works of the Bible after the model of Luis de Leon

GOOCH, SIR DANIEL, BART (1816–1889), English mechanical engineer, was born at Bedlington, Northumberland, on Aug 16, 1816 In 1837 he became the locomotive superintendent of the Great Western Railway, and gradually replaced the unsatisfactory locomotives employed by a new and efficient eight-wheeled class One of these broad gauge locomotives, the "Lord of the Isles" gained a gold medal at the Great Exhibition of 1851, and ran 789,300 miles, with its original boiler, before withdrawal in 1881 Gooch left the railway in 1864, and as a director of the Telegraph Construction Company personally superintended the laying of the first two Atlantic Cables by the steamship "Great Eastern" in 1865–6 He returned to the Great Western Railway as chairman in 1866 and carried out many improvements before his death at Clewer Park, near Windsor, on Oct 15, 1889. He was an advocate of the "broad," or 7 ft, gauge for railways, but his death only preceded by three years the complete conversion of the Great Western Railway to standard gauge

GOOCH, GEORGE PEABODY (1873–), English historian, was educated at King's college, London, and Trinity college, Cambridge, and continued his studies in Berlin and Paris He was Liberal M P for Bath (1906–10), and for Reading (1913) He was joint editor of the *Contemporary Review* (1911 onwards); president of the Historical Association (1922–25), and joint editor of the *British Documents on the Origins of the War, 1898–1914* (1926, etc) Gooch has made a special study of modern German history, and is one of the first English authorities on the subject

His more important works include *Germany and the French Revolution* (1920), *History of Modern Europe, 1878–1918* (1923), *Franco-German Relations, 1871–1914* (1923), *Recent Revelations of European Diplomacy* (1927)

GOOD, JOHN MASON (1764–1827), English writer on medical, religious and classical subjects, was born on May 25, 1764, at Epping, Essex, the son of a Nonconformist minister. In 1794 he became a member of the British Pharmaceutical Society, and in that connection, and especially by the publication of *A History of Medicine* (1795), he effected a greatly needed reform in the profession of the apothecary In 1820 he took the diploma of M D. at Marischal college, Aberdeen He died at Shepperton, Middlesex, on Jan 2, 1827 Good was acquainted with the principal European languages, and also with Persian, Arabic and Hebrew

GOOD CONDUCT BADGES: *see* STRIPE

GOODE, GEORGE BROWN (1851–1896), American zoologist, was born in New Albany, Ind., on Feb 13, 1851 He graduated from Wesleyan University at Middletown, Conn., and spent a year at Harvard studying natural history under Agassiz In 1874 he became chief of the division of fisheries at the National Museum, Washington, D C, and in 1887 assistant secretary of the Smithsonian Institution in charge of the National Museum, which position he held until his death at Washington, on Sept 6, 1896 Under his direction the collections at the museum were entirely reorganized and recatalogued in a scientific manner and displayed with an educational aim in view His ideas of museum administration and display as expressed in his papers "Museums of the Future" and "Principles of Museum Administration" (U S National Museum *Report*, pt II, 1897) influenced nearly every important museum of the period They were also spread by the remarkable Government exhibits prepared by Goode for the Centennial Exhibition of 1876, The World's Columbian Exposition of 1893, exhibitions at Berlin (1880), London (1883) and Madrid (1892–93) and many others Goode directed the fisheries division of the 10th census (1880) and prepared the report in seven quarto volumes *The Fisheries and Fishing Industries of the United States* (1884–87) He wrote *American Fishes* (1888) and in 1896 published his most important scientific work, *Ocean Ichthyology*. He was prominent in the organization and conduct of scientific societies, interested in the history of science, in which field he prepared many papers, and an indefatigable bibliographer of the writings of naturalists The *Annual Report* of the U S Nat Museum for 1897 contains a bibliography of Goode's publications together with memoirs by S P Langley and others

See also D S. Jordan, ed., *Leading Men of Science* (1910)

GOOD FRIDAY, the English name for the Friday before Easter, kept as the anniversary of the Crucifixion The term is probably a corruption of "God's Friday" It was called Long Friday by the Anglo-Saxons and Danes, possibly in allusion to the length of the services which marked the day

The origin of the custom of a yearly commemoration of the Crucifixion is somewhat obscure It may be regarded as certain that among Jewish Christians it almost imperceptibly grew out of the old habit of annually celebrating the Passover on the 14th of Nisan, and of observing the "days of unleavened bread" from the 15th to the 21st of that month In the Gentile churches, on the other hand, it seems to be well established that originally no yearly cycle of festivals was known at all (*See* EASTER)

From its earliest observance, the day was marked by a specially rigorous fast, and also, on the whole, by a tendency to greater simplicity in the services of the church Prior to the 4th century there is no evidence of non-celebration of the eucharist on Good Friday; but after that date the prohibition of communion became common In Spain, indeed, it became customary to close the churches altogether as a sign of mourning, but this practice was condemned by the council of Toledo (633) In the Roman Catholic Church the Good Friday ritual at present observed is marked by many special features, most of which can be traced back to a date at least prior to the close of the 8th century (*see* the Ordo Romanus in Muratori's *Liturg Rom Vet*) The altar and the officiating clergy are draped in black and the gospel for the day consists of the history of the Passion as recorded by St John This is often sung in plain-chant by three priests, one representing the "narrator," the other two the various characters of the story The singing of this is followed by bidding prayers for the peace and unity of the church, for the pope, the clergy, all ranks and conditions of men, the sovereign, for catechumens, the sick and afflicted, heretics and schismatics, Jews and heathen Then follows the "adoration of the cross" In the Church of England the history of the Passion from the gospel according to John is also read; the collects for the day are based upon the bidding prayers which are found in the Ordo Romanus The "three hours" service, borrowed from Roman Catholic usage and consisting of prayers, addresses on the "seven last words from the cross" and intervals for meditation and silent prayer, has become very popular in the Anglican Church, and the observance of the day is more marked than formerly among Nonconformist bodies even in Scotland

GOODHUE, BERTRAM GROSVENOR (1869–1924), American architect, was born at Pomfret Hill (Conn.), April 28, 1869 He studied architecture in New York city with James Renwick, and in 1891 entered the office of R A Cram in Boston (Mass), later becoming a partner In 1903 the firm opened an office in New York city, of which Goodhue took charge After 1914 he practised alone He designed churches and cathedrals which were thoroughly modern, yet Gothic in inspiration At the same time he was one of the most prominent exponents of the sky-scraper building

Among the structures designed by him are St Thomas's Church, the Chapel of the Intercession, and the Church of St Vincent Ferrer, New York city, the Nebraska State capitol, Lincoln (Neb), St Mark's Church, Mount Kisco (N Y), St Thomas's College, and the National Academy of Sciences and National Research Council in Washington (D C.), Mandel Hall, at the University of Chicago, the California Institute of Technology, Pasadena (Calif), and the Exposition buildings for San Diego (Calif) He was also the architect for the Cathedral of Maryland (Balt) He died in New York city, April 24, 1924

GOOD KING HENRY (*Chenopodium Bonus-Henricus*), a perennial herb of the goose-foot family (Chenopodiaceae), found in Great Britain and naturalized in North America from Nova Scotia to Ontario and southward It is a smooth, dark green, little-branched plant, about 2 ft high, with usually entire halberd-shaped leaves The plant is cultivated as a pot-herb, in lieu of asparagus, under the name mercury or all-good (*See* CHENOPODIUM)

GOODMAN, GODFREY (1583–1656), bishop of Gloucester, was born at Ruthin, Denbighshire, and educated at Westminster and Cambridge He took orders in 1603, and, after holding various preferments, became bishop of Gloucester in 1625 From this time his tendencies towards Roman Catholicism constantly got him into trouble In 1633 he secured the see of Hereford by bribery, but Archbishop Laud persuaded the king to refuse his consent In 1640 he was imprisoned for refusing to sign the new canons denouncing popery and affirming the divine right of kings He afterwards signed and was released on bail, but next year the bishops who had signed were all imprisoned in the Tower, by order of parliament, on the charge of treason After 18 weeks' imprisonment Goodman was allowed to return to his diocese About 1650 he settled in London, where he died a confessed Roman Catholic His best known book is *The Fall of Man* (1616).

GOODNOW, FRANK JOHNSON (1859–), American educationalist, was born in Brooklyn (N Y), on Jan 18, 1859 Educated at Amherst college (Mass), he graduated in law at Columbia (1882), subsequently proceeding to the École Libre des Sciences Politiques, Paris, and the University of Berlin He was appointed instructor in history and lecturer in U S. administrative law at Columbia university in 1883, becoming professor in 1891, and Eaton professor of administrative law and municipal science in 1903 During 1906–7 he was acting dean of political science He was legal adviser to the Chinese Government, stationed at Peking, during the years 1913 and 1914, and from 1914 to 1928 was president of Johns Hopkins university Among his published works are *Comparative Administrative Law* (1893); *Municipal Home Rule* (1895), *Municipal Problems* (1897), *Politics and Administration* (1900), *City Government in the United*

States (1904); *The Principles of the Administrative Law of the United States* (1905); *Municipal Government* (1909); *Social Reform and the Constitution* (1911); *Principles of Constitutional Government* (1916); and *China, an Analysis* (1926)

GOODRICH, ANNIE WARBURTON (1866–), American nurse educator, was born at New Brunswick, N J, on Feb 6, 1866 She was educated at private schools in Connecticut, England and France and in 1892 graduated from the New York hospital training school for nurses In 1900–14 she was superintendent of nurses at St Luke's, New York and Bellevue and Allied hospitals, inspector of nurses' training schools under the New York department of education, also lecturer at Teachers college, Columbia university, 1904–13 In 1914 she became assistant professor of the department of nursing and health at Teachers college, and in 1917 director of nurses, Henry St Settlement Her services to nursing during the World War led to her appointment in 1918 as dean of the army school of nursing At the invitation of Yale university she became dean of its school of nursing in 1923 when it was established with the aid of the Rockefeller Foundation In 1928 it was the only school of nursing awarding the degree of "Bachelor of Nursing"

GOODRICH, SAMUEL GRISWOLD (1793–1860), an American author, better known under the pseudonym of "Peter Parley," was born, the son of a Congregational minister, at Ridgefield, Connecticut, Aug 19, 1793 He was largely self-educated, but after general mercantile experience became a bookseller and publisher at Hartford and later in Boston There, beginning in 1828, he published for fifteen years an illustrated annual, the *Token,* to which he was a frequent contributor both in prose and verse The *Token* contained some of the earliest work of Nathaniel Hawthorne, N P Willis, Henry W Longfellow and Lydia Maria Child In 1841 he established *Merry's Museum,* which he continued to edit till 1854 In 1827 he began, under the name of "Peter Parley," his series of books for the young, which embraced geography, biography, history, science and miscellaneous tales Of these he was the sole composer of comparatively few, but in his *Recollections of a Lifetime* (2 vols, 1856) he wrote that he was "the author and editor of about 170 volumes," of which about seven million copies had been sold, and gave a list both of the works of which he was the author or editor and of the spurious works published under his name He was chosen a member of the Massachusetts House of Representatives in 1836, and of the state senate in 1837, and in 1851–53 he was consul at Paris, where he remained till 1855 He died in New York May 9, 1860

GOODRICH or **GOODRICKE, THOMAS** (d 1554), English ecclesiastic, son of Edward Goodrich of East Kirkby, Lincolnshire, was educated at Corpus Christi college, Cambridge, afterwards becoming a fellow of Jesus college in 1510 He was consulted about the legality of Henry VIII's marriage with Catherine of Aragon, became royal chaplain about 1530, and bishop of Ely in 1534 He was zealous for the Reformation, helped in 1537 to draw up the *Institution of a Christian Man* (known as the *Bishops' Book*), and translated the Gospel of St John for the revised New Testament On the accession of Edward VI in 1547 the bishop was made a privy councillor He assisted to compile the First Prayer Book of Edward VI, and he was one of the commissioners for the trial of Bishop Gardiner In January 1551 he succeeded Rich as chancellor and held this office during the nine days' reign of Lady Jane Grey, but he made his peace with Queen Mary by associating himself with the order commanding the duke of Northumberland to disarm He conformed to the restored religion, and, though deprived of the chancellorship, kept his bishopric until his death on May 10, 1554

See the *Dict Nat Biog*, where further authorities are cited

GOODSIR, JOHN (1814–1867), Scottish anatomist, was born at Anstruther, Fife, on March 20, 1814 He was educated at St Andrews, and at Edinburgh, and in 1835 joined his father in practice at Anstruther Three years later he communicated to the British Association a paper on the pulps and sacs of the human teeth, and about the same date, on the nomination of Edward Forbes, he was elected to the famous coterie called the "Universal Brotherhood of the Friends of Truth," which comprised artists, scholars, naturalists and others, whose relationship became a potent influence in science With Forbes he worked at marine zoology, but human anatomy, pathology and morphology formed his chief study In 1840 he moved to Edinburgh, where he was appointed conservator of the museum of the College of Surgeons, in succession to William Macgillivray In his lectures in the theatre of the college in 1842–43 he insisted on the importance of the cell as a centre of nutrition, and pointed out that the organism is subdivided into a number of departments R Virchow recognized his indebtedness to these discoveries by dedicating his *Cellular Pathologie* to Goodsir, as "one of the earliest and most acute observers of cell-life" In 1843 Goodsir became curator in the University of Edinburgh, then demonstrator of anatomy, and in 1845 curator of the entire museum A year later he was elected to the chair of anatomy in the university He died at Wardie near Edinburgh, on March 6, 1867

See *Anatomical Memoirs of John Goodsir, F R S, edited by W Turner, with Memoir by H Lonsdale* (Edinburgh, 1868), *Proc Roy Soc*, vol iv (1868), *Trans Bot Soc Edin*, vol ix (1868)

GOODWILL. In accounting, goodwill appears as an asset upon the balance sheet at the amount it originally cost, or at such lesser amount as it may have been written down out of profits No attempt is ever made to re-value the goodwill of a business from year to year for balance sheet purposes When, however, a change takes place in the owners of a business, the price to be paid for goodwill has necessarily to be agreed upon by the incoming and outgoing parties This price is a matter of bargaining, and has nothing to do with the figure that goodwill may appear at in the books of the business changing hands

Goodwill represents the difference between an established successful business and one that has yet to establish itself and achieve success The price that a purchaser is willing to pay for goodwill is the price he is prepared to pay for the right to stand in the shoes of his predecessor, and to represent himself as his successor in business The price that the vendor of a goodwill is content to receive is the compensation that he is content to regard as adequate for his surrender of an income equal to the future profits of the business The future profits of any business are, in the nature of things, incalculable

The Result of Fair Dealing.—At one time it used to be thought that the goodwill of a business consisted solely of the goodwill of its customers, and represented the reputation that the business had acquired in their minds as a result of fair dealing over a reasonably extended period of time Modern thought recognizes that, second only to the esteem of customers, is the esteem of supplying houses and employees

Writing down Goodwill.—Many persons take the view that goodwill is an unsatisfactory item to appear in a balance sheet The earning power of every business fluctuates from year to year, thus, the actual value of goodwill also fluctuates No attempt would ever be made to record these fluctuations in successive balance sheets, as that would give rise to confusion and serve no useful purpose, but goodwill is very commonly written down year by year when the profits are sufficiently large to make that practice possible, and many persons confuse this with the writing down of such wasting assets as plant and machinery to provide for depreciation As a matter of fact, the goodwill of a business does not "depreciate" unless the business is a temporary one Paradoxical as it may seem, goodwill is in practice written down only when in fact its value is increasing

Bibliography—L R Dicksee and F Tillyard's *Goodwill and its Treatment in Accounts* (4th ed 1920) (L R D)

GOODWIN, JOHN (*c* 1594–1665), English Nonconformist divine, was born in Norfolk and educated at Queens' college, Cambridge, where he was elected fellow in 1617 He was vicar of St Stephen's, Coleman street, London, from 1633 to 1645, when he was ejected by parliament for his attacks on Presbyterianism, especially in his Θεομαχία (1644) He established an independent congregation, and put his literary gifts at Oliver Cromwell's service In 1648 he justified the proceedings of the army against the parliament ("Pride's Purge") in a pamphlet *Might and Right*

Well Met, and in 1649 defended the proceedings against Charles I (to whom he had offered spiritual advice) in 'Υβριστοδίκαι At the Restoration this tract, with some that Milton had written to Monk in favour of a republic, was publicly burnt, and Goodwin was ordered into custody, though finally indemnified. He died in 1665.

Among his other writings are *Anti-Cavalierisme* (1642), a translation of the *Stratagemata Satanae* of Giacomo Aconcio, the Elizabethan advocate of toleration, *Redemption Redeemed, containing a thorough discussion of . . election, reprobation and the perseverance of the saints* (1651, reprinted 1840) John Wesley published an abridged edition of his *Imputatio fidei* See *Life* by T Jackson (1839)

GOODWIN, THOMAS (1600–1680), English Nonconformist divine, was born at Rollesby, Norfolk, on Oct 5, 1600, and was educated at Christ's college, Cambridge, and became a fellow of Catharine Hall In 1625 he was licensed a preacher of the university; he became lecturer and then vicar (1632) of Trinity church, Cambridge Worried by his bishop, who was a zealous adherent of Laud, he resigned all his preferments and left the university in 1634. He lived for some time in London; but in 1639 he withdrew to Holland Returning to London soon after Laud's impeachment by the Long Parliament, he became minister of an independent congregation in Lime St, East London In 1643 he was chosen a member of the Westminster Assembly, and at once identified himself with the Congregational party In 1650 he became president of Magdalen college, Oxford, a post which he held until the Restoration He was one of Cromwell's intimate advisers, attending him on his death-bed He was also a commissioner for the inventory of the Westminster Assembly, 1650, and for the approbation of preachers, 1653, and together with John Owen (*q v*) drew up an amended Westminster Confession in 1658 From 1660 until his death on Feb 23, 1680 he lived in London as pastor of the Fetter Lane Independent church

See his *Works* (5 vols, 1681–1704, reprinted 12 vols, Edin, 1861–66), a memm prefixed to vol v of his *Works*, and a sketch by Addison in No 494 of the *Spectator*

GOODWIN, WILLIAM WATSON (1831–1912), American classical scholar, was born in Concord, Mass, on May 9, 1831 He graduated at Harvard in 1851, studied at Bonn, Berlin and Göttingen, receiving his Ph D degree from there in 1855, was tutor in Greek at Harvard in 1856–60, and Eliot professor of Greek thereafter until his retirement in 1901 He became an overseer of Harvard in 1903. In 1882–83 he was the first director of the American School of Classical Studies at Athens Goodwin edited the *Panegyricus* of Isocrates (1864) and Demosthenes' *De Corona* (1901), and assisted in preparing the 7th edition of Liddell and Scott's *Greek-English Lexicon* He revised an English version by several writers of *Plutarch's Morals* (5 vol, 1871), and published the Greek text with literal English version of Aeschylus' *Agamemnon* for the Harvard production of that play in June 1906 As a teacher he did much to raise the tone of classical reading from that of a mechanical exercise to literary study But his most important work was his *Syntax of the Moods and Tenses of the Greek Verb* (1860, enlarged ed 1890) Besides making accessible to American students the works of Madvig and Kruger, it presented original matter, including a "radical innovation in the classification of conditional sentences," notably the "distinction between particular and general suppositions" Both this and his *Greek Grammar* (1870) in later editions are largely dependent on the theories of Gildersleeve for additions and changes He died in Cambridge, Mass, on June 16, 1912

GOODWIN SANDS, a dangerous line of shoals at the entrance to the Strait of Dover from the North sea, about 6 m from the Kent coast of England, from which they are separated by and form shelter for, the anchorage of the Downs The shifting sands are partly exposed at low water and in spite of lights and bell-buoys, are frequently the scene of wrecks, while attempts to erect a lighthouse have failed Tradition finds in the Goodwins the remnant of an island called Lomea, which belonged to Earl Godwine (11th century) and was afterwards submerged Four lightships mark the limits of the sands, and also signal to the lifeboat stations on the coast when any vessel is in distress on the sands

GOODYEAR, CHARLES (1800–1860), American inventor, was born at New Haven (Conn), Dec. 29, 1800, the son of Amasa Goodyear, an inventor (especially of farming implements) and a pioneer in the manufacture of hardware in America. In 1821 he entered into a partnership with his father at Naugatuck, which continued till 1830. Already he was interested in an attempt to discover a method of treatment by which india-rubber could be made into articles that would stand extremes of heat and cold. To the solution of this problem the next ten years of his life were devoted For a time he seemed to have succeeded with a treatment of the rubber with *aqua fortis* In 1836 he secured a contract for the manufacture by this process of mail bags for the U S. Government, but the rubber fabric was useless at high temperatures In 1837 he worked with Nathaniel Hayward (1808–65), who had been an employee of a rubber factory in Roxbury and had made experiments with sulphur mixed with rubber Goodyear bought from Hayward the right to use this imperfect process In 1839, by dropping on a hot stove some india-rubber mixed with sulphur, he discovered accidentally the process for the vulcanization of rubber In 1844 his first patent was granted Numerous infringements had to be fought in the courts, the decisive victory coming in 1852 In the same year he went to England, where articles made under his patents had been displayed at the International Exhibition of 1851, but he was unable to establish factories there In France a company for the manufacture of vulcanized rubber by his process failed, and in Dec 1855 he was arrested and imprisoned for debt in Paris He died in New York city July 1, 1860 He wrote an account of his discovery entitled *Gum-Elastic and Its Varieties* (2 vols, New Haven, 1853–55)

See also B K Peirce, *Trials of an Inventor, Life and Discoveries of Charles Goodyear* (New York, 1866), James Parton, *Famous Americans of Recent Times* (Boston, 1867), and Herbert L. Terry, *India Rubber and Its Manufacture* (New York, 1907).

GOODYEAR TIRE AND RUBBER COMPANY, founded in 1898 at Akron, O, began as a manufacturer of bicycle and carriage tyres. It soon entered the field of automobile tyre manufacture, research and development, and by 1916 had become the largest tyre company in existence, and in 1926 the largest manufacturer of rubber products It is the principal American manufacturer of lighter-than-air craft More than 1,100 passenger-carrying balloons, observation, kite and free balloons, and more than 100 dirigible airships have been built by the company, including the semi-rigid U S army airship RS-1.

The company has subsidiary tyre factories at Toronto and Bowmanville, Ontario, Can; at Los Angeles, and in England and Australia; textile mills for making tyre fabric in Los Angeles, Goodyear, Conn, New Bedford, Mass, Cedartown, Ga and St. Hyacinthe, Quebec; a 40,000 ac cotton plantation in Southern Arizona, a 50,000 ac plantation in Sumatra, and its own coal mines in southern Ohio It has branches or sales representation throughout the world. For its 35,000 employees, the company has developed an industrial university at Akron, with some 2,000 employee-students and a curriculum ranging from Americanization subjects and business administration to rubber chemistry. In 1906 the company's total annual sales were approximately $2,000,000; twenty years later they exceeded $200,000,000

GOOGE, BARNABE (1540–1594), English poet, son of Robert Googe, recorder of Lincoln, was born at Alvingham, Lincolnshire He studied at Christ's college, Cambridge, and at New college, Oxford He was attached to the household of his kinsman, Sir William Cecil, and in 1563 became a gentleman pensioner to Queen Elizabeth. His poems appeared in 1563 as *Eglogs, Epytaphes and Sonettes* Googe was provost-marshal of the court of Connaught, and some 20 letters of his in this capacity are preserved in the record office He was an ardent Protestant, and his poetry is coloured by his religious and political views

His other works include a translation from Marcellus Palingenius (said to be an anagram for Pietro Angelo Manzolli) of a satirical Latin poem, *Zodiacus vitae* (Venice, 1531?), in 12 books, under the title of *The Zodyake of Life* (1560); *The Popish Kingdome, or Reign of Antichrist* (1570), translated from Thomas Kirchmayer or Naogeorgus; *The Spiritual Husbandrie* from the

same author, printed with the last; *Foure Bookes of Husbandrie* (1577), collected by Conradus Heresbachius, and *The Proverbs of . . . Lopes de Mendoza* (1579).

GOOLE, urban district, market town and river-port, in the Pontefract parliamentary division of the West Riding of Yorkshire, England, at the confluence of the Don and the Ouse, 24 m. W. by S. from Hull, and served by the L M S and L N.E railways. Pop (1921), 19,111 It is situated on very low-lying land, on the right bank of the Ouse, at its last bridging place The river later widens to the broad channel of the Humber The town owes its existence to the construction of the Knottingley canal, in 1826, by the Aire and Calder Navigation company, after which, in 1829, Goole was created a landing port. The port was administratively combined with that of Hull in 1885. It is 47 m from the North sea (mouth of the Humber), and a wide system of inland navigation opens from it There are eight docks supplied with timber ponds, quays, warehouses, etc. The depth of water is 21 or 22 ft. at high water, spring tides Chief exports are coal, stone, woollen goods, machinery, cotton (raw and waste), and hams, imports include butter, fruit, indigo, logwood, linen yarn, wool and timber. Iron founding and the manufacture of alum, sugar, rope and agricultural implements form the principal industries Shipbuilding is also carried on, and there is a large dry dock and patent slip for repairing vessels Passenger steamship services are worked in connection with the L N E railway to Amsterdam, Antwerp, Bruges, Copenhagen, Rotterdam and other north European ports

GOOSE, the common name for birds forming the sub-family *Anserinae* of the *Anatidae* Technically "goose" is the female, the male being "gander" Geese differ from ducks in that the sexes are alike and that the male assists the female in the duties of rearing the young At the close of the breeding season they moult their wing quills and may then be easily approached. When in company, geese usually fly in a V-shaped formation

The type of the sub-family is the grey-lag goose (*Anser anser*), from which the domestic goose has been derived (*see* POULTRY) It breeds in suitable localities from Lapland to Spain, and from Scotland to China The nest is placed in heather or grass and five or six eggs form a clutch The genus *Anser* constitutes the "grey" geese, and includes, besides the grey-lag, the bean-goose (*A fabalis*), the pink-footed goose (*A brachyrhynchus*) and the white-fronted goose (*A albifrons*), all breeding in the northern part of the Old World and migrating south in winter American members of the genus are *A gambeli* and, in its northern portions, the snow-geese, of which the commonest is *A hyperboreus*, the snow goose proper, white with black primaries, and *A canagica*, the emperor goose of the Aleutian Islands South America possesses the genus *Chloephaga*, which includes the kelpgoose, *C. antarctica*, and the upland goose, *C magellanica*

The "black" geese include the barnacle-goose (*Branta leucopsis*), breeding in Spitsbergen, north-east Greenland and north-west Siberia, supposed of old to be produced from barnacles (*Lepadidae*), and the brent-goose, *B bernicla*, with a circumpolar breeding range To this group also belongs the well-known Canada goose (*B canadensis*) of America Other species occur in North America, Asia and the Hawaiian archipelago

The largest living goose is the Chinese goose, *Cygnopsis cygnoides*, the origin of the eastern domestic races *Cnemiornis calcitrans* is a fossil goose from New Zealand, remarkable for its extraordinary *patella*, and its loss of flight The Egyptian and Orinoco geese (*Chenalopex*) are of doubtful affinities and possess an enlargement of the junction of the bronchial tubes and trachea —a characteristic of the ducks (*Anatinae*)

GOOSEBERRY, *Ribes Grossularia*, a well-known fruit-bush of northern and central Europe, placed in the same genus of the family Saxifragaceae as the closely allied currants It forms a distinct section *Grossularia*, the members of which differ from the true currants chiefly in their spinous stems, and in their flowers growing on short foot-stalks, solitary, or two or three together, instead of in racemes

The wild gooseberry is a small, straggling bush, nearly resembling the cultivated plant,—the branches being thickly set with sharp spines, standing out singly or in diverging tufts of two or three from the bases of the short spurs or lateral leaf shoots, on which the bell-shaped flowers are produced, singly or in pairs, from the groups of rounded, deeply-crenated 3- or 5-lobed leaves The fruit is smaller than in the garden kinds, but is often of good flavour; it is generally hairy, but in one variety smooth; the colour is usually green, but plants are occasionally met with having



GOLDEN DROP GOOSEBERRY (RIBES GROSSULARIA), A SPINY EUROPEAN FRUIT, DIFFICULT TO GROW IN AMERICA BECAUSE OF THE CLIMATE

deep purple berries The gooseberry is indigenous in Europe and western Asia, growing naturally in alpine thickets and rocky woods in the lower country, from France eastward, perhaps as far as the Himalayas In Britain it is often found in copses and hedgerows and about old ruins, but has been so long a plant of cultivation that it is difficult to decide upon its claim to a place in the native flora of the island Of the many hundred sorts enumerated in horticultural works, few equal in flavour some of the older denizens of the fruit-garden, such as the "old rough red" and "hairy amber" The climate of the British Isles seems peculiarly adapted to bring the gooseberry to perfection, and it may be grown successfully even in the most northern parts of Scotland, indeed, the flavour of the fruit is said to improve with increasing latitude. In Norway the bush flourishes in gardens on the west coast nearly up to the Arctic Circle, and it is found wild as far north as 63°. The dry summers of the French and German plains are less suited to it, though it is grown in some hilly districts with tolerable success It will succeed in almost any soil, but prefers a rich loam or black alluvium, and, though naturally a plant of rather dry places, will do well in moist land, if drained

The varieties are easily propagated by cuttings planted in the autumn, which root rapidly, and in a few years form good fruit-bearing bushes Much difference of opinion prevails regarding the mode of pruning this valuable shrub, it is probable that in different situations it may require varying treatment The fruit being borne on the lateral spurs, and on the shoots of the last year, it is the usual practice to shorten the side branches in the winter, before the buds begin to expand When large fruit is desired, plenty of manure should be supplied to the roots, and the greater portion of the berries picked off while still small If standards are desired, the gooseberry may be grafted or budded with advantage on stocks of some other species of *Ribes, R aureum*, the ornamental golden currant of the flower garden, answering well for the purpose The bushes at times suffer much from the ravages of the caterpillars of the gooseberry or magpie moth, *Abraxas grossulariata*, which often strips the branches of leaves in the early summer, if not destroyed before the mischief is accomplished The

most effectual way of getting rid of this destructive insect is to look over each bush carefully, and pick off the larvae by hand Equally annoying in some years is the smaller larva of the V-moth, *Halias vanaria*, which often appears in great numbers, and is not so readily removed The gooseberry is sometimes attacked by the grub of the gooseberry sawfly, *Nematus ribesii*, of which several broods appear in the course of the spring and summer, and are very destructive For the destruction of the first broods it has been recommended to syringe the bushes with tar-water, perhaps a very weak solution of carbolic acid might prove more effective The powdered root of white hellebore is said to destroy both this grub and the caterpillars of the gooseberry moth and V-moth, infusion of foxglove, and tobacco-water, are likewise tried by some growers If the fallen leaves are carefully removed from the ground in the autumn and burnt, and the surface of the soil turned over with the fork or spade, most eggs and chrysalids will be destroyed

The gooseberry was introduced into the United States by the early settlers, and in some parts of New England large quantities of the green fruit are produced and sold for culinary use in the towns, but the excessive heat of the American summer is not adapted for the healthy maturation of the berries, especially of the English varieties, and the attacks of the American gooseberry mildew have largely contributed to the failure of the crop in America

Occasionally the gooseberry is attacked by a fungus once called *Aecidium Grossulariae*, which forms little cups with white torn edges clustered together on reddish spots on the leaves or fruits The spores contained in these cups will not reproduce the disease on the gooseberry, but infect species of *Carex* (sedges), on which they produce a fungus of a totally different appearance This stage in the life-history of the parasite gives its name to the whole fungus and it is now known as *Puccinia Pringsheimiana* Both *uredospores* and *teleutospores* are formed on the sedge, and the latter live through the winter and produce the disease on the gooseberry in the succeeding year

A much more prevalent disease is that caused by *Microsphaera Grossulariae* This is a mildew growing on the surface of the leaf and sending suckers into the epidermis The white mycelium gives the leaves of the plant the appearance of having been whitewashed There are numerous white spores produced in the summer which are able to germinate immediately, and later small blackish fruits (*perithecia*) are produced that pass uninjured through the winter liberating the spores they contain in the spring, which infect the young developing leaves of the bush In bad cases the plants are greatly injured but frequently little harm is done

An allied fungus, *Sphaerotheca mors-uvae*, of much greater virulence, causes the disease known as "American gooseberry mildew" For the most part the mode of attack is similar to that of the last-mentioned, but not only are the leaves attacked, but the tips of the young shoots and the fruits become covered by the cobweb-like mycelium, the attack frequently resulting in the death of the shoots and the destruction of the fruits After a time the mycelium becomes rusty brown and produces the winter form of the fungus Through the winter the shoots are covered thickly with the brown mycelium and in the spring the spores contained in the perithecia germinate and start the infection anew, as in the case of the European mildew

The gooseberry, when ripe, yields a wine by the fermentation of the juice with water and sugar, the resulting sparkling liquor retaining much of the flavour of the fruit By similarly treating the juice of the green fruit, picked just before it ripens, an effervescing wine is produced, nearly resembling some kinds of champagne, and, when skilfully prepared, far superior to much of the liquor sold under that name Brandy has been made from ripe gooseberries by distillation, by exposing the juice with sugar to the acetic fermentation, a good vinegar may be obtained The gooseberry, when perfectly ripe, contains a large quantity of sugar, most abundant in the red and amber varieties, in the former it amounts to from 6 to upwards of 8% The acidity of the fruit is chiefly due to malic acid

Several other species of the sub-genus produce edible fruit, though none have been brought under economic culture. Among them may be noticed *R oxyacanthoides* and *R Cynosbati*, abundant in Canada and the northern United States, and *R gracile*, common along the Allegheny range The group is widely distributed in the north temperate zone,—one species is found in Europe extending to the Caucasus and North Africa (Atlas Mountains), five occur in Asia and nineteen in North America, the range extending southwards to the republics of Mexico and Guatemala

GOOSSENS, EUGENE (1893–), English composer and conductor, was born at Bordeaux on May 26, 1893, being the son of a Belgian musician of the same name who has settled in England and is well known as an excellent operatic conductor His musical training was received at Bruges conservatoire, the Liverpool School of Music and the Royal College of Music, London In 1921, after he had for some years been associated with Sir Thomas Beecham, he organized an orchestra of his own and gave some concerts of modern chamber music He has since then conducted the London Symphony orchestra, the new Rochester orchestra (U S A), the Russian Ballet, and the Beecham National and Carl Rosa opera companies In composition his output is already considerable Of particular interest is his chamber music, which includes Suite for flute, violin and harp op 6, "Five Impressions of a Holiday" for piano, flute or violin, and 'cello, Fantasy for string quartet, string quartet op 14, a quintet, and a sextet for strings He has also written songs and arrangements of folk-songs, piano, 'cello, and violin pieces; and works for orchestra

GOOTY, a town and hill fortress of southern India, in the Anantapur district of Madras, 48 m E of Bellary, with a station on the Madras and Southern Mahratta railway Pop (1921) 8,720 The town is surrounded by a circle of rocky hills, connected by a wall On the highest stands the citadel, 2,100 ft above sea-level Here was the stronghold of Morari Rao Ghorpade, a famous Mahratta warrior and ally of the English, who was ultimately starved into surrender by Hyder Ali in 1775

GOPHER, the name applied in North America to certain burrowing, squirrel-like rodents, as the pocket gopher (*Geomys bursarius*), of the Mississippi valley, and the northern pocket gopher (*Thomomys talpoides*), common west of the Rocky Mountains, both exceedingly destructive to crops The gopher turtle (*Gopherus polyphemus*), native to the Southern States, likewise lives in burrows and often does great damage to crops

GÖPPINGEN, a town of Germany, in the republic of Wurttemberg, on the Fils, 22 m E S E of Stuttgart on the railway to Friedrichshafen Pop (1925) 22,017 Goppingen originally belonged to the Hohenstaufen, and in 1270 came into possession of the counts of Wurttemberg It was surrounded by walls in 1129, and was rebuilt after a fire in 1782 It possesses a castle built partly with stones from the ruined castle of Hohenstaufen which stands 3 m N of the town, by Duke Christopher of Wurttemberg in the 16th century and now used as public offices The manufactures include linen and woollen cloth, electric motors, leather, glue, paper and toys There are machine shops and tanneries in the town It has a chalybeate spring

GORAKHPUR, a city, district and division of the United Provinces of British India The city is situated on the left bank of the river Rapti Pop (1921) 50,498 It is believed to have been founded about A D 1400 It is the civil headquarters of the district and an important depot for recruits coming from Nepal to join the Gurkha regiments of the Indian army It is also the headquarters of the Bengal and North-western railway, with its workshops and a large settlement of European employees The town itself is little better than a collection of adjacent village sites, sometimes separated by cultivated land, and most of the inhabitants are agriculturists

The DISTRICT OF GORAKHPUR has an area of 4,528 sq m It lies immediately south of the lower Himalayan slopes, but itself forms a portion of the great alluvial plain Only a few sandhills break the monotony of its level surface, which is, however, intersected by numerous rivers (Gōgra, Gandak, Rapti and others) studded with lakes and marshes In the north and centre dense

forests abound, and the district is not subject to very intense heat, from which it is secured by its vicinity to the hills and the moisture of its soil

Gautama Buddha was born, and died near the boundaries of the district, and near Kasia are remains which were long (but probably erroneously) believed to mark his burial-place From the beginning of the 6th century the country was the scene of a continuous struggle between the Bhars and their Rajput antagonists, the Rathors Towards the end of the 16th century the Mohammedans occupied Gorakhpur town, but they interfered very little with the district, and allowed it to be controlled by the local rajas In the middle of the 18th century a formidable foe, the Banjaras from the west, so weakened the power of the rajas that they could not resist the fiscal exactions of the Oudh officials, who plundered the country to a great extent The district formed part of the territory ceded by Oudh to the British under the treaty of 1801 The population in 1921 was 3,266,830



FROM RUSSEL, "TRIBES AND CASTES OF CENTRAL INDIA"

BANJARA WOMAN WITH THE SINGH OR HORN

The Division comprises the three districts of Gorakhpur, Basti and Azamgarh, and has an area of 9,543 sq m The population in 1921 was 6,720,715, giving an average density of 704 persons per sq m , the highest for any large tract in India

GORAL (*Urotragus goral*), a small Himalayan rough-haired cylindrical-horned ruminant related to the chamois The native name is often extended to all the members of the genus In addition to peculiarities in the form of the skull, gorals are chiefly distinguished from serows (*q v*) by not possessing a gland below the eye Several species are known, ranging from the Himalaya to Burma and through Tibet to North China

GORAMY or **GOURAMY** (*Osphromenus olfax*), one of the best-flavoured freshwater fishes in the East Indian archipelago Being omnivorous and tenacious of life, it is to be recommended for acclimatization in other tropical countries It attains the size of a large turbot Its shape is flat and short, the body covered with large scales, the dorsal and anal fins are provided with numerous spines, and the ventral fins are produced into long filaments It possesses an accessory respiratory organ above the gills, enabling it to live for some time out of water

GÖRBERSDORF, a health resort in the Prussian province of Silesia, in a valley of the Waldenburg range, 1,900 ft above the sea, 60 m S W of Breslau by the railway to Friedland Pop (1925) 1,615 It has large sanatoria for consumptives

GORBODUC, a mythical king of Britain He gave his kingdom away during his lifetime to his sons, Ferrex and Porrex The two quarrelled and the younger stabbed the elder Their mother, loving the latter most, avenged his death by murdering the other, and the people, horrified at her act, revolted and slew both her and King Gorboduc This legend was the subject of the earliest regular English tragedy written by Thomas Sackville, Lord Buckhurst and Thomas Norton in collaboration Produced in 1561, it was first published very corruptly in 1565, and in better form as *The Tragedy of Ferrex and Porrex* in 1570

GORCHAKOV or GORTCHAKOFF, a noble Russian family, descended from Michael Vsevolodovich, prince of Chernigov, who, in 1246, was assassinated by the Mongols PRINCE ANDREY IVANOVICH (1768–1855), general in the Russian army, took a conspicuous part in the final campaigns against Napoleon ALEXANDER IVANOVICH (1769–1825) served with distinction under his relative Suvarov in the Turkish Wars, and took part as a general officer in the Italian and Swiss operations of 1799, and in the war against Napoleon in Poland in 1806–1807 (battle of Heilsberg) PETR DMITRIEVICH (1790–1868) served under Kamenski and Kutusov in the campaign against Turkey, and afterwards against France in 1813–14 In 1820 he suppressed an insurrection in the Caucasus, for which service he was raised to the rank of major-general. In 1828–29 he fought under Wittgenstein against the Turks, won an action at Aidos, and signed the treaty of peace at Adrianople In 1839 he was made governor of Eastern Siberia, and in 1851 retired into private life When the Crimean War broke out he offered his services to the emperor Nicholas, by whom he was appointed general of the VI army corps in the Crimea He commanded the corps in the battles of Alma and Inkerman He retired in 1855 and died at Moscow, on March 18, 1868 Other members of the family are separately noted.

GORCHAKOV, PRINCE ALEXANDER MIKHAILOVICH (1798–1883), Russian statesman, cousin of Princes Petr and Mikhail Gorchakov, was born on July 16, 1798, and was educated at the lyceum of Tsarskoye Selo On leaving the lyceum Gorchakov entered the foreign office under Count Nesselrode When the German confederation was re-established in 1850 in place of the parliament of Frankfort, Gorchakov was appointed Russian minister to the diet, and formed with Bismarck a friendship which was afterwards renewed at St Petersburg Gorchakov was then transferred to Vienna, where he remained through the critical period of the Crimean War Although he attended the Paris conference of 1856, he abstained from signing the treaty of peace Alexander II then appointed him minister of foreign affairs in place of Count Nesselrode Gorchakov was appointed chancellor, and was, for a time, the most powerful minister in Europe

When the conflict arose between Austria and Prussia in 1866, Russia remained neutral, and when the Franco-German war of 1870–71 broke out Russia answered for the neutrality of Austria In 1875 Bismarck was suspected of a design of again attacking France, and Gorchakov let it be known that Russia would oppose any such scheme Slavophil agitation produced the Russo-Turkish campaign of 1877–78 At the congress of Berlin (June 13 to July 13, 1878) the aged chancellor held nominally the post of first plenipotentiary, but left to Count Shuvalov the odium for the concessions which Russia had to make to Great Britain and Austria He died at Baden-Baden on March 11, 1883

See Charles-Roux, *Alexandre II, Gorchakov et Napoleon III.* (1913)

GORCHAKOV, PRINCE MIKHAIL DMITRIEVICH (1795–1861), served in the campaigns against Persia in 1810, and in 1812–15 against France During the Russo-Turkish War of 1828–29 he was present at the sieges of Silistria and Shumla After being appointed, in 1830, a general officer, he was present in the campaign in Poland, and was wounded at the battle of Grochow Feb 25 (1831) He also distinguished himself at the battle of Ostrolenka and at the taking of Warsaw In 1846 he was nominated military governor of Warsaw In 1849 he commanded the Russian artillery in the war against the Hungarians, and in 1852 he visited London as the representative of the Russian army at the funeral of the duke of Wellington At this time he was chief of the staff of the Russian army and adjutant-general to the tsar Upon Russia declaring war against Turkey in 1853, he was appointed commander-in-chief of the troops which occupied Moldavia and Wallachia In 1854 he crossed the Danube and besieged Silistria, but was superseded in April by Prince Paskevich, who, however, resigned on June 8, when Gorchakov resumed the command In July the siege of Silistria was raised, and the Russian armies recrossed the Danube, in August they withdrew to Russia In 1855 he was appointed commander-in-chief of the Russian forces in the Crimea in place of Prince Menshikov Gorchakov's defence of Sevastopol, and final retreat to the northern part of the town, which he continued to defend till peace was signed in Paris, were conducted with skill and energy In 1856 he was appointed governor-general of Poland in succession to Prince Paskevich He died at Warsaw on May 30, 1861, and was buried, in accordance with his own wish, at Sevastopol

GORDIAN or **GORDIANUS,** the name of three Roman emperors The first, Marcus Antonius Gordianus Sempronianus Romanus Africanus (A D 159–238), an extremely wealthy man, was descended from the Gracchi and Trajan Alexander Severus made him governor of Africa, and during his proconsulship occurred the usurpation of Maximin The universal discontent under

Maximin ended in a revolt in Africa in 238, and Gordian reluctantly yielded to the popular clamour and assumed the purple His son, Marcus Antonius Gordianus (192–238), was associated with him The Senate and most of the provinces supported them But after a siege of 36 days they fell before Cappellianus, a supporter of Maximin The Senate continued the revolt against Maximin and elected M Antonius Gordianus Pius (224–244), grandson of the elder Gordian, joint emperor with two Senators The death of Maximin and the murder of Gordian's colleagues by the praetorians left Gordian sole emperor. For some time he was under the control of his mother's eunuchs, till Timesitheus, his father-in-law and praefect of the praetorian guard, persuaded him to assert his independence When the Persians under Shapur (Sapor) I (*q v*) invaded Mesopotamia, the young emperor opened the temple of Janus for the last time recorded in history, and marched in person to the East The Persians were driven back over the Euphrates and defeated in the battle of Resaena (243), and only the death of Timesitheus (under suspicious circumstances) prevented an advance into the enemy's territory Philip the Arabian, who succeeded Timesitheus, stirred up discontent in the army, and Gordian was murdered by the mutinous soldiers in Mesopotamia

See lives of the Gordians by Capitolinus in the *Scriptores historiae Augustae;* Herodian VII VIII, Zosimus I 16, 18, Ammianus Marcellinus XXIII. 5, Eutropius IX 2; Aurelius Victor, *Caesares,* 27, article SHAPUR (I); Pauly-Wissowa, *Realencyclopadie,* I 2619 f (von Rohden).

GORDIAN KNOT: *see* GORDIUM

GORDIUM, an ancient city of Phrygia on the road from Pessinus to Ancyra, and not far from the Sangarius Its site lies opposite the village Pebi, a little north of the point where the Constantinople-Angora railway crosses the Sangarius According to the legend, Gordium was founded by Gordius, a Phrygian peasant who had been called to the throne by his countrymen in obedience to an oracle of Zeus commanding them to select the first person that rode up to the temple of the god in a wagon The king afterwards dedicated his car to the god, and another oracle declared that whoever succeeded in untying the strangely entwined knot of cornel bark which bound the yoke to the pole should reign over all Asia Alexander the Great, according to the story, cut the knot by a stroke of his sword Gordium was captured and destroyed by the Gauls soon after 189 B C and disappeared from history In imperial times only a small village existed on the site

See *Jahrbuch des Instituts,* Erganzungsheft v. (1904)

GORDON, the name of a Scottish family, no fewer than 157 main branches of which are traced by the family historians A laird of Gorden, in Berwickshire, near the English border, is said to have fallen in the battle of the Standard (1138) The families of the two sons ascribed to him by tradition, Richard Gordon of Gordon and Adam Gordon of Huntly, were united by the marriage of their great-grandchildren Alicia and Sir Adam, whose grandson Sir Adam (killed at Halidon Hill, 1333) at first took the English side in the Scottish struggle for independence, and is the first member of the family definitely to emerge into history He was justiciar of Scotland in 1310, but after Bannockburn he attached himself to Robert Bruce, who granted him in 1318 the lordship of Strathbogie in Aberdeenshire, to which Gordon gave the name of Huntly from a village on the Gordon estate in Berwickshire He had two sons, Adam and William The younger son, laird of Stitchel in Roxburghshire, was the ancestor of William de Gordon of Stitchel and Lochinvar, founder of the Galloway branch of the family represented in the Scottish peerage by the dormant viscounty of Kenmure (*q v*), created in 1633; most of the Irish and Virginian Gordons are offshoots of this stock The elder son, Adam, inherited the Gordon-Huntly estates He had two grandsons, Sir John (d 1394) and Sir Adam (slain at Homildon Hill, 1403) Sir John had two illegitimate sons, Jock of Scurdargue, the ancestor of the earls of Aberdeen, and Tam of Ruthven From these two stocks most of the northern Gordon families are derived. Sir Adam's daughter and heiress, Elizabeth, married Sir Alexander Seton, and with her husband was confirmed in 1408 in the possession of the barony of Gordon and Huntly in Berwickshire and of the Gordon lands in Aberdeen. The Seton-Gordons are their descendants. Their son Alexander was created earl of Huntly (*see* HUNTLY, EARLS AND MARQUESSES OF), probably in 1445; and his heirs became dukes of Gordon, George Gordon (*c.* 1650–1716), 4th marquess of Huntly, being created duke of Gordon in 1684. His son Alexander, 2nd duke of Gordon (*c* 1678–1728), joined the Old Pretender, but gained the royal pardon after the surrender of Gordon castle in 1716 Of his children by his wife Henrietta Mordaunt, second daughter of Charles Mordaunt, earl of Peterborough, Cosmo George (*c.* 1720–1752) succeeded as 3rd duke; Lord Lewis Gordon (d 1754) took an active part in the Jacobite rising of 1745; and General Lord Adam Gordon (*c.* 1726–1801) became commander of the forces in Scotland in 1782, and governor of Edinburgh Castle in 1786 Lord George Gordon (*q v*) was a younger son of the 3rd duke



BY COURTESY OF AMERICAN MUSEUM OF NATURAL HISTORY

A PIPER OF THE GORDON HIGHLANDERS, A SCOTTISH REGIMENT ORGANIZED IN 1796

The title, with the earldom of Norwich and the barony of Gordon Huntly, became extinct on the death of George, 5th duke (1770–1836), a distinguished soldier who raised the corps now known as the 2nd battalion of the Gordon Highlanders The marquessate of Huntly passed to his cousin and heir-male, George, 5th earl of Aboyne Lady Charlotte Gordon, sister of and co-heiress with the 5th duke, married Charles Lennox, 4th duke of Richmond, whose son took the name of Gordon-Lennox The dukedom of Gordon was revived in 1876 in favour of the 6th duke of Richmond, who thenceforward was styled duke of Richmond and Gordon Adam Gordon of Aboyne (d 1537) took the courtesy title of earl of Sutherland in right of his wife Elizabeth, countess of Sutherland in her own right, sister of the 9th earl The lawless and turbulent Gordons of Gight were the maternal ancestors of Lord Byron.

Among the many soldiers of fortune bearing the name of Gordon was Colonel John Gordon, one of the murderers of Wallenstein Patrick Gordon (1635–99) was born at Auchleuchries in Aberdeenshire, entered the service of Charles X of Sweden in 1651 and served against the Poles He changed sides more than once before he found his way to Moscow in 1661 and took service under the tsar Alexis He became general in 1687; in 1688 he helped to secure Peter the Great's ascendancy; and later he crushed the revolt of the Streltzi His diary was published in German (3 vols, 1849–53, Moscow and St. Petersburg), and selections from the English original by the Spalding Club (Aberdeen, 1859)

The Gordons fill a considerable place in Scottish legend and ballad. "Captain Car," or "Edom (Adam) of Gordon" describes an incident in the struggle between the Forbeses, and Gordons in Aberdeenshire in 1571; "The Duke of Gordon's Daughter" has apparently no foundation in fact, though "Geordie" of the ballad is sometimes said to have been George, 4th earl of Huntly; "The Fire of Frendraught" goes back to a feud (1630) between James Crichton of Frendraught and William Gordon of Rothiemay, the "Gallant Gordons Gay" figure in "Chevy Chase"; William Gordon of Earlston, the Covenanter, appears in "Bothwell Bridge," etc

See William Gordon (of old Aberdeen), *The History of the Ancient, Noble, and Illustrious House of Gordon* (2 vols, Edinburgh, 1726–27), of which *A Concise History of the . House of Gordon,* by C A. Gordon (Aberdeen, 1754) is little more than an abridgment; *The Records of Aboyne, 1230–1681,* edited by Charles, 11th marquess of Huntly (New Spalding Club, Aberdeen, 1894); *The Gordon Book,* ed. J M Bulloch (1902); *The House of Gordon,* ed. J M. Bulloch (Aberdeen, vol. I, 1903); and J M. Bulloch, *The First Duke of Gordon* (1909)

GORDON, ADAM LINDSAY (1833–1870), Australian poet, was born at Fayal, in the Azores, in 1833, the son of a retired Indian officer who taught Hindustani at Cheltenham college Young Gordon was educated there and at Merton college, Oxford,

but a youthful indiscretion led to his being sent in 1853 to South Australia, where he joined the mounted police He then became a horsebreaker, but on his father's death he inherited a fortune and obtained a seat in the House of Assembly At this time he had the reputation of being the best non-professional steeplechase rider in the colony In 1867 he moved to Victoria and set up a livery stable at Ballarat Two volumes of poems, *Sea Spray and Smoke Drift* and *Ashtaroth,* were published in this year, and two years later he gave up his business and settled at New Brighton, near Melbourne A second volume of poetry, *Bush Ballads and Galloping Rhymes,* appeared in 1870 It brought him more praise than money, and, discouraged by his failure to make good his claim to some property in Scotland to which he believed himself entitled, he committed suicide on June 24, 1870 Much of Gordon's poetry might have been written in England, when, however, it is really local, it is vividly so, his genuine feeling frequently kindles into passion; his versification is always elastic and sonorous, but sometimes too reminiscent of Swinburne

Gordon's *Poems* were edited by F M Robb (1912), with a biographical introduction. *See* also J Howlett-Ross, *The Laureate of the Centaurs,* etc. (1888); E. Humphries and D. Sladen, *Adam Lindsay Gordon* (1912).

GORDON, ALEXANDER (*c* 1692–*c* 1754), Scottish antiquary, the "Sandy Gordon" of Scott's *Antiquary* When still young he travelled abroad, probably in the capacity of tutor He returned to Scotland previous to 1726, and devoted himself to antiquarian work In 1726 appeared the *Itinerarium Septentrionale,* his greatest and best-known work In 1741 he accompanied James Glen (afterwards governor) to South Carolina Through his influence Gordon, besides receiving a grant of land in South Carolina, became registrar of the province and justice of the peace, and filled several other offices

See Sir Daniel Wilson, *Alexander Gordon, the Antiquary;* and his Papers in the *Proceedings of the Society of Antiquaries of Scotland,* with Additional Notes and an Appendix of Original Letters by Dr David Laing (*Proc Soc of Antiq of Scot* x 363–382).

GORDON, CHARLES GEORGE (1833–1885), British soldier and administrator, fourth son of Gen H W Gordon, Royal Artillery, was born at Woolwich on Jan 28, 1833 He received his early education at Taunton school, and was given a cadetship in the Royal Military Academy, Woolwich, in 1848 He was commissioned as second lieutenant in the corps of Royal Engineers on June 23, 1852 In 1854 he was sent to Pembroke dock to assist in the construction of the fortifications then being erected for the defence of Milford Haven Gordon served in the Crimean War, and took part in the siege of Sevastopol He was attached to one of the British columns which assaulted the Redan on June 18, 1855, and was present at the capture of that work on Sept 8 After the peace Gordon was attached to an international commission appointed to delimit the treaty boundary between Russia and Turkey in Bessarabia, and on the conclusion of this work was ordered to Asia Minor on similar duty on the eastern boundary While so employed Gordon studied the geography and people of Armenia, and the knowledge of dealing with eastern nations then gained was of great use to him in after life

In China.—He returned to England towards the end of 1858, and was made instructor at the Royal Engineers' establishment, but in 1860 was ordered out to China He was too late for the attack on the Taku forts, but was present at the occupation of Peking and destruction of the Summer palace He remained with the British force of occupation in northern China until April 1862, when the British troops, under the command of Gen Staveley, proceeded to Shanghai, in order to protect the European settlement at that place from the Taiping rebels The Taiping revolt, which had some remarkable points of similarity with the Mahdist rebellion in the Sudan, had commenced in 1850 in the province of Kwangsi The leader, Hung Sin Tsuan, a semi-political, semi-religious enthusiast, assumed the title of Tien Wang, or Heavenly King The imperialist troops sent against him were defeated The area of revolt extended northwards through the provinces of Hunan and Hupeh, and down the valley of the Yangtsze-kiang as far as Nanking, which was captured by the rebels in 1853 Here the Tien Wang established his court, and sent the assistant Wangs on warlike expeditions through the adjacent provinces.

The Taipings gradually advanced eastwards, and approaching Shanghai, alarmed the European inhabitants, who subscribed to raise a mixed force of Europeans and Manila men for the defence of the town This force was placed under the command of an American, Frederick Townsend Ward (1831–62) Ward's force was not altogether successful, and when Gen Staveley arrived from Tientsin he decided to clear the district of rebels within a radius of 30 m from Shanghai, and Gordon was attached to his staff as engineer officer A French force, under the command of Admiral Prôtet, co-operated with Staveley and Ward, with his little army, also assisted The country was fairly cleared of rebels by the end of 1862

Ward was, unfortunately, killed in the assault of Tseki, and Li Hung Chang, the governor of the Kiang-su province, asked for a British officer to command the contingent Staveley selected Gordon who, in March, 1863, proceeded to Sungkiang to take command of "The Ever-Victorious Army" He marched at once to the relief of Chansu, a town 40 m north-west of Shanghai The relief was successfully accomplished, and the operation established Gordon in the confidence of his troops Gordon then marched through the country, seizing town after town

Suchow was taken on Nov 29, and after its capture Gordon had a serious dispute with Li Hung Chang, who had beheaded certain rebel leaders whose lives Gordon had promised to spare if they surrendered This action, though not opposed to Chinese ethics, was so opposed to Gordon's ideas of honour that he withdrew his force from Suchow and remained inactive at Quinsan until Feb. 1864 He then came to an arrangement with Li, no allusion being made to the death of the Wangs Chanchufu, the principal military position of the Taipings, fell in May, when Gordon returned to Quinsan and disbanded his force In June the Tien Wang, seeing his cause was hopeless, committed suicide, and the capture of Nanking by the imperialist troops shortly afterwards brought the Taiping revolt to a conclusion The suppression of this serious movement was undoubtedly due in great part to the skill and energy of Gordon, who had shown remarkable qualities as a leader of men The emperor promoted him to the rank of Titu, the highest grade in the Chinese army, and also gave him the Yellow Jacket, the most important decoration in China He wished to give him a large sum of money, but this Gordon refused Henceforth he was "Chinese" Gordon

Gordon was appointed on his return to England Commanding Royal Engineer at Gravesend, where he was employed in superintending the erection of forts for the defence of the Thames He devoted himself with energy to his official duties, and his leisure hours to practical philanthropy In Oct 1871 he was appointed British representative on the international Danube Commission, with headquarters at Galatz In a visit to Constantinople in 1872 he met Nubar Pasha, prime minister of Egypt, who sounded him as to whether he would take service under the khedive In 1873 he received a definite order from the khedive, which he accepted with the consent of the British Government, and proceeded to Egypt early in 1874 He was then a colonel in the army, though still only a captain in the corps of Royal Engineers

First Visit to Egypt.—In 1820–22 Nubia, Sennar and Kordofan had been conquered by Egypt, and the authority of the Egyptians was subsequently extended southward, eastward to the Red Sea and westward over Darfur (conquered by Zobeir Pasha in 1874) The Egyptian occupation of the country led to the development of the slave trade, especially in the White Nile and Bahr-el-Ghazal districts Public opinion was moved by the accounts brought back by travellers and in 1869 the khedive Ismail decided to send an expedition up the White Nile, with the double object of limiting the evils of the slave trade and opening up the district to commerce The command of the expedition was given to Sir Samuel Baker, who reached Khartum in Feb 1870, but did not reach Gondokoro, the centre of his province, for 14 months He established a few posts along the Nile and placed some

steamers on the river. The khedive asked for Gordon's services, as governor of the equatorial regions in succession to Baker After a short stay in Cairo, Gordon proceeded to Khartum by way of Suakin and Berber, a route which he ever afterwards regarded as the best mode of access to the Sudan From Khartum he proceeded up the White Nile to Gondokoro, where he arrived in 24 days, the sudd, which had proved such an obstacle to Baker, having been removed Gordon remained in the equatorial provinces until Oct 1876, and then returned to Cairo The 2½ years thus spent in Central Africa was a time of incessant toil A line of stations was established from the Sobat confluence on the White Nile to the frontier of Uganda—to which country he proposed to open a route from Mombasa—and the slave trade was repressed The river and lake Albert were mapped by Gordon and his staff, and he sought to improve the condition of the people But Khartum and the whole of the Sudan north of the Sobat were in the hands of an Egyptian governor, independent of Gordon, and not too eager to diminish the slave trade On arriving in Cairo Gordon informed the khedive of his reasons for not wishing to return to the Sudan, but did not definitely resign the appointment of governor of the equatorial provinces; but on reaching London he telegraphed to the British consul-general in Cairo, asking him to let the khedive know that he would not go back to Egypt Ismail Pasha wrote to him saying that he had promised to return, and that he expected him to keep his word Upon this Gordon returned to Cairo, and the Khedive appointed him governor-general of the Sudan, inclusive of Darfur and the equatorial provinces.

Governor-General of the Sudan.—Gordon had now to consider the political relations between Egypt and Abyssinia, which were embittered by a dispute over the district of Bogos, claimed by both parties In March 1877 he proceeded to Massawa to endeavour to make peace with King John of Abyssinia He went up to Bogos, and had an interview with Walad Michael, an Abyssinian chief and the hereditary ruler of Bogos, who had joined the Egyptians with a view to raiding on his own account Gordon persuaded Michael to remain quiet, and wrote to the king proposing terms of peace But John, feeling pretty secure on the Egyptian frontier after his two successful actions against the khedive's troops, had gone south to fight with Menelek, king of Shoa Gordon then proceeded to Khartum Here he took up the slavery question, and proposed to issue regulations making the registration of slaves compulsory, but his proposals were not approved by the Cairo government

In the meantime an insurrection had broken out in Darfur, and Gordon had to relieve the Egyptian garrisons On coming up with the main body of rebels he saw that diplomacy gave a better chance of success than fighting, and, accompanied only by an interpreter, rode into the enemy's camp to discuss the situation. This bold move proved successful, as part of the insurgents joined him, and the remainder retreated to the south The relief of the Egyptian garrisons was successfully accomplished, and Gordon visited the provinces of Berber and Dongola, whence he had again to return to the Abyssinian frontier to treat with King John No satisfactory settlement was reached and Gordon returned to Khartum in Jan 1878 The khedive then summoned him to Cairo to assist in settling the financial affairs of Egypt He reached Cairo in March, and was appointed by Ismail as president of a commission of inquiry into the finances, on the understanding that the European commissioners of the debt should *not* be members of the commission Gordon accepted the post on these terms, but the consuls-general of the different powers protested against the constitution of the commission, and the khedive had to abandon the scheme The attempt to utilize Gordon as a counterpoise to the European financiers having failed, Ismail fell into the hands of his creditors, and was deposed by the sultan in the following year in favour of his son Tewfik Gordon returned to the Sudan and proceeded to the province of Harrar, south of Abyssinia

He dismissed Raouf Pasha, the governor, who had allowed the administration to fall into disorder, then returned to Khartum, and in 1879 went again into Darfur to pursue the slave traders, while his subordinate, Gessi Pasha, fought them in the Bahr-el-Ghazal district and killed Suleiman, their leader and a son of Zobeir This put an end to the revolt, and Gordon went back to Khartum. Shortly afterwards he went down to Cairo and was requested by the new khedive to pay a visit to King John and make a definite treaty of peace with Abyssinia Gordon was not able to do much, as the king wanted great concessions from Egypt, and the khedive's instructions were that nothing material was to be conceded. The matter ended by Gordon being made a prisoner and sent back to Massawa Thence he returned to Cairo and resigned his Sudan appointment He was exhausted by the three years' incessant work, during which he had ridden no fewer than 8,500 m on camels and mules, and was constantly engaged in the task of trying to reform a vicious system of administration

1880–1884.—In March 1880 Gordon visited Brussels, and King Leopold suggested that he should at some future date take charge of the Congo Free State In April the Government of Cape Colony telegraphed to him offering the position of commandant of the local forces, but he declined the appointment In May the marquess of Ripon, governor-general of India, asked Gordon to go with him as private secretary Gordon accompanied him to India, but definitely resigned his post on Lord Ripon's staff shortly afterwards Hardly had he resigned when he received a telegram from Sir Robert Hart, inspector-general of customs in China, inviting him to Peking He started at once and arrived at Tientsin in July, where he met Li Hung Chang, and learnt that affairs were in a critical condition, and that there was risk of war with Russia Gordon proceeded to Peking and used all his influence in favour of peace His arguments, which were given with much plainness of speech, appear to have convinced the Chinese government, and war was avoided Gordon returned to England, and in April 1881 exchanged with a brother officer, who had been ordered to Mauritius as Commanding Royal Engineer, but who for family reasons was unable to accept the appointment He remained in Mauritius until the following March, when, on promotion to the rank of major-general, he had to vacate the position

The Cape ministry now asked his advice on affairs in Basutoland Gordon sailed at once for the Cape, and saw the governor, Hercules Robinson, Thos Scanlen, the premier, and J X Merriman, who, for political reasons, asked him not to go to Basutoland, but to take the appointment of commandant of the colonial forces at King William's Town After a few months spent in reorganizing the colonial forces Gordon was requested to go up to Basutoland to try to arrange a settlement with the Basuto chief Masupha Greatly to his surprise, at the very time he was with Masupha, J W Sauer, a member of the Cape Government, was taking steps to induce Lerethodi, another chief, to advance against Masupha This was regarded by Gordon as an act of treachery He advised Masupha not to deal with the Cape Government until the hostile force was withdrawn, and resigned his appointment He considered that the Basuto difficulty was due to the bad system of administration by the Cape Government A few years later Gordon's view was endorsed, when Basutoland was separated from Cape Colony and placed directly under the imperial government

After his return to England Gordon went to Palestine, where he devoted a year to the study of Biblical history and the antiquities of Jerusalem He then accepted a mission from the King of the Belgians to take charge of the Congo Free State, and returned to London to make the necessary preparations But a few days after his arrival he was requested by the British Government to proceed immediately to the Sudan to cope with the revolt headed by the Mahdi (Mohammed Ahmed)

The Revolt of the Mahdi.—The Egyptian government was too busily engaged in suppressing Arabi's revolt to be able to send any help to the governor of the Sudan, Abdel Kader, and in Sept 1882, when the British troops entered Cairo, the position in the Sudan was very perilous Had the British Government listened to the representations then made to them, that, having conquered Egypt, it was imperative at once to suppress the revolt in the Sudan, the rebellion could have been crushed, but unfortunately Great Britain would do nothing herself, while the steps she allowed Egypt to take ended in the disaster to Hicks Pasha's expe-

dition. In Dec. 1883, the Government ordered Egypt to abandon the Sudan. But abandonment involved the withdrawal of thousands of Egyptian soldiers, civilian employees and their families Abdel Kader Pasha was asked to undertake the work, and he agreed on the understanding that he would be supported, and that the policy of abandonment was not to be announced But the latter condition was refused, and he declined the task. The British Government then asked Gen Gordon to proceed to Khartum to report on the best method of carrying out the evacuation. Sir Evelyn Baring (Lord Cromer), was, however, at first opposed to Gordon's appointment. His objections were overcome and Gordon received his instructions in London on Jan. 18, 1884, and started at once for Cairo, accompanied by Lt.-Col. J. D. H. Stewart

At Khartum.—At Cairo Gordon received further instructions from Baring, and was appointed by the khedive as governor-general, with executive powers Travelling by Korosko and Berber, he arrived at Khartum on Feb 18, and at once commenced the task of sending the women and children and the sick and wounded to Egypt. about two thousand five hundred had been removed before the mahdi's forces closed upon Khartum At the same time he saw the necessity of making some arrangement for the future government of the country, and asked for the help of Zobeir (*q v*), who had great influence in the Sudan, and had been detained in Cairo for some years This request had been made at Cairo, and was repeated on the day Gordon reached Khartum The British Government refused (March 13) to sanction the appointment, because Zobeir had been a notorious slave-hunter With this refusal vanished all hope of a peaceful retreat of the Egyptian garrisons Wavering tribes went over to the Mahdi. The advance of the rebels against Khartum was combined with a revolt in the eastern Sudan, and the Egyptian troops in the vicinity of Suakin met with constant defeat At length a British force was sent to Suakin under the command of Gen Sir Gerald Graham, and routed the rebels in several hard-fought actions Gordon telegraphed to Baring urging that the road from Suakin to Berber should be opened by a small force But this request, though strongly supported by Baring and the British military authorities in Cairo, was refused by the Government in London In April Gen Graham and his forces were withdrawn from Suakin The garrison of Berber, seeing that there was no chance of relief, surrendered a month later, and Khartum was completely isolated

With an energy and skill that were almost miraculous, Gordon held Khartum until Jan 1885 He had only one British officer to assist him, and the town was badly fortified and insufficiently provided with food The siege commenced on March 18, but it was not until August that the British Government under the pressure of public opinion decided to take steps to relieve Gordon Gen Stephenson, who was in command of the British troops in Egypt, wished to send a brigade at once to Dongola, but was overruled, and it was not until the beginning of Nov that the British relief force was ready to start from Wadi Halfa under the command of Wolseley The force reached Korti towards the end of Dec, and from that place a column was despatched across the Bayuda desert to Metemmeh on the Nile After severe fighting in which the leader of the column, Sir Herbert Stewart, was mortally wounded, the force reached the river on Jan 20, and the following day four steamers, which had been sent down by Gordon to meet the British advance, and which had been waiting for them for four months, reported to Sir Charles Wilson, who had taken command after Stewart was wounded

Death.—On the 24th Wilson started with two of the steamers for Khartum, but on arriving there on the 28th he found that the place had been captured by the rebels and Gordon killed two days before The attack was made at a point in the fortifications where the rampart and ditch had been destroyed by the rising of the Nile, and when the mahdi's troops entered the soldiers were too weak to make any effectual resistance Gordon himself expected the town to fall before the end of December, and it is difficult to understand how he succeeded in holding out until Jan. 26. Writing on Dec 14, he said, "Now, mark this, if the expeditionary force—and I ask for no more than 200 men—does not come in ten days, the town may fall, and I have done my best for the honour of my country." He had indeed done his best, and far more than could have been regarded as possible Part of his journal (Sept. 10–Dec 14) was fortunately preserved and published

Gordon's power to command men of non-European races has rarely—if ever—been exceeded He had no fear of death, and cared but little for the opinion of others, adhering tenaciously to the course he believed to be right in the face of all opposition He was a religious man in the highest sense of the word, and was a constant student of the Bible. To serve God and to do his duty were the great objects of his life, and he died as he had lived, carrying out the work that lay before him to the best of his ability. The last words of his last letter to his sister, written when he knew that death was very near, sum up his character: "I am quite happy, thank God, and, like Lawrence, I have *tried* to do my duty."[1]

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[1]With this estimate of Gordon's character may be contrasted those of Lord Cromer (one of the most severe of Gordon's critics), Lord Morley and—in more recent times—Lytton Strachey In their strictures as in their praise they help to explain both the causes of the extraordinary influence wielded by Gordon and also his difficulties. Cromer's criticism deals solely with Gordon's last mission to the Sudan, Morley's is a more general judgment; while Lytton Strachey's essay in *Eminent Victorians* is impressionistic and has a tendency to throw the high lights on the weaker points in Gordon's character

Lord Cromer (*Modern Egypt*, I, xxvii, p 565–571) says "We may admire, and for my own part I do very much admire General Gordon's personal courage, his disinterestedness and his chivalrous feeling in favour of the beleaguered garrisons, but admiration of these qualities is no sufficient plea against a condemnation of his conduct on the ground that it was quixotic In his last letter to his sister, dated December 14, 1884, he wrote 'I am quite happy, thank God, and, like Lawrence, I have tried to do my duty' . . I am not now dealing with General Gordon's character which was in many respects noble, or with his military defence of Khartoum, which was heroic, but with the political conduct of his mission, and from this point of view I have no hesitation in saying that General Gordon cannot be considered to have tried to do his duty unless a very strained and mistaken view be taken of what his duty was . As a matter of public morality I cannot think that General Gordon's process of reasoning is defensible. . . . I do not think that it can be held that General Gordon made any serious effort to carry out the main ends of British and Egyptian policy in the Sudan He thought more of his personal opinions than of the interests of the state In fact, except personal courage, great fertility in military resource, a lively though sometimes ill-directed repugnance to injustice, oppression and meanness of every description, and a considerable power of acquiring influence over those, necessarily limited in numbers, with whom he was brought into personal contact, General Gordon does not appear to have possessed any of the qualities which would have fitted him to undertake the difficult task he had in hand."

Lord Morley (*Life of Gladstone*, III, ix, p 151) says "Gordon, as Mr Gladstone said, was a hero of heroes He was a soldier of infinite personal courage and daring, of striking military energy, initiative and resource, a high, pure and single character, dwelling much in the region of the unseen But as all who knew him admit, and as his own records testify, notwithstanding an undercurrent of shrewd common sense, he was the creature, almost the sport, of impulse, his impressions and purposes changed with the speed of lightning, anger often mastered him, he went very often by intuitions and inspirations rather than by cool inference from carefully surveyed fact; with many variations of mood he mixed, as we often see in people less famous, an invincible faith in his own rapid prepossessions while they lasted Everybody now discerns that to despatch a soldier of this temperament on a piece of business [the mission to the Sudan in 1884] that was not only difficult and dangerous, as Sir E Baring said, but profoundly obscure, and needing vigilant sanity and self-control, was little better than to call in a wizard with his magic Mr Gladstone always professed perplexity in understanding why the violent end of the gallant Cavagnari in Afghanistan stirred the world so little in comparison with the fate of Gordon The answer is that Gordon seized the imagination of England, and seized it on its higher side His religion was eccentric, but it was religion, the Bible was the rock on which he founded himself, both old dispensation and new, he was known to hate forms, ceremonies and all the 'solemn plausibilities'; his speech was sharp, pithy, rapid and ironic, above all, he knew the ways of war and would not bear the sword for nought"

H. W. Gordon, *Events in the Life of C. G. Gordon* (1886); Sir W. F. Butler, *Charles George Gordon* (1889), D. C. Boulger, *Life of Gordon* (1896) *See* also L Brine, *The Taeping Rebellion in China* (1862); A Wilson, "The Ever Victorious Army," *A History of the Chinese Campaign under Lt Col. C. G. Gordon and of the Taeping Rebellion* (1868), S Mossman, *General Gordon's private diary of his exploits in China* (1885), T Lyster, *With Gordon in China. Letters* (ed. E. A Lyster, 1891), *Events in the Taeping Rebellion* (ed A E. Hake, 1891); *Colonel Gordon in Central Africa 1874–79* (ed G B Hill, 1881, 3rd ed, 1899); *British Parliamentary Papers on Egypt* (1884–85), F. R. Wingate, *Mahdism and the Egyptian Sudan* (1891), Lord Cromer, *Modern Egypt*, 2 vol (1908); Sir G. Graham, *Last Words with Gordon* (1887), "War Correspondent," *Why Gordon perished* (1896); G Lytton Strachey, "The end of Gordon" in *Eminent Victorians* (1918). (C. M W)

GORDON, LORD GEORGE (1751–93), third and youngest son of Cosmo George, duke of Gordon, was born in London on Dec 26, 1751 He was educated at Eton and entered the navy, rising to the rank of lieutenant in 1772, but Lord Sandwich, then at the head of the Admiralty, would not promise him a command, and he resigned his commission shortly before the beginning of the American War In 1774 the pocket borough of Ludgershall was bought for him by Gen Fraser, whom he was opposing in Inverness-shire, in order to bribe him not to contest the county. He was considered flighty, and of little importance. In 1779 he organized, and made himself head of the Protestant associations, formed to secure the repeal of the Catholic Relief act of 1778 On June 2, 1780, he headed the mob which marched in procession from St George's Fields to the Houses of Parliament in order to present the monster petition against the acts. A terrific riot ensued, which continued several days, during which the city was virtually at their mercy. At first indeed they dispersed after threatening to make a forcible entry into the House of Commons, but reassembled soon afterwards and destroyed several Roman Catholic chapels, pillaged the private dwellings of many Roman Catholics, set fire to Newgate and broke open all the other prisons, attacked the Bank of England and several other public buildings, and continued the work of violence and conflagration until the interference of the military, by whom no fewer than 450 persons were killed and wounded before the riots were quelled. For his share in instigating the riots Lord Gordon was apprehended on a charge of high treason; but, mainly through the skilful and eloquent defence of Erskine, he was acquitted on the ground that he had no treasonable intentions. His life was henceforth full of crack-brained schemes, political and financial In 1786 he was excommunicated by the archbishop of Canterbury for refusing to bear witness in an ecclesiastical suit, and in 1787 he was convicted of libelling the queen of France, the French ambassador and the administration of justice in England He was, however, permitted to withdraw from the court without bail, and made his escape to Holland; but on account of representations from the court of Versailles he was commanded to quit that country, and, returning to England, was apprehended, and in January 1788 was sentenced to five years' imprisonment in Newgate, where he lived at his ease, giving dinners and dances. As he could not obtain securities for his good behaviour on the termination of his term of imprisonment, he was not allowed to leave Newgate, and there he died of delirious fever on Nov 1, 1793. Some time before his apprehension he had become a convert to Judaism, and had undergone the initiatory rite

A serious defence of most of his eccentricities is undertaken in *The Life of Lord George Gordon, with a Philosophical Review of his Political Conduct*, by Robert Watson, M D. (1795). The best accounts of Lord George Gordon are to be found in the *Annual Registers* from 1780 to the year of his death.

GORDON, JOHN BROWN (1832–1904), American soldier and statesman, born July 6, 1832, in Upson county, Georgia He was graduated from the University of Georgia (1852) and later practised law in Atlanta At the outbreak of the Civil War he joined the Confederate army as captain of volunteers (1861) and passed successfully through the grades to lieutenant general In the course of the war he was wounded in battle eight times He commanded an infantry division at Gettysburg and led the attack on July 1, 1863 He held the last lines at Petersburg, guarding the Confederate retreat from that city At Appomattox he commanded one wing of Lee's army with the instructions to cut through Grant's line. He made the last charge, and was taking the Federal breastworks, when news of his chief's surrender ended his action. Following the war he settled in Atlanta, Ga., and was a member of the Democratic national conventions of 1868 and 1872. He was elected to the U S. Senate in 1873 and re-elected in 1879 and 1890. He was governor of Georgia (1886–90), and elected commander-in-chief of the United Confederate Veterans (1900). He died in Miami, Fla., Jan 9, 1904. He wrote *The Old South* (1887) and *Reminiscences of the Civil War* (1903).

GORDON, SIR JOHN WATSON (1788–1864), Scottish portrait painter, born in Edinburgh, was the son of Captain Watson R N., he began to exhibit in 1808 After the death of Sir Henry Raeburn in 1823, he succeeded to much of his practice. He assumed in 1826 the name of Gordon. One of the earliest of his famous sitters was Sir Walter Scott, who sat for a first portrait in 1820

Among his works may be mentioned the earl of Dalhousie (1833), in the Archers' Hall, Edinburgh; Sir Alexander Hope (1835), in the county buildings, Linlithgow; Lord President Hope, in the Parliament House, and Dr. Chalmers. These, unlike his later works, are generally rich in colour. The full length of Dr. Brunton (1844), and Dr Lee, the principal of the university (1846), both on the staircase of the college library, mark a modification of his style, which ultimately resolved itself into extreme simplicity, both of colour and treatment Among the portraits painted during the last 20 years of his life, in what may be termed his third style, are De Quincey, in the National Portrait Gallery, London; the prince of Wales, Lord Macaulay, Lord Murray, Lord Cockburn, Lord Rutherford and Sir John Shaw Lefevre, in the Scottish National Gallery These latter pictures are mostly clear and grey, sometimes showing little or no positive colour, the flesh itself being very grey, and the handling extremely masterly

John Watson Gordon was one of the earlier members of the Royal Scottish Academy, and was elected its president in 1850; he became R A in 1851. He died on June 1, 1864.

GORDON, LEON, originally JUDAH LOEB BEN ASHER (1831–1892), Russian-Jewish poet and novelist (Hebrew), was born at Wilna in 1831 and died at St Petersburg in 1892 He took a leading part in the modern revival of the Hebrew language and culture His satires did much to rouse the Russian Jews to a new sense of the reality of life, and Gordon was the apostle of enlightenment in the Ghettos. His Hebrew style is classical and pure His poems were collected in four volumes, *Kol Shire Yehuda* (St Petersburg, 1883–1884); his novels in *Kol Kithbe Yehuda* (Odessa, 1889)

For his works see *Jewish Quarterly Review*, xviii. 437 *seq*

GORDON, PATRICK (1635–1699), Russian general, descended from a Scottish family, was brought up in Aberdeenshire, but entered, in his 15th year, the Jesuit college at Braunsberg, Prussia In 1655 he enlisted at Hamburg in the Swedish service In the course of the next five years he served alternately with the Poles and Swedes as he was taken prisoner by either In 1661 he took service in the Russian army under Alexis I, and in 1665 he was sent on a special mission to England. After his return he fought against the Turks and Tatars in southern Russia In 1678 he was made major-general, in 1679 was appointed to the chief command at Kiev, and in 1683 was made lieutenant-general He visited England in 1686, and in 1687 and 1689 took part as quartermaster-general in expeditions against the Crim Tatars in the Crimea On the outbreak of the revolution in Moscow in 1689, Gordon with the troops he commanded virtually decided events in favour of the tsar Peter I, and against the tsaritsa Sophia. The tsar confided to him the command of his capital during his absence from Russia, employed him in organizing his army according to the European system, and raised him to the rank of general-in-chief He died on Nov. 29, 1699 The tsar was with him when he died, and with his own hands closed his eyes.

Gordon left a diary of his life (in English), the ms of which is in the archives of the Russian Foreign Office It was translated into German (Moscow and St. Petersburg, 1849, 1853 and 1855) *Passages from the Diary of General Patrick Gordon of Auchleuchries (1635–1699)* was printed in 1859.

GORDON-CUMMING, ROUALEYN GEORGE (1820–1866), Scottish traveller and sportsman, known as the "lion-hunter," was born on March 15, 1820, the second son of Sir William G. Gordon-Cumming, second baronet of Altyre and Gordonstown. He was educated at Eton, and served in the Madras Light Cavalry and later in the Cape Mounted Rifles. At the end of 1843 he sold out, and with a few native followers set out for the interior, hunting in Bechuanaland and the Limpopo valley. In 1848 he returned to England and published his book, *Five Years of a Hunter's Life in the Far Interior of South Africa* (1850, 3rd ed 1851). His collection of hunting trophies was shown at the Great Exhibition of 1851, and afterwards exhibited in various parts of the country. He died at Fort Augustus, Scotland, on March 24, 1866

An abridgment of his book, *The Lion Hunter of South Africa* (1856), has been frequently reprinted

GORE, CATHERINE GRACE FRANCES (1799–1861), English novelist and dramatist, the daughter of Charles Moody, a wine merchant, was born at East Retford, Nottinghamshire. In 1823 she was married to Captain Charles Gore; and, in the next year, she published her first work, *Theresa Marchmont, or the Maid of Honour* Mrs Gore continued to write, with unfailing fertility of invention, one or more novels year by year till her death She also wrote some dramas, of which the most successful was the *School for Coquettes,* produced at the Haymarket (1831).

Mrs Gore's novels had an immense temporary popularity; they were parodied by Thackeray in *Punch,* in his "Lords and Liveries by the author of *Dukes and Déjeuners*" Some of them deserve to be revived, her *Cecil* was reprinted with success in 1927

GORE, CHARLES (1853–), English bishop, was born in 1853, the 3rd son of the Hon Charles Alexander Gore, brother of the 4th earl of Arran His mother was a daughter of the 4th earl of Bessborough He was educated at Harrow and at Balliol college, Oxford, and was elected fellow of Trinity college in 1875 He was vice-principal (1880–83) of the theological college at Cuddesdon, and librarian of Pusey Library (1884–93) Gore exercised a wide influence over undergraduates and the younger clergy, and under his influence the "Oxford Movement" underwent a change which to the survivors of the old school of Tractarians seemed to involve a break with its basic principles "Puseyism" had based itself on authority and tradition, and repudiated any compromise with the modern critical and liberalizing spirit. Gore, starting from the same basis of faith and authority, set himself the task of reconciling the principle of authority in religion with that of scientific authority by attempting to define their respective spheres of influence In 1889 he published two works, *The Church and the Ministry,* a vindication of the principle of Apostolic Succession in the episcopate against the Presbyterians and other Protestant bodies, and *Roman Catholic Claims,* a defence of the Anglican Church and Anglican orders against the Roman Catholics

So far his published views had been in consonance with those of the older Tractarians But in 1890 there appeared under his editorship *Lux Mundi,* a series of essays by different writers, being an attempt "to succour a distressed faith by endeavouring to bring the Christian Creed into its right relation to the modern growth of knowledge, scientific, historic, critical; and to modern problems of politics and ethics" Gore himself contributed an essay on "The Holy Spirit and Inspiration" The book produced a profound effect far beyond the borders of the English Church, and the High Church movement developed thenceforth on "Modernist" rather than Tractarian lines

In 1891 Gore delivered the Bampton lectures before the university He chose for his subject the Incarnation, developing the doctrine, the enunciation of which in *Lux Mundi* had caused so much heart-searching This is an attempt to explain how it came that Christ, though incarnate God, could be in error, *e g*, in his citations from the Old Testament. He interpreted St Paul's saying (2 Phil ii 7) that Christ "emptied himself and took upon him the form of a servant" (ἑαυτὸν ἐκένωσεν μορφὴν δούλου γαβὼν) as meaning that Christ, on his incarnation, became subject to all human limitations, and had, so far as his life on earth was concerned, stripped himself of all the attributes of the Godhead, including the Divine omniscience, the Divine nature being, as it were, hidden under the human [1]

In 1893 Dr Gore resigned his principalship and became vicar of Radley, a small parish near Oxford In 1894 he became canon of Westminster. Here he gained commanding influence as a preacher and in 1898 was appointed one of the court chaplains In 1902 he became bishop of Worcester and in 1905 was installed bishop of Birmingham, a new see, the creation of which had been mainly due to his efforts While adhering rigidly to his views on the divine institution of episcopacy, Dr. Gore cultivated friendly relations with the ministers of other denominations, and advocated co-operation with them in all matters when agreement was possible. In social questions he became one of the leaders of the group of High Churchmen known, somewhat loosely, as Christian Socialists He worked actively against the sweating system, pleaded for European intervention in Macedonia, and was a keen supporter of the Licensing Bill of 1908. In 1892 he founded the clerical fraternity known as the Community of the Resurrection. Its members are priests, who are bound by the obligation of celibacy, live under a common rule and with a common purse Their work is pastoral, evangelistic, literary and educational In 1898 the House of the Resurrection at Mirfield, near Huddersfield, became the centre of the community, in 1903 a college for training candidates for orders was established there, and in the same year a branch house, for missionary work, was set up in Johannesburg in South Africa

From 1911 to 1919 Dr Gore was bishop of Oxford, he then resigned and settled in London Dr Gore's works include *The Incarnation* (Bampton Lectures, 1891), *The Creed of the Christian* (1895); *The Body of Christ* (1901), *The New Theology and the Old Religion* (1908); *Orders and Unity* (1910), *The Question of Divorce* (1911), *The Religion of the Church* (1916), *Belief in God* (1921), *The Holy Spirit and the Church* (1924), *Can We Then Believe?* (1926), and expositions of *The Sermon on the Mount* (1896), *Ephesians* (1898), *Romans* (1899) *The Epistles of St. John* (1920)

GOREE, an island off the west coast of Africa, forming part of the autonomous district of Dakar It lies at the entrance of the large natural harbour formed by the peninsula of Cape Verde The island, some 900 yd long by 330 broad, and 3 m distant from the nearest point of the mainland, is mostly barren rock The greater part of its surface is occupied by a town, formerly a thriving commercial entrepôt and a strong military post. With the rise of Dakar (*q v*), *c.* 1860, on the adjacent coast, Goree lost its trade and its inhabitants, mostly Jolofs, had dwindled in 1905 to about 1,500 Its healthy climate, however, makes it useful as a sanatorium Goree was first occupied by the Dutch, who took possession of it early in the 17th century It was captured by the English under Commodore Holmes in 1663, but retaken in the following year by de Ruyter. The Dutch were finally expelled in 1677 by the French under Admiral d'Estrées Goree subsequently fell again into the hands of the English, but was definitively occupied by France in 1817 (*see* SENEGAL *History*)

GORELL, JOHN GORELL BARNES, 1ST BARON (1848–1913), English judge, was born at Liverpool on May 16, 1848, the son of Henry Barnes, a shipowner He was educated at Peterhouse, Cambridge He began as a solicitor, but was called to the bar in 1876 becoming Q C in 1888 He was an expert in Admiralty cases, and in 1892 was made a judge of the Probate, Divorce and Admiralty division, becoming its president in 1905 He was made privy councillor in 1905, and in 1909 raised to the peerage In 1909 he became chairman of the royal commission on divorce Lord Gorell, who married in 1881 Mary, daughter of Thomas Mitchell, died at Mentone on April 22, 1913

[1] *Cf* the Lutheran theologian Ernst Sartorius in his *Lehre von der heiligen Liebe* (1844), *Lehre* II pp 21 *et seq* "the Son of God veils his all-seeing eye and descends into human darkness and as child of man opens his eye as the gradually growing light of the world of humanity, until at the right hand of the Father he allows it to shine forth in all its glory" *See* Loofs, Art "Kenosis" in Herzog-Hauck, *Realencyklopadie* (ed 1901), x 247

See J. E. G. de Montmorency, *John Gorell Barnes, first Lord Gorell* (1920).

GORGAS, WILLIAM CRAWFORD (1854–1920), American army surgeon, was born at Mobile (Ala.), on Oct. 3, 1854. He was educated at the University of the South, Sewanee (Tenn.), and Bellevue hospital medical college, New York, taking his M.D. in 1879. In 1880 he entered the Medical Corps of the U.S. Army. During the Spanish-American War he served as major in the Medical Corps, and was sent, after the Santiago expedition, to Havana, where he was in charge of yellow fever patients. From 1898 to 1902 he was chief officer in charge of sanitation measures in Havana, and there conducted many experiments in connection with the discovery that yellow fever was transmitted by the mosquito. Because of his success in eliminating yellow fever there he was made assistant surgeon general, U.S. Army, with the rank of colonel, by special act of Congress in 1903.

In 1904 Gorgas was sent as chief sanitary officer to Panama, where two of the main obstacles to building the canal were yellow fever and malaria. Here again his methods were so effective that in two years he eliminated yellow fever from the Canal region. Malaria also was brought under control. In 1907 he was appointed a member of the Isthmian Canal commission by President Roosevelt, and the following year was U.S. delegate to the first Pan-American Medical Congress, held at Santiago, Chile. He was president of the American Medical Association, 1908–09. In 1913 he was called to the Rand gold mines in South Africa, to suggest means for combating the frequent epidemics of influenza. This he found was largely due to crowding the labourers together in barracks.

In 1914 he was made surgeon general, U.S. Army, with the rank of brigadier general, becoming major general in 1916. In 1918 he was retired. He then became the permanent director of the yellow-fever work of the international health board of the Rockefeller Foundation. He went to Central America, and under his direction investigations of yellow fever were made in Guayaquil, Ecuador and Guatemala. In 1919 he accepted a contract with the Government of Peru to carry out a sanitary programme in that country. He died in London, July 3, 1920, and was buried in the Arlington National Cemetery, Washington (D.C.).

GÖRGEI, ARTHUR (1818–1916), Hungarian soldier, was born at Toporcz, in Upper Hungary, on Jan. 30, 1818, of a Saxon family. In 1837 he entered the Hungarian bodyguard transferring in 1842 to the Palatines Hussars. In 1845, on the death of his father, he retired from the army and devoted himself to the study of chemistry at Prague, afterwards retiring to the family estates in Hungary. On the outbreak of the revolutionary war of 1848, Gorgei offered his sword to the Hungarian Government. Entering the Honvéd army with the rank of captain, he was employed in the purchase of arms, and soon became major and commandant of the national guards north of the Theiss. After various successes over the Croatian forces, notably at Ozora, where 10,000 prisoners fell into his hands, Gorgei was appointed commander of the army of the Upper Danube, but when Windischgratz advanced across the Leitha (Dec. 15), he retreated, despite the remonstrances of Kossuth, whom he disliked, and on Jan. 5, 1849 he issued a public manifesto, blaming the Government for Hungary's recent failures. After conducting operations independently and with Klapka, he was appointed Hungarian commander-in-chief after the battle of Kapolna (Feb. 1849) and won a series of brilliant victories. The relief of Komoru (April 22) forced the Austrian troops to evacuate Hungary, and on May 21 Gorgei took Buda.

Meanwhile Kossuth at Debreczen had proclaimed Hungary a republic. Gorgei, who had, strangely enough, a strong dislike of Magyars, refused a field-marshal's baton but consented to become minister of war, while retaining the command of the troops in the field. The Russians had now intervened in the struggle, the allies were advancing into Hungary on all sides, and Gorgei was defeated by Haynau at Pered (June 20–21). Kossuth resigned his position as dictator. Gorgei took his place, and finding the military position hopeless, surrendered at Vilagós to the Russian commander (Aug. 13). Alone of the ex-Austrian officers in his force, Görgei escaped court-martial, at the tsar's personal intervention. He was interned at Klagenfurt till 1867, when he was pardoned and returned to Hungary, but took no part in public life, as his surrender and the personal pardon granted him led the Hungarians to accuse him of treason. After some years work as a railway engineer he retired to Visegrád, where he lived in retreat until his death on May 21, 1916.

Görgei wrote a justification of his operations (*Mein Leben und Wirken in Ungarn 1848–1859* (Leipzig, 1852), an anonymous paper under the title *Was verdanken wir der Revolution?* (1875), and a reply to Kossuth's charges (signed "Joh. Demár") in *Budapesti Szemle*, 1881, 25–26. *See* also A. G. Horn, *Gorgei, Oberkommandant d. ung. Armee* (Leipzig, 1850); Kinety, *Gorgei's Life and Work in Hungary* (1853); and HUNGARY: *History*.

GORGES, SIR FERDINANDO (*c.* 1566–1647), English colonial pioneer in America and the founder of Maine, was born in Somersetshire, England, probably in 1566. From youth both a soldier and a sailor, he was a prisoner in Spain at the age of 21, having been captured by a ship of the Spanish Armada. In 1589 he was in command of a small body of troops fighting for Henry IV. of France, and after distinguishing himself at the siege of Rouen was knighted there in 1591. In 1596 he was commissioned captain and keeper of the castle and fort at Plymouth and captain of St. Nicholas Isle, in 1597 he accompanied Essex on the expedition to the Azores; in 1599 assisted him in the attempt to suppress the Tyrone rebellion in Ireland, and in 1600 was implicated in Essex's own attempt at rebellion in London. In 1603, on the accession of James I., he was suspended from his post at Plymouth, but was restored in the same year and continued to serve as "governor of the forts and island of Plymouth" until 1629, when, his garrison having been without pay for three and a half years, his fort a ruin, and all his applications for aid having been ignored, he resigned. About 1605 he began to be greatly interested in the New World, in 1606 he became a member of the Plymouth Company, and he laboured zealously for the founding of the Popham colony at the mouth of the Sagadahoc (now the Kennebec) river in 1607. For several years following the failure of that enterprise in 1608 he continued to fit out ships for fishing, trading and exploring, with colonization as the chief end in view. He was largely instrumental in procuring the new charter of 1620 for the Plymouth Company, and was at all times of its existence perhaps the most influential member of that body. He was the recipient, either solely or jointly, of several grants of territory from it, for one of which he received in 1639 the royal charter of Maine (*see* MAINE). In 1635 he sought to be appointed governor-general of all New England, but the English Civil War—in which he espoused the royal cause—prevented him from ever actually holding that office. A short time before his death at Long Ashton in 1647 he wrote his *Briefe Narration of the Originall Undertakings of the Advancement of Plantations into the Parts of America*. He was an advocate, especially late in life, of the feudal type of colony.

See J. P. Baxter (ed.), *Sir Ferdinando Gorges and his Province of Maine* (Boston, 1890, in the Prince Society Publications), the first volume of which is a memoir of Gorges, and the other volumes contain a reprint of the *Briefe Narration*, Gorges's letters, and other documentary material. Also Henry Sweetser Burrage, *Gorges and the Grant of the Province of Maine, 1622* (1923), and Raymond Gorges, "Sir Frederick Gorges and His Connection with the Essex Rebellion," *Soc. of Colonial Wars, Publication No. 37* (1926).

GORGET, the name applied after about 1480 to the collar-piece of a suit of armour (O.Fr. *gorgete*, dim. of *gorge*, throat). It was generally formed of small overlapping rings of plate and attached either to the body armour or to the armet. It was worn in the 16th and 17th centuries with the half-armour, with the plain cuirass, and even occasionally without any body armour at all. During these times it gradually became a distinctive badge for officers, and as such it survived in several armies—in the form of a small metal plate affixed to the front of the collar of the uniform coat—until after the Napoleonic wars.

GORGIAS (*c.* 483–375 B.C.), Greek sophist and rhetorician, was a native of Leontini, Sicily. In 427 he headed an embassy to ask Athenian protection against the Syracusans. He subsequently

settled in Athens, and supported himself by oratory and by teaching rhetoric. He died at Larissa, Thessaly. His chief claim to recognition consists in the fact that he transplanted rhetoric to Greece, and contributed to the diffusion of the Attic dialect as the language of literary prose. He was the author of a lost work *On Nature or the Non-existent* Περὶ τοῦ μὴ ὄντος ἢ περὶ φύσεως (fragments ed. by M C Valeton, 1876), the substance of which may be gathered from the writings of Sextus Empiricus, and also from the treatise (ascribed to Theophrastus) *De Melisso, Xenophane, Gorgia.* Gorgias is the central figure in Plato's *Gorgias* The genuineness of two rhetorical exercises (*The Encomium of Helen* and *The Defence of Palamedes,* ed. with Antiphon by F Blass 1881) is disputed

For his philosophy *see* SOPHISTS and SCEPTICISM *See* also Gomperz, *Greek Thinkers,* Eng trans vol i.; Jebb's *Attic Orators,* introd to vol i. (1893); F Blass, *Die attische Beredsamkeit,* i. (1887), and article RHETORIC.

GORGON, GORGONS, a figure or figures in Greek mythology Homer speaks of only one Gorgon, whose head is represented in the *Iliad* (v 741) as fixed in the centre of the aegis of Zeus In the *Odyssey* (xi 633) she is a monster of the underworld Hesiod increases the number of Gorgons to three—Stheno (the mighty), Euryale (the far-springer) and Medusa (the queen), and makes them the daughters of the sea-god Phorcys and of Keto Their home is on the extreme west; according to later authorities, in Libya (Hesiod, *Theog* 274, Herodotus II 91; Pausanias II 21) The Attic tradition, reproduced in Euripides (*Ion,* 1002), regarded the Gorgon as a monster, produced by Ge to aid her sons the giants against the gods and slain by Athena

The Gorgons are represented as winged female creatures; their hair consists of snakes; they are round faced, flat nosed, with tongues lolling out and with large projecting teeth Medusa was the only one of the three who was mortal, hence Perseus was able to kill her by cutting off her head From the blood that spurted from her neck sprang Chrysaor and Pegasus, her two sons by Poseidon The head, which had the power of turning all who looked upon it into stone, was given to Athena, or buried in the market-place of Argos The hideously grotesque original type of the Gorgoneion, as the Gorgon's head was called, was used generally as an amulet, a protection against the evil eye Heracles is said to have obtained a lock of Medusa's hair from Athena and given it to Sterope, the daughter of Cepheus, as a protection for the town of Tegea against attack (Apollodorus II 144) Later classical art showed Medusa as coldly beautiful; the realists of Hellenistic times gave her face an agonized expression Various silly rationalistic accounts are given by late authors More reasonable is the explanation of anthropologists that Medusa, whose virtue is really in her head, was originally a ritual mask It also seems possible that the staring or pursuing faces, not uncommon in nightmares, have a good deal to do with her.

BIBLIOGRAPHY —N. G Polites (Ὁ περὶ τῶν Γοργόνων μῦθος παρὰ τ Ἕλλησικῷ λαῷ, 1878) gives an account of the Gorgons, and of the various superstitions connected with them, from the modern Greek point of view, which regards them as malevolent spirits of the sea W H Roscher, *Die Gorgonen und Verwandtes* (1870), J Six, *De Gorgone* (1885), on the types of the Gorgon's head, articles by Roscher and Furtwangler in Roscher's *Lexikon der Mythologie,* by G Glotz in Daremberg and Saglio's *Dictionnaire des antiquités,* Jane E Harrison, *Prolegomena to the Study of Greek Religion* (1903)

GORGONZOLA, a town of Lombardy, Italy, province of Milan, from which it is 11 m E N E by steam tramway Pop (1921), 4,989 It produces the well-known Gorgonzola cheese

GORI, a town in the Georgian S S R north-west of Tiflis, on the river Kura, altitude, 2,010 ft, lat 42° 0′ N, long 44° 7′ E Pop. (1926) 10,192 It is the centre of a corn and wine district. The climate is delightfully cool in summer, owing to refreshing mountain breezes, though these are disagreeable in winter It has timber mills and manufactures railway sleepers, and a jam industry is being established Gori was founded (1123) by the Georgian king David II, the Renovator, for the Armenians who fled their country on the Persian invasion The earliest remains of the fortress are Byzantine, it was thoroughly restored in 1634–1658, but destroyed by Nadir Shah of Persia in the 18th century There is a church constructed in the 17th century by Capuchin missionaries from Rome Five miles east of Gori is the remarkable rock-cut town of Uplis-tsykhe, which was a fortress in the time of Alexander the Great of Macedon, and an inhabited city in the reign of the Georgian king Bagrat III (980–1014)

GORILLA, the largest of the anthropoid (manlike) apes, inhabiting forest regions of West Africa from the Cameroons to the Congo river and represented by a somewhat different form in mountainous regions of the eastern Belgian Congo The popular reputation of the giant ape (*Gorilla gorilla*) is largely due to the writings of the explorer Paul B du Chaillu in 1861 and later In 1903 a somewhat different type of gorilla was discovered in high mountains of the eastern Belgian Congo, where it thrives at an altitude of 10,000ft and is protected from the cold by much longer and thicker fur than the western form This mountain species is known as *Gorilla beringei*

Though nearly related to the chimpanzee, the gorilla is a far larger and heavier animal, the males attaining a weight of 400 lb. or more, and a standing height of 5½ feet The naked skin of the face is black and wrinkled, the hair in general black, commonly with a reddish tinge on the crown and tending to become grey on the back in adult males The animals inhabit dense forests, commonly in small family groups, feeding on fruits and tender shoots and occasionally raiding plantations The West African gorillas construct sleeping nests in the branches of trees, which seem to be used chiefly by the females and young These beds, commonly used only for a single night, are also sometimes constructed on the ground; the American explorer Carl Akeley always found them thus placed by the mountain gorilla Adult males, owing probably to their great weight, generally remain on the ground The gorilla is shy and not usually inclined to attack man unless provoked, in which case the males are extremely dangerous A peculiar habit, mentioned by du Chaillu, and observed in all captive gorillas, is a rapid drumming on the chest with both hands Comparatively few gorillas have been kept in captivity and most of these have survived for only a short time They seem to react far less favourably to captivity than the chimpanzee, lacking the friendly curiosity, imitativeness and general social adaptability of that animal, and exhibiting in contrast a self-centred repression and lack of interest in their surroundings A few examples, however, captured when quite young have remained fairly tractable up to the age of five or six years

The American psychologist R M Yerkes, as a result of extensive observations and experiments on the mentality of a young female mountain gorilla, found that this animal showed considerable ability in the solution of problems involving the use of sticks as tools, stacking boxes to secure suspended food, and in experiments involving multiple choice and delayed response Some insight, memory and anticipation of experience were clearly demonstrated Though he cautiously avoids generalizing from a single case, Yerkes finds this gorilla, as "compared with chimpanzees and orang-utans of like age . remarkably slow in adaptation and limited in initiative, originality and insight" (*See* CHIMPANZEE and PRIMATES) (J H McG)

GORINCHEM or GORCUM, a fortified town of Holland in the province of south Holland, on the right bank of the Merwede at the confluence of the Linge, 16 m by rail E of Dordrecht. It is connected by the Zederik and Merwede canals with Amsterdam Pop (1925) 13,599 Gorinchem possesses several old houses, and overlooking the river are some fortified gateways of the 17th century It has an old church dedicated to St Vincent Gorinchem possesses a good harbour, and a considerable trade in grain, hemp, cheese, potatoes, cattle and fish, the salmon fishery being noted Woerkum, or Woudrichem, a little below the town on the left bank of the Merwede, has old buildings decorated with mosaics

GORING, GEORGE GORING, LORD (1608–1657), English Royalist, soldier, son of George Goring, earl of Norwich, was

born on July 14, 1608. He served in the Dutch army, and was lamed at Breda in 1637. Returning in 1639 he became governor of Portsmouth, and won favour with parliament by betraying the "First Army Plot." He then became a Royalist, and obtained Dutch recruits in Dec. 1642 In March 1643 he defeated Fairfax at Seacroft Moor, but was taken prisoner in May In April 1644 he effected an exchange, and commanded the Royalist left at Marston Moor, being routed by Cromwell. In November he became Lord Goring He had joined Charles in the south, and became lieutenant-general of the Royalist horse (*see* GREAT REBELLION). After some successes in the west he retreated to Exeter His excesses gave the Royalist cause a bad name. In March 1645 he went to relieve Oxford, and obtained a high position in the west; being engaged in the operations round Taunton. Fairfax followed his victory at Naseby by defeating Goring at Langport on July 10. In November Goring retired; he later commanded some English regiments in the Spanish service He died at Madrid in the summer of 1657

See the life by C. H Firth in the *Dictionary of National Biography;* the *Clarendon State Papers;* Clarendon, *History of the Great Rebellion;* and S R. Gardiner, *History of the Great Civil War* (1886–91).

GORIZIA (German *Görz;* Slovene, *Gorica*), the capital of a province in Venetia Giulia, Italy, 25 m E of Udine by rail Pop (1921) 26,334, town; 39,829 commune It is picturesquely situated on the left bank of the Isonzo in a fertile valley almost entirely surrounded by hills It is the seat of an archbishop and possesses the richly decorated church of St Ignatius, built in the 17th century by the Jesuits. On an eminence, which dominates the town, is situated the old castle, formerly the seat of the counts of Gorizia Owing to the mildness of its climate Gorizia was a favourite winter resort, and received the name of the Nice of Austria. Its mean annual temperature is 55° F; while the mean winter temperature is 38 7° F It is adorned with many pretty gardens with a luxuriant southern vegetation.

Gorizia was the centre of some of the most important battles on the Italian front during the World War On slightly rising ground above the river Isonzo, which flows to the west, it is surrounded on three sides by heights and villages which constituted so many vantage points for the contending armies These positions are divided into two groups on the two banks of the river On the right bank the village of Podgora, opposite Gorizia, with the hill of the same name dominating, constituted one of the most formidable bulwarks of the Austrian bridgehead, and the Sabotino, farther north, with its vast network of dug-outs and caverns, capable of sheltering many regiments, was the other Repeated attacks on the two hills from June 1915 onward were repulsed with heavy loss, and the attempts to capture the Oslavia saddle between them resulted in desperate engagements at various points which were captured and lost many times In the general offensive against Gorizia of Aug 1916, after elaborate preparations conducted by Colonel (later Field Marshal) Badoglio, Hill 188, Oslavia, the Sabotino and Podgora were finally captured with comparatively small loss, and the operations on San Michele (*see* CARSO) having been equally successful, the Italians were able to occupy Gorizia on the 8th The positions north and east were never completely held, owing to heavy enemy fire, while those to the east remained for the most part in Austrian hands. After Caporetto (Oct 1917) Gorizia itself had to be evacuated together with all the positions on both banks of the Isonzo It was reoccupied after Vittorio Veneto (Oct 1928) The town, which suffered great damage, has been almost entirely reconstructed

GORKI, MAXIM (1868–), pen-name of the Russian author Alexey Maximovich Peshkov, born at Nizhni-Novgorod His father, an upholsterer, died when the boy was five, his mother married again, and he grew up in the family of his maternal grandfather, a dyer, whose affairs went from bad to worse. At nine, the boy was made to earn his own bread. In the following 15 years he changed many trades, and covered in search of work all east and south Russia from Nizhni to the Danube and to Georgia. At the same time he contrived to give himself an education, read voraciously and early began to write While at Tiflis, where he was working in the railway workshops, he succeeded in getting published a story in a local daily, over the signature that has become famous He now became a provincial journalist, and in 1895 a tale of his (*Chelkash,* first Eng. trans. 1902) was accepted by a leading St. Petersburg review. Two years later his stories appeared in book form. The success was unprecedented Gorki found himself placed in public opinion by the side of Tolstoy. Before long his fame crossed the frontier and he became one of the foremost world-celebrities. His play *The Lower Depths* (*Na Dne,* 1903, Eng trans. 1912) had a run of almost two years at Berlin His association (from 1899) with the Social-Democrats brought on him police persecution, but this only increased his popularity at home. In 1905 he took an active part in revolutionary activities, and in 1906 left Russia for an anti-tsarist campaign abroad. In 1907 he settled in Capri About the same time he contracted a friendship with Lenin In 1913 he returned to St Petersburg and started a review (*Letopis*) During the World War he took a pacifist attitude, and in 1917 he gave his, not always unqualified, support to the Bolsheviks. After their victory he became the official spokesman for culture before the new Government, and did much to alleviate the hardships of the intellectual classes, as well as to preserve cultural treasures In 1922 his health compelled him to go abroad After a stay in Germany, he settled at Sorrento. In 1928 he visited the U S S R , where he was given an enthusiastic reception.

Gorki's literary work falls distinctly into three periods In the '90s he wrote the short stories that first made him famous. Their subject-matter is taken mainly from the lives of tramps and social outcasts, whom he represents with a mixture of outspoken realism and romantic gusto. It was the latter quality that most endeared them to the Russian public The romantic colouring he gave his tramps and thieves has become somewhat the worse for wear, but the best of these early stories (*My Fellow-traveller* and *Twenty-Six Men and a Girl,* Eng trans 1902) fall little short of being masterpieces After 1899 Gorki wrote longer and more ambitious novels and plays, which aimed at presenting a broad and comprehensive picture of Russian life and at finding the solution of burning social problems. Most of them lack constructive unity, and are disfigured by interminable conversations on "the meaning of life" The plays especially are hopelessly formless. Towards 1906 Gorki's popularity with the intelligentsia began to decline, but it increased among the working-class, who came to regard him as their literary spokesman His proletarian novel *Mother* (1907, Eng trans 1921, publ in U S A) which has been recently turned into a splendid film by the great film-producer Eisenstein, is not, however, by itself a work of great value. Gorki's third period begins with the publication in 1913 of *Childhood* (Eng trans 1915), the first part of an autobiographical trilogy, of which the other parts are *In the World* (*V Lyudyakh,* 1915, Eng trans 1917) and *My Universities* (1923, Eng trans *Reminiscences of my Youth,* 1924). Together with a volume of *Recollections* (it includes the famous *Recollections of Tolstoy,* Eng trans 1920, a document of quite exceptional value), and *Fragments from my Diary* (1924, Eng trans 1924) these works are the best Gorki has written The penetrating and plastic realism with which he presents a vast gallery of Russian characters, is unrivalled After 1926 Gorki seems once more to have turned to formal fiction dealing with social problems (*The Artamonov's Business,* Eng trans. *Decadence,* 1927). (D. S. M.)

GÖRLITZ, a town in the Prussian province of Silesia, on the left bank of the Neisse, 62 m E from Dresden on the railway to Breslau, and at the junction of lines to Berlin, Zittau and Halle Pop. (1925) 85,636. Gorlitz is an ancient village, which, as Drebenau, received civic rights at the beginning of the 12th century. After a fire in 1131, it was rebuilt and called Zgorzelice About the end of the 12th century it was strongly fortified, and for a short time it was the capital of a duchy of Gorlitz. It also suffered considerably in the Thirty Years' War and the Seven Years' War. In 1815 the town, with the greater part of Upper Lusatia, came into the possession of Prussia. Gorlitz is wealthy, owing to the extensive municipal forests of 70,000 acres The fine Gothic church of St. Peter and St Paul dates from the 15th century; the Frauen Kirche (end 15th cent.) possesses a fine

portal and choir in pierced work; the Kloster Kirche, restored in 1868, has handsome choir stalls and a carved altar dating from 1383. The old bastion, named Kaisertrutz, has been used as a guardhouse and armoury Near the town is the chapel of the Holy Cross, where there is a model of the Holy Sepulchre at Jerusalem made during the 15th century. In the public park there is a bust of Schiller and a monument to Alexander von Humboldt, also a statue of the mystic Jakob Böhme (1575–1624). There is a large library and a rich collection of antiquities, coins and articles of *virtu*. Gorlitz, next to Breslau, is the largest and most flourishing commercial town of Silesia, and is classic for study of German Renaissance architecture Cloth is manufactured, also various linen and woollen wares, machines, railway wagons, glass, sago, tobacco, leather, chemicals and tiles.

GÖRRES, JOSEPH VON (1776–1848), German writer, was born on Jan. 25, 1776, at Coblenz, and educated at a Latin college under clerical direction Young Görres sympathized with the French Revolution, harangued the revolutionary clubs in the Rhineland, and insisted on the unity of interests which should ally all civilized States He then began a Republican journal called *Das rote Blatt* (afterwards *Rubezahl*), in which he eloquently defended French principles

After the peace of Campo Formio (1797) there was some hope that the Rhenish provinces would be constituted into an independent Republic In 1799 the provinces sent to Paris an embassy of which Görres was a member; it arrived two days after Napoleon had assumed the supreme direction of affairs After much delay he received the embassy; but the only answer they obtained was "that they might rely on perfect justice, and that the French Government would never lose sight of their wants" Görres on his return published a tract called *Resultate meiner Sendung nach Paris*, in which he reviewed the history of the French Revolution He was thoroughly disillusioned During the 13 years of Napoleon's dominion Gorres lived a retired life In 1801 he married Catherine de Lasaulx, from 1806 to 1808 he lectured at Heidelberg With K Brentano and L von Arnim he edited the famous *Zeitung fur Einsiedler* (subsequently re-named *Tröst-Einsamkeit*), and in 1807 he published *Die deutschen Volksbücher*.

He loved the German folk-tale, not as a vehicle for romantic ideas, but in its stark realism His versions have none of the fanciful adornments given to the folk-tale by Novalis and Tieck, but are more akin to those of the brothers Grimm He returned to Coblenz in 1808 He now studied Persian, and published a *Mythengeschichte der asiatischen Welt* (2 vols, 1810) and *Das Heldenbuch von Iran* (1816), a translation of part of the *Shahnama*, the epic of Firdousi In 1813 he was drawn into the movement for national independence and in 1814 founded the *Rheinische Merkur* The intense earnestness of the paper, its hostility to Napoleon, and its fiery eloquence secured for it a position unique in the history of German newspapers Napoleon himself called it *la cinquième puissance* It advocated a united Germany, with representative government, but under an emperor after the fashion of other days—for Görres now abandoned his early revolutionary ideas He inveighed most bitterly against the second peace of Paris (1815), declaring that the territory comprising Alsace and Lorraine should have been demanded back from France.

Stein was glad enough to make use of the *Merkur* at the time of the meeting of the congress of Vienna, but Hardenberg in May 1815 warned Görres to remember that he was not to attack France but only Bonaparte The *Merkur* evinced an antipathy to Prussia, a desire for an Austrian emperor, and also a tendency to pronounced liberalism—which made it most distasteful to Hardenberg and Frederick William III Görres disregarded the warnings of censorship, and accordingly his paper was suppressed early in 1816 at the instance of the Prussian Government; soon afterwards Görres was dismissed from his post as teacher at Coblenz In the wild excitement which followed Kotzebue's assassination the reactionary decrees of Carlsbad were framed, and these were attacked by Görres in his pamphlet *Deutschland und die Revolution* (1820) He reviewed the circumstances which had led to the murder of Kotzebue, and, while expressing horror at the deed itself, he urged the danger of repressing the free utterance of public opinion by reactionary measures. The pamphlet was suppressed by the Prussian Government, and orders were immediately issued for the arrest of Gorres and the seizure of his papers He escaped to Strasbourg, and thence went to Switzerland.

In Gorres's pamphlet *Die heilige Allianz und die Völker auf dem Kongress zu Verona*, he asserted that the princes had met together to crush the liberties of the people, and that the people must look elsewhere for help The "elsewhere" was to Rome; and from this time Gorres became a vehement Ultramontane King Ludwig of Bavaria gave him the chair of history at Munich His *Christliche Mystik* (1836–42) was an exposition of Roman Catholic mysticism On the deposition and imprisonment by the Prussian Government of the archbishop Clement Wenceslaus, in consequence of the dispute on mixed marriages, Görres wrote a violent tract, *Athanasius* (1837), on the Catholic side Görres died on Jan 29, 1848

Gorres's *Gesammelte Schriften* (only his political writings) appeared in six volumes (1854–60), to which three volumes of *Gesammelte Briefe* were subsequently added (1858–74). *See* J Galland, *Joseph von Gorres* (1876, 2nd ed 1877), J N Sepp, *Gorres und seine Zeitgenossen* (1877) and by the same author, *Gorres*, in the series *Geisteshelden* (1896), J G Uhlmann, *Joseph Gorres und die deutsche Einheits und Verfassungsfrage* (1912), M. Berger, *Gorres als politischer Publizist* (1921) A *Gorres-Gesellschaft* was founded in 1876, and in 1926 counted about 4,000 members. Its purpose is to encourage the Catholic aspect in culture

GORSAS, ANTOINE JOSEPH (1752–1793), French publicist and politician, son of a shoemaker, was born at Limoges (Haute-Vienne) on March 24, 1752 He set up an army school at Versailles In 1781 he was imprisoned in the Bicêtre on an accusation of corrupting the morals of his pupils, his real offence being the writing of satirical verse At the opening of the states-general he published the *Courrier de Versailles à Paris et de Paris à Versailles*, in which appeared on Oct 4, 1789, the account of the banquet of the royal bodyguard. He continued his incendiary propaganda in the *Courrier des quatre-vingt-trois départements* During the September massacres he wrote that the prisons were the centre of an anti-national conspiracy and that the people exercised a just vengeance on the guilty On Sept 10, 1792 he was elected to the Convention (Seine-et-Oise) He sat at first with the Mountain, but his agreement with the Girondists became gradually more pronounced, during the trial of Louis XVI. he voted for the king's detention during the war and subsequent banishment An attack on Marat in the *Courrier* led to a raid on his printing establishment on March 9, 1793, but he escaped to Normandy to join Buzot, and after the defeat of the Girondists at Pacy-sur-Eure he found shelter in Brittany The Convention passed a resolution forbidding representatives to engage in journalism On June 2 he was ordered by the Convention to hold himself under arrest He was imprudent enough to return to Paris in the autumn, where he was arrested on Oct 6, and guillotined the next day

See the *Moniteur*, No 268 (1792), Nos 20, 70 new series 18 (1793); M Tourneux, *Bibl de l'hist de Paris*, 10,291 *seq.* (1894).

GORSE: *see* FURZE

GORST, SIR JOHN ELDON (1835–1916), English statesman, was born at Preston, the son of Edward Chaddock Gorst, who took the name of Lowndes on succeeding to the family estate in 1853. He graduated third wrangler from St John's College, Cambridge, in 1857, and was admitted to a fellowship After beginning to read for the bar in London, he sailed for New Zealand, where he married in 1860 Mary Elizabeth Moore The Maoris had at that time set up a king of their own in the Waikato district and Gorst, who had made friends with the chief Tamihana (William Thomson), acted as an intermediary between the Maoris and the Government Sir George Grey made him inspector of schools, then resident magistrate, and eventually civil commissioner in Upper Waikato Tamihana's influence secured his safety in the Maori outbreak of 1863 In 1908 he published a volume of recollections, under the title of *New Zealand Revisited· Recollections of the Days of my Youth* He then returned to England and was called to the bar at the Inner Temple in 1865,

becoming Q C. in 1875. He sat in parliament for Cambridge from 1865 to 1868. After the Conservative defeat of that year he was entrusted by Disraeli with the reorganization of the party machinery, and in five years of hard work he paved the way for the Conservative success at the general election of 1874. At a bye-election in 1875 he re-entered parliament as member for Chatham, which he continued to represent until 1892 He joined Henry Drummond-Wolff, Randolph Churchill and Arthur Balfour in the "Fourth Party," and he became solicitor-general in the administration of 1885–86 and was knighted On the formation of the second Salisbury administration (1886) he became under-secretary for India and in 1891 financial secretary to the Treasury At the general election of 1892 he became member for Cambridge university He was deputy chairman of committees in the House of Commons from 1888 to 1891, and on the formation of the third Salisbury administration in 1895 he became vice-president of the committee of the council on education (until 1902) Sir John Gorst adhered to the principles of Tory democracy which he had advocated in the days of the fourth party, and took an active interest in the housing of the poor, the education and care of their children, and in social questions generally, both in parliament and in the press But he was always "independent" in his political action He objected to Chamberlain's proposals for tariff reform, and lost his seat at Cambridge at the general election of 1906 to a tariff reformer He then withdrew from the vice-chancellorship of the Primrose League, of which he had been one of the founders, on the ground that it no longer represented the policy of Lord Beaconsfield In 1910 he contested Preston as a Liberal, but failed to secure election. He died in London on April 4, 1916

His elder son, Sir J Eldon Gorst (1861–1911), was financial adviser to the Egyptian government from 1898 to 1904, when he became assistant under-secretary of state for foreign affairs In 1907 he succeeded Lord Cromer as British agent and consul-general in Egypt. He died at Castle Combe, Wiltshire, on July 12, 1911.

An account of Sir John Gorst's connection with Lord Randolph Churchill will be found in the *Fourth Party* (1906), by his younger son, Harold E Gorst

GORTER, HERMAN (1864–), Dutch poet, was born on Nov 26, 1864, at Wormerveer He taught for some time in the gymnasium at Amersfoort, and then settled at Bussum. His strong impressionistic tendencies colour his three chief publications—*Mei, een Gedichte* (1893), *De School der Poezie* (1897) and *Pan, een Gedichte* (1912) His translation of Spinoza's *Ethics* appeared in 1895

See Hauser, *Die niederlandische Lyrik von 1875–1900* (1901).

GORTON, SAMUEL (1592–1677), colonial fighter for religious and civil liberty, was born in Gorton, England, in 1592 For a time a clothier in London, he sailed for Boston, Mass., "to enjoy liberty of conscience." Failing to find it there and being involved in religious, political and property disputes at Plymouth, Aquidneck, Providence and Shawomet successively, he went to England, where he published in 1646 *Simplicities Defence against Seven Headed Policie* (reprinted in the R I Hist Soc *Collections*, vol. ii), giving an account of his grievances against the Massachusetts Government He returned to Shawomet in 1648 with a letter from the earl of Warwick, after whom he renamed the settlement, and lived there in peace and honour until his death on or before Dec. 10, 1677 He left several religious treatises, both in print and manuscript, some of them surprisingly modern in concept in spite of their quaint phraseology. As a result estimates of him have shifted from his contemporaries' denunciations as "a most prodigious minter of exorbitant novelties" and "a man whose spirit was stark drunk with blasphemies and insolences," to his later biographers' tributes as "a forgotten founder of our liberties," "the premature John the Baptist of New England Transcendentalism"

Edward Winslow's attack on Gorton, *Hypocrisie Unmasked* (1646) was issued by the Club for Colonial Reprints (Providence, 1916) Among his biographers are J. M Mackie in J Sparks's, *Library of American Biography* (2nd ser., vol v, 1845); L G. Janes (1896), and Adelos Gorton (1907).

GORTON, Gorton parliamentary division, Manchester borough, Lancashire, England. Pop. (1921), 48,465. It is a large manufacturing district, with cotton mills, engineering, motor, iron and chemical works, and contains two reservoirs (capacity 223 million gallons) for Manchester water supply.

GORTYNA or Gortyn, an important ancient city of Crete on the small river Lethaeus (Mitropolipotamo), about three hours distant from the south coast with which it communicated by two harbours, Metallum and Lebena Near the town was the spring, overhung by an evergreen plane tree which in popular belief marked the scene of the amours of Zeus and Europa Gortyna was, next to Cnossus, the largest and most powerful city of Crete, but neither plays a conspicuous part in the history of Greece Under the Romans Gortyna became the metropolis of the island Extensive ruins may be seen at the village of Hagii Deka, and the great inscription containing many of the ancient laws. The ruinous church of St Titus dates from about the 4th century.

See also Crete, and for a full account of the laws *see* Greek Law (J. L. My.)

GÖRTZ, GEORG HEINRICH VON, Baron von Schlitz (1668–1719), Swedish statesman, entered the Holstein-Gottorp service, and after the death of the duchess Hedwig Sophia, Charles XII 's sister, became influential during the minority of her son, Duke Charles Frederick His earlier policy aimed at strengthening Holstein-Gottorp at the expense of Denmark. With this object, during Charles XII 's stay at Altranstadt (1706–1707), he tried to divert the king's attention to the Holstein question, and six years later, when the Swedish commander, Magnus Stenbock, crossed the Elbe, Gortz surrendered the fortress of Tonning to the Swedes. He next attempted to undermine the grand alliance against Sweden by negotiating with Russia, Prussia and Saxony for the purpose of isolating Denmark, or even of turning the arms of the allies against her The plan foundered on the refusal of Charles XII to save the rest of his German domains by ceding Stettin to Prussia Another simultaneous plan of procuring the Swedish crown for Duke Charles Frederick failed Gortz first suggested the marriage between the duke of Holstein and the tsarevna Anne of Russia.

On the arrival of Charles XII. from Turkey at Stralsund, Gortz was the first to visit him, and emerged from his presence virtually chief minister Gortz owed his extraordinary influence to the fact that he was the only one of Charles's advisers who believed, or pretended to believe, that Sweden was still far from exhaustion, or at any rate had a sufficient reserve of power to give support to an energetic diplomacy Ostensibly, Gortz was only the Holstein minister at Charles's court, in reality he was everything in Sweden except a Swedish subject—finance minister, plenipotentiary to foreign powers, factotum, and responsible to the king alone, though he had not a line of instructions His chief financial expedient was to debase, or rather ruin, the currency by issuing copper tokens redeemable in better times; but it was no fault of his that Charles XII, during his absence, flung upon the market too enormous an amount of this copper money for Gortz to deal with By the end of 1718 the hatred of the Swedes towards him was so intense and universal that they blamed him for Charles XII 's tyranny as well as for his own.

Gortz hoped to conclude peace with at least some of Sweden's numerous enemies before the crash came and then, by means of fresh combinations, to restore Sweden to her rank as a great power In pursuance of his "system," Gortz displayed a genius for diplomacy which would have done honour to a Metternich or a Talleyrand He desired peace with Russia first of all, and at the congress of Åland even obtained relatively favourable terms, only to have them rejected by his obstinately optimistic master Simultaneously, Gortz was negotiating with Cardinal Alberoni and with the whigs in England On the sudden death of Charles XII the whole fury of the Swedish nation fell upon Gortz After a trial before a special commission which was a parody of justice —the accused was not permitted to have any legal assistance or the use of writing materials—he was condemned to be beheaded,

and promptly executed. His death was certainly a judicial murder, and some historians even regard him as a political martyr

See R. N Bain, *Charles XII* (1895), and *Scandinavia*, chap 12 (Cambridge, 1905); B von Beskow, *Freiherre Georg Heinrich von Gortz* (Stockholm, 1868).

GORZ: *see* Gorizia

GOSCHEN, GEORGE JOACHIM GOSCHEN, 1st Viscount (1831–1907), British statesman, son of William Henry Göschen, a London merchant of German extraction, was born in London on Aug 10, 1831 He was educated at Rugby under Dr Tait, and at Oriel college, Oxford, where he took a first-class in classics He entered his father's firm of Fruhling and Goschen, of Austin Friars, in 1853, and three years later became a director of the Bank of England In 1863 he was returned without opposition as member for the city of London in the Liberal interest, and this was followed by his re-election, at the head of the poll, in the general election of 1865 In November he was appointed vice-president of the Board of Trade and paymaster-general, and in Jan 1866 he was made chancellor of the duchy of Lancaster, with a seat in the cabinet Goschen joined Gladstone's cabinet in 1868 as president of the Poor Law Board, and continued to hold that office until March 1871, when he succeeded Childers as first lord of the admiralty In 1874 he was elected lord rector of the University of Aberdeen Sent to Cairo in 1876 as delegate for the British holders of Egyptian bonds, to arrange for the conversion of the debt, he effected an agreement with the Khedive

In 1880 he was elected for Ripon, and continued to represent that constituency until the general election of 1885, when he was returned for the eastern division of Edinburgh Being opposed to the extension of the franchise, he was unable to join Gladstone's Government in 1880, declining the post of viceroy of India, he accepted that of special ambassador to the Porte, and was successful in settling the Montenegrin and Greek frontier questions in 1880 and 1881. In 1884 he declined the speakership of the House of Commons During the parliament of 1880–85 he frequently found himself at variance with his party, and when Gladstone adopted the policy of Home Rule for Ireland, Goschen followed Hartington and became one of the most active of the Liberal Unionists. He lost his seat in the election of July 1886 On the resignation of Randolph Churchill in Dec 1886, Goschen though a Liberal Unionist, became chancellor of the exchequer Being defeated at Liverpool (Jan 26, 1887), by seven votes, he was elected for St George's, Hanover Square (Feb 9)

His chancellorship of the exchequer (1886–92) was rendered memorable by his successful conversion of the National Debt in 1888 (*see* National Debt) With that financial operation, under which the new 2¾% Consols became known as "Goschens," his name will long be connected From 1895 to 1900 Goschen was first lord of the admiralty He retired in 1900, and was raised to the peerage by the title of Viscount Goschen of Hawkhurst, Kent He continued to take a great interest in public affairs, and when Mr. Chamberlain started his tariff reform movement in 1903, Lord Goschen was one of the weightiest champions of free trade on the Unionist side He died on Feb. 7, 1907, being succeeded in the title by his son George Joachim (b 1866), who was Conservative M P for East Grinstead from 1895 to 1900, and married a daughter of the 1st earl of Cranbrook

In educational subjects Goschen had always taken the greatest interest He was a pioneer of the University Extension movement, and his first efforts in parliament were devoted to advocating the abolition of religious tests and the admission of Dissenters to the universities In addition to his well-known work on *The Theory of the Foreign Exchanges* (1861, 5th ed 1864) he published several financial and political pamphlets and addresses on educational and social subjects, among them being that on *Cultivation of the Imagination* (Liverpool, 1877), and that on *Intellectual Interest* (Aberdeen, 1888). He also wrote *The Life and Times of Georg Joachim Goschen, publisher and printer of Leipzig* (1903)

See A. D. Elliot, *Life of Lord Goschen* (2 vols. 1911)

GOSHAWK, *i e*, goose-hawk (*Accipiter gentilis*), the largest short-winged hawk used in falconry The genus *Accipiter* may be distinguished from *Falco* by the smooth edges of its beak, its short wings, and its long legs and toes In plumage the goshawk has a general resemblance to the peregrine falcon, and it undergoes a corresponding change as it develops—the young being longitudinally streaked beneath, while the adults are transversely barred The irides, however, are always yellow, or in old birds orange, while those of the falcons are dark brown The sexes differ greatly in size The goshawk, nowadays rare in England, was once common. In many parts of Europe it still abounds It ranges eastward to China and thence to North America It feeds on small mammals, especially squirrels, and birds of all kinds, including gamebirds and domestic pigeons and poultry

GOSHEN, a region of Egypt (? by the Wadi Tumilāt) settled by the Israelite shepherds between Jacob's immigration and the Exodus The region has not been finally identified The name may possibly be of Semitic, or at least non-Egyptian origin, as in Palestine we meet with a district (Josh x 41, xi 16) and a city (*ib.* xv 51) of the same name The Septuagint reads Γέσεμ Ἀραβίας in Gen xlv 10, and xlvi 34, elsewhere simply Γέσεμ. In xlvi. 28 "Goshen . . . the land of Goshen" are translated respectively "Heroopolis the land of Rameses" This represents a late Jewish identification The extent of Goshen, according to the book of Judith (1 9, 10), included Tanis and Memphis; this is probably an overstatement Goshen was a place of good pasture and fruitful in edible vegetables and in fish (Numbers xi 5)

GOSHEN, a city of northern Indiana, U S A, on the Elkhart river, at an altitude of 800ft, the county seat of Elkhart county It is served by the Big Four, the New York Central, and two inter-urban electric railways, and has an air-mail landing field The population in 1920 was 9,525 (97% native white) Goshen is in the fertile St Joseph River valley, and is within 20m of two popular lake resorts Its residential streets are beautifully shaded with maple trees Since 1903 it has been the seat of Goshen college (Mennonite), chartered as Elkhart institute (in Elkhart) in 1895 Ample electric power is available from a super-power system, and there are over 40 manufacturing establishments, making maps, flour, condensed milk, knitted underwear and diversified products of wood, metal and rubber Goshen was settled in 1828 and was chartered as a city in 1868

GOSLAR, a town in the Prussian province of Hanover, on the Gose, at the north foot of the Harz, 24 m S E of Hildesheim and 31 m S S W from Brunswick, by rail Pop (1925) 20,911

Goslar, probably founded under Henry the Fowler (920) became important under Otto the Great when minerals were discovered here It was often the meeting-place of German diets, and about 1350 it joined the Hanseatic League In the middle of the 14th century the famous *Goslar statutes*, a code of laws, adopted by many other towns, was published Fires in 1632, in 1728 and 1780 damaged its prosperity In 1802 it came into the possession of Prussia, in 1807 was joined to Westphalia, and in 1866 it was, along with Hanover, re-united with Prussia It is surrounded by walls Among the noteworthy buildings are the "Zwinger," a tower with walls 23 ft thick, the market church, in Romanesque style, restored since its partial destruction by fire in 1844, containing a library in which are some of Luther's manuscripts, the old town hall (Rathaus) has interesting antiquities, and the Kaiserhaus is the oldest secular building in Germany, built by the emperor Henry III before 1050 A small chapel is all that remains since 1820 of the cathedral of St Simon and St Jude founded by Henry III about 1040, it contains an old altar supposed to be that of the idol Krodo which formerly stood on the Burgberg near Neustadt-Harzburg; the church of the former Benedictine monastery of St Mary, or Neuwerk, is Romanesque of the 12th century, the house of the bakers' gild is now an hotel, the birthplace of Marshal Saxe, a natural science museum, contains a collection of Harz minerals, and there is a museum of antiquities Sulphur, copper, silver and other mines are important The town has been long noted for beer, possesses small manufactures and trades in fruit

GOSLICKI, WAWRZYNIEC (?1533–1607), Polish bishop, better known under his Latinized name of Laurentius Grimalius

Goslicius, was born about 1533. After having studied at Cracow and Padua, he entered the church, and was successively appointed bishop of Kamnietz and of Posen. It was chiefly through Goslicki's influence that the Jesuits were prevented from establishing their schools at Cracow He died on Oct. 31, 1607. His principal work is *De optimo senatore*, etc. (Venice, 1568). There are two English translations published respectively under the titles *A commonwealth of good counsaile*, etc (1607), and *The Accomplished Senator*, done into English by Mr. Oldisworth (1733).

GOSLIN or **GAUZLINUS** (d. *c.* 886), bishop of Paris and defender of the city against the Northmen (885), is variously described as the son of Roricon II, count of Maine and the natural son of the emperor Louis I. In 848 he entered a monastery at Reims; later he became abbot of St Denis. He took a prominent part in the struggle against the Northmen, by whom he and his brother Louis were taken prisoners (858), and he was released only after paying a heavy ransom (*Prudentii Trecensis episcopi Annales*, ann. 858). From 855 to 867 he held intermittently, and from 867 to 881 regularly, the office of chancellor to Charles the Bald and his successors In 883 or 884 he was elected bishop of Paris, and foreseeing the dangers to which the city was to be exposed from the attacks of the Northmen, he strengthened the defences, though he also relied for security on the merits of the relics of St. Germain and St. Geneviève The city was attacked on Nov 26, 885, and the struggle for the possession of the bridge (now the Pont-au-Change) lasted for two days; but Goslin repaired the destruction of the wooden tower overnight, and the Normans were obliged to give up the attempt to take the city by storm The siege lasted for about a year longer, while the emperor Charles the Fat was in Italy. Goslin died soon after the preliminaries of the peace had been agreed on, worn out by his exertions, or killed by a pestilence which raged in the city

See Amaury Duval, *L'Evêque Gozlin ou le siège de Paris par les Normands, chronique du IXe siècle* (2 vols., 1832, 3rd ed. *ib.*, 1835).

GOSNOLD, BARTHOLOMEW (d. 1607), English navigator In 1602, in command of the "Concord," chartered by Sir Walter Raleigh and others, he crossed the Atlantic; coasted from what is now Maine to Martha's Vineyard, landing at and naming Cape Cod and Elizabeth island (now Cuttyhunk) and giving the name Martha's Vineyard to the island now called No Man's Land; and returned to England with a cargo of furs, sassafras and other commodities obtained in trade with the Indians about Buzzard's bay. In London he actively promoted the colonization of the regions he had visited and, by arousing the interest of Sir Ferdinando Gorges and other influential persons, contributed toward securing the grants of the charters to the London and Plymouth companies in 1606 In 1606–07 he was associated with Christopher Newport in command of the three vessels by which the first Jamestown colonists were carried to Virginia. As a member of the council he took an active share in the affairs of the colony, seconding the efforts of John Smith to introduce order, industry and system in the colony. He died from swamp fever on Aug. 22, 1607

See *The Works of John Smith* (Arber's Edition, 1884); and J M Brereton, *Brief and True Relation of the North Part of Virginia* (reprinted by B. F. Stevens, 1901), an account of Gosnold's voyage of 1602.

GOSPATRIC or **COSPATRIC** (*fl* 1067), earl of Northumberland, belonged to a family which had connections with the royal houses both of Wessex and Scotland Before the Conquest he is said to have accompanied Tostig on a pilgrimage to Rome (1061) About 1067 he bought the earldom of Northumberland from William the Conqueror, but, repenting of his submission, fled with other Englishmen to the court of Scotland (1068) He joined the Danish army of invasion in 1069, but was afterwards able, from his possession of Bamburgh castle, to make terms with the conqueror The peace concluded with Scotland in 1072 left him at William's mercy He lost his earldom and took refuge in Scotland, where Malcolm seems to have provided for him

See E. A Freeman, *Norman Conquest*, vol. i (Oxford, 1877), and the *English Hist Review*, vol. xix (London, 1904).

GOSPEL denotes primarily the "good news" of Christianity (O. Eng. *godspel, i.e.*, good news, corresponding to Lat. *evangelium*, Gr. *εὐαγγέλιον*). *See* CHRISTIANITY. In the Greek New Testament "evangel" and "evangelize" are used especially in the Pauline and Lucan writings ("evangel" also in certain passages in Mark) to denote the preaching or the message of Christianity, and would seem therefore at a very early date to have become technical terms in the vocabulary of the Gentile Christian Mission. An inscription of the year 9 B C found at Priene describes the birthday of the Emperor Augustus as having been "for the world the beginning of things which owing to him are *glad tidings*." The Christian use of such language probably goes back, however, to the LXX. version of Is. lxi 1, in which the Gr. verb "evangelize" is used to translate a corresponding Hebrew expression In Mk i. 14, 15 Jesus' own preaching is described as a "gospel" It is possible that He may have used some Aramaic phrase for "glad tidings," or quoted Is. lxi 1 (*cf.* Mt. xi. 5, Lk iv 18, vii 22).

The use of the term "gospel" to denote a written work setting forth the story of Jesus is derived probably from the fact that the word happened to occur in the opening sentence of the Gospel according to St Mark, which appears to have been the earliest work of the kind. Christian usage was influenced by Jewish, and among the Jews it was a common practice to refer to books by their opening words "Gospel" became consequently a kind of title, and when other similar works came to be compiled, the same title was extended to them by analogy. When it became necessary, later still, to distinguish the different "Gospels" from one another, they were described as the Gospels *according to* Mark, *according to* Luke, etc The four "Gospels" recognised by the Church were not regarded as rivals, but as parallel versions of the same fundamental message—the "good news" about Jesus. The heretic Marcion, early in the second century A.D, described St Luke's Gospel (edited with modifications by himself) as "the Gospel," in contradistinction to "the *Apostolicon*" (a collection of Pauline Epistles), and Justin Martyr (*c* A D 145–160) speaks of "memoirs" of the Apostles, "which are called Gospels" (Justin, *Apol* I. 66). The use of the term by Ignatius of Antioch (*c.* A D. 110; *see* Ignat *ad Philad* viii 2) in the sense of a *written Gospel* is less certain A number of more or less imaginative lives of our Lord, not accepted by the Church as canonical, are known as the "apocryphal gospels" (*see* APOCRYPHAL LITERATURE) The Syriac writer Tatian, not long after the death of Justin, produced a harmony of the four Gospels, known as the *Diatessaron* ("through four"); and in the treatise of Irenaeus *Against Heresies* (*c* A D 180; *see* esp III i 1 *sq*, and x, xi) the four Gospels since recognised as canonical are clearly regarded as being uniquely authoritative For further information as regards the diffusion and reception of the Gospels in Christian antiquity *see* BIBLE, N T, § 1, CANON; and for individual accounts of the Gospels *see* the articles MATTHEW, MARK, LUKE and JOHN The present article deals only in general terms with the beginnings of Gospel-literature, and with the mutual relations of the four Gospels received by the Church

The Beginnings of Gospel Literature.—The Church did not depend originally upon written accounts of our Lord Christianity was proclaimed as a "Gospel" before any Christian literature existed at all, and the first Christian writings are not "Gospels"; they are the Epistles of St Paul From the date of the Crucifixion to the date at which the earliest of our Gospels was written (*see* MARK, GOSPEL OF) appears to have been almost exactly a generation The substance of the narratives and sayings which eventually went to make up the contents of the Gospels circulated originally in the form of oral tradition.

The attempt has been made by recent New Testament criticism to infer back, behind the present literary forms of "the Gospel," to the pre-literary stage of the tradition According to Paul, the "Gospel" received by him and handed on to his converts included "first of all" the assertions that "Christ died for our sins according to the Scriptures; and that he was buried, and that he hath been raised on the third day according to the Scriptures; and that he appeared to Cephas: then to the twelve" (I Cor. xv.

1–5). The story of the Passion and Resurrection was regarded therefore from the first as being of primary import; a fact which accounts at once for the connected and continuous character of the Passion-narratives in the existing four Gospels, for the elaboration of detail which they display, and for the large proportion of space which they occupy in relation to the contents of the Gospels as a whole

The interest, however, of the Christian Church in the story of Jesus was not confined to the fundamental story of the Passion and Resurrection Apart from the theological interest in Christ the Redeemer from sin, there was a purely human interest—those who had been personally in contact with Jesus could never allow His memory to fade. There was further a moral and spiritual interest—the sayings and deeds of the Lord were regarded as supplying the key to the solution of the moral and practical problems confronting the Church. The ideal of life which was everywhere set before converts was that of "living in accordance with the words of the Lord"; and the experiences which befell the Church, whether of success or of failure, the sharp onset of persecution and the call to face martyrdom, the problems of early Church discipline, the necessities of early apologetic and polemic against the Jews—all these were illuminated and dealt with, as far as possible, by reference to the remembered words and example of Jesus The church was interested further to know the story of its own beginnings and of the origin of its characteristic institutions—the Apostolate, Baptism, the Eucharist Stories moreover appear to have been preserved which exhibited Jesus more particularly in the characters of Wonder-worker, Teacher and Prophet

With all these considerations in view, the new school of "form-criticism" attempts to throw light upon the pre-literary history of the Gospel-material by means of an analysis and classification of its "forms" The material can, as a matter of fact, without difficulty be classified or grouped under such headings as (1) dialogues, (2) stories of miracles, (3) parables, (4) narrative paragraphs, (5) poem stanzas, and (6) groups of short sayings It is noticeable that all these represent "forms" of which the contents would be easy to memorize, and it may be presumed that it was in these "forms" that the material of the Church's tradition about Jesus was in circulation before it came to be written down

Precisely how early the material, or any part of it, was committed to writing is a matter of dispute among scholars The Greek of St Mark, and to a large extent also the Greek in which the sayings of Jesus contained in the non-Marcan Gospels are expressed, is strongly Semitic in colouring, and bears all the marks of what is described as "translation Greek" The story of Jesus must of course have been originally told, and His sayings reported, in the vernacular Aramaic language of Palestine Was the Aramaic stage of the tradition a purely oral one? Or are there Aramaic *documentary* sources behind our Greek Gospels?

On the whole it appears to be the more probable view that the literary stage in the transmission of the Gospel materials belongs, in the main, to Greek-speaking Christianity, the evidences of "translation Greek" being due not to actual translation from documents, but to the originally Semitic character of the tradition, and to the fact that it was in the first instance "done into Greek" by interpreters whose native speech was Semitic The Aramaic-speaking Church of Jerusalem, the original fountain-head of the tradition, was in all probability for a considerable period of the same mind as the early second century writer Papias, who believed that he "would not be so much profited" by "what came from books" as by "the living and abiding voice" (Papias *ap* Euseb *H E* III 39, 4)

On the other hand, it is probable that in Greek-speaking circles the work of Christian teachers and catechists was at a very early stage helped by the use of written materials as an aid to the memory Collections of the sayings and parables of Jesus were probably made, and perhaps collections of short narratives also There were therefore written materials available when the Gospels came to be compiled (*cf* Lk i 1 *sq*), for the most part probably in the form rather of catechists' notes than of "books" in any literary sense. The later Gospels of Matthew and Luke are dependent on Mark (*see* below), but on other documents also A specific tradition with regard to the words and deeds of our Lord probably tended to crystallize in each of the main centres of early Church missionary work—Jerusalem, Caesarea, Antioch, and eventually Rome St. Mark's Gospel represents the tradition of Rome (*see* MARK, GOSPEL OF) It has been suggested of late that a great part of the special material peculiar to Luke may have been derived from the tradition of the Church at Caesarea, that the document "Q," used in common by Matthew and Luke (*see* below), represents the tradition of Antioch; and that the matter peculiar to Matthew is derived, in the main, from the tradition of the Church at Jerusalem (B H Streeter, *The Four Gospels*, pp. 230 *sqq*) The conjecture is not without probability, but it does not follow that we can to-day reconstruct these supposed sources with any exactness, since it is likely that in respect of their contents all or most of the documents to a certain extent overlapped

The Synoptic Problem.—It has been already remarked that the Gospels of Matthew and Luke are dependent on Mark If the first three canonical Gospels are arranged in parallel columns, so as to provide a "synoptic" view of their contents, it becomes manifest at once that there are literary relationships between them, and the literary problem thus constituted—the *Synoptic* Problem, as it is called—has been elaborately studied in modern times, and to a large extent solved

(1) Of the 661 verses contained in the authentic text of Mark, it has been calculated that more than 600 are reproduced or represented in substance in Matthew, and about 350 in Luke, while the material contained in Mark which is wholly unrepresented in *either* Matthew *or* Luke amounts to only 31 verses in all The agreements are largely *verbatim*, sometimes in all three Synoptists, more often either between Matthew and Mark or between Luke and Mark, only rarely between Matthew and Luke against Mark, and it is to be observed that this latter type of agreement (Mt and Lk against Mk) tends either to disappear, when the true text of the Gospels has been critically determined in the light of the most recent discoveries of textual criticism (*i e*, the supposed "agreements" are the result merely of the erroneous assimilation of the texts to one another in the course of scribal transmission), or to be fairly easily explicable (*e g*, Mt and Lk have concurred in correcting in the most obvious way the defective grammar of Mk, or in the substitution of the most obvious Greek word for a rare or unsuitable word used by Mk.) It is to be observed, further, that the actual *order* of the materials in Mk tends to be reproduced *either* in Mt *or* in Lk, and sometimes in *both* Mt and Lk. It is true that the two non-Marcan writers both in different ways alter the order at times, and that they both modify and edit, transpose, change and abridge the material contained in Mk very freely The conclusion nevertheless follows from the facts summarized above that *they both employed Mark as a source*

(2) Apart from the Marcan material, the Synoptic tradition includes also a considerable amount of material—chiefly though not exclusively consisting of sayings of Jesus—which is common to both Mt and Lk The agreements here also extend not infrequently to the actual wording of the sayings in Greek, and are of such a kind as to suggest literary dependence, though not directly the dependence either of Mt upon Lk or of Lk upon Mt *Scholars therefore assume the existence at one time of a second source, no longer extant, which was used in common by Mt and Lk, and which is conventionally designated "Q" (from the German "Quelle"="source")* Attempts to reconstruct "Q" have been numerous, but the procedure is necessarily speculative, and the results are not valuable The "Q" material which is common to Mt and Lk cannot safely be taken to represent the whole contents of the document, but we cannot tell what more it may have contained The attempt based on the statement, ascribed by Eusebius to Papias (Euseb *H E* III 39, 16), that "Matthew wrote" (or "compiled") "the oracles in the Hebrew language, and every man translated them as he was able" to identify "Q" with a document supposed to have been written by the

Apostle Matthew in Aramaic, is more unfortunate still. By the *logia* or "oracles" it is probable that Papias meant the canonical Gospel of Matthew, of which he gives an erroneous account The supposed source "Q" was a *Greek* document, and it is extremely unlikely that Matthew was the author It has been suggested of late (*see* above) that the "Q" material in our Gospels may represent more particularly the tradition of Antioch. It is in any case wiser to regard "Q" as a mere symbol, a convenient designation for the non-Marcan material which is common to Mt and Lk

(3) The compilers of Mt and Lk clearly drew also upon other sources, oral or written, for at least some proportion of their material The two infancy-narratives (Mt i–ii, Lk i–ii) are independent, and apart from these, there is a good deal of material which is peculiar to one or other of the Gospels For the view that the compiler of Mt may have had access to materials derived from the tradition of Jerusalem, and for the possible connection of the specific Lucan material with Caesarea, *see* above On the "special source" of Luke and the recent "proto-Luke" theory *see* further LUKE, GOSPEL OF

The Fourth Gospel.—The Gospel according to St John stands apart by itself The author perhaps knew Mk. and Lk, and less probably Mt, but he writes throughout in a characteristic style of his own, and is in the main independent. His book presents many problems, which criticism cannot be said to have solved His work is certainly not meant as an allegory—he insists strongly on the historical fact that the "Word became flesh" He is at the same time more meditative, more interpretative, and more explicitly doctrinal than the Synoptic Evangelists, and his work (which for these very reasons is of supreme *spiritual* value) is best regarded as an "inspired meditation" upon the life of our Lord and upon the significance of the Incarnation—the maturest expression of the Christianity of Ephesus at the close of the first Christian century For a more detailed consideration *see* JOHN, GOSPEL OF

The Historical Value of the Gospels.—The Gospels were not written primarily in the interests of history in the modern scientific sense of that word They were written in a religious interest, to evoke, deepen and foster the faith of Christians in Christ. They are not biographical, they afford the materials for a vividly realistic historical *picture,* but not for a "life" (in the modern sense), of our Lord They are the literary products of what was in the first century a living tradition, and they are in a broad sense based upon facts, but they are written from the standpoint of "faith" On the other hand, "the scientific historian could not trust as reliable an account of Jesus which did not show how men came to believe in Him"; the Jesus whom the Gospels present to us is an uninventable Figure, and the rise of Christianity implies the historical existence of some such Person as its source The creative fact behind Christianity is the action of God in and through Jesus—a Jesus such as the Gospels portray The historical tradition was not merely overlaid, and it is worth noticing that—despite the fact that the Gospels are written in Greek, and that Christianity very quickly moved out beyond Palestine into Greek-speaking areas—the perspective and atmosphere of the Synoptic tradition (and indeed even to a certain extent also of the Johannine tradition) is still strongly Palestinian. The antithesis sometimes set up between the "Christ of faith" and the "Jesus of history" is (in the form in which it is commonly stated) misleading

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GOSPORT, a seaport and municipal borough of Hampshire, England, on a peninsula on the west side of Portsmouth harbour, 86 m S W from London by the S R. Pop (1921) 33,580. A floating bridge connects it with Portsmouth

Gosport (Goseporte, Gozeport, Gosberg, Godsport) was originally included in Alverstoke manor, held in 1086 by the bishop and monks of Winchester under whom villeins farmed the land In 1641, the manor of Alverstoke with Gosport was granted to George Withers, but reverted to the bishop at the Restoration In the 16th century Gosport was "a little village of fishermen" It was called a borough in 1461, when there are also traces of burgage tenure. From 1462 one bailiff was elected annually in the borough court, and government by a bailiff continued until 1682, when Gosport was included in Portsmouth borough under the charter of Charles II This was annulled in 1688. In the 16th century the inhabitants held common property in the shape of tolls of the ferry The importance of Gosport increased during the 16th and 17th centuries owing to its convenience as a victualling station For this reason also the town was particularly prosperous during the American and Peninsular Wars About 1540 fortifications were built there for the defence of the harbour, and in the 17th century it was a garrison town under a lord-lieutenant Its church of the Holy Trinity was built under William III It owes its present importance to its being a naval depot

GOSS, SIR JOHN (1800–1880), English composer, was born at Fareham, on Dec 27, 1800 His church music includes some admirable compositions, such as the anthems "O taste and see," "O Saviour of the world," and others, and in the history of the glee he has also an honoured place. He died in London, on May 10, 1880

GOSSAMER, a fine, thread-like, filmy substance spun by small spiders, covering stubble fields and floating in the air in clear weather, especially in the autumn, figuratively, anything light and unsubstantial A gauzy material used for trimming, resembling the "chiffon" of to-day, was formerly known as gossamer, and in the early Victorian period it was a term used in the hat trade, for silk hats of very light weight It is suggested that the word is a corruption of *gaze à Marie* (gauze of Mary) through the legend that gossamer was originally the threads which fell away from the Virgin's shroud on her assumption

GOSSAU, a town (alt 2,090 ft) in the canton of St Gall, Switzerland, at the junction of the railway lines St Gall–Winterthour and Sulgen–Herisau–Appenzell Lace and embroidery are made in the district, which has a population of 8,334, the majority German-speaking Roman Catholics.

GOSSE, SIR EDMUND (1849–1928), English poet and critic, born in London Sept 21, 1849, son of the zoologist P H. Gosse In 1867 he became an assistant in the department of printed books in the British Museum, where he remained until he became in 1875 translator to the Board of Trade. In 1904 he was appointed librarian to the House of Lords and retired in 1914 In 1884–90 he was Clark Lecturer in English literature at Trinity College, Cambridge Himself a writer of literary verse of much grace, and master of a prose style admirably expressive of a wide and appreciative culture, he was conspicuous for his valuable work in bringing foreign literature home to English readers. *Northern Studies* (1879), a collection of essays on the literature of Holland and Scandinavia, was followed by later work in the same direction He translated Ibsen's *Hedda Gabler* (1891), and, with W. Archer, *The Master-Builder* (1893), and in 1907 he wrote a life of Ibsen for the "Literary Lives" series. He

also edited the English translation of the works of Bjornson

Gosse's published volumes of verse include *On Viol and Flute* (1873), *King Erik* (1876), *New Poems* (1879), *Firdausi in Exile* (1885), *In Russet and Silver* (1894), *Collected Poems* (1896), and *Hypolympia, or the Gods on the Island* (1901). His *Seventeenth Century Studies* (1883), *Life of William Congreve* (1888), *The Jacobean Poets* (1894), *Life and Letters of Dr John Donne, Dean of St. Paul's* (1899), *Jeremy Taylor* (1904, "English Men of Letters"), and *Life of Sir Thomas Browne* (1905) form a very considerable body of critical work on the English 17th-century writers. He also wrote a life of Thomas Gray, whose works he edited (4 vols., 1884), *A History of Eighteenth Century Literature* (1889), *A History of Modern English Literature* (1897), and vols iii and iv of an *Illustrated Record of English Literature* (1903–04) undertaken in connection with Dr Richard Garnett Gosse was always a sympathetic student of the younger school of French and Belgian writers, some of his papers on the subject being collected as *French Profiles* (1905) *Critical Kit-Kats* (1896) contains an admirable criticism of J M. de Heredia, reminiscences of Lord de Tabley and others To the 9th edition of the *Encyclopædia Britannica* he contributed numerous articles, and acted as chief literary adviser in the preparation of the 10th and 11th editions In 1905 he was entertained in Paris by the leading *littérateurs* as a representative of English literary culture In 1907 he published anonymously *Father and Son,* an intimate study of his own early life, which was crowned by the *Académie Française* in 1913 In 1917 he published his *Life of Algernon Charles Swinburne* He received numerous honours from universities and governments, British and foreign, and was knighted in 1925 He continued to write weekly critical articles in *The Sunday Times,* and selections from these were reprinted in *Books on the Table* (1921) and *More Books on the Table* (1923). He published *Silhouettes* in 1925 and *Leaves and Fruit* in 1927 Edmund Gosse died in London on May 16, 1928.

GOSSE, PHILIP HENRY (1810–1888), English naturalist, was born at Worcester on April 6, 1810 In 1827 he became a clerk in a whaler's office at Carbonear, Newfoundland, where he beguiled the tedium of his life by investigations into natural history After an unsuccessful interlude of farming in Canada he travelled in the United States, taught for some time in Alabama, and returned to England in 1839 He published many popular books on zoology, and was elected F R S in 1856 He died at St Marychurch, Devon, on Aug 23, 1888.

See *The Life of P H Gosse* by his son, Edmund Gosse (1890), and the intimate biography, *Father and Son,* by the same writer.

GOSSEC, FRANÇOIS JOSEPH (1734–1829), French musical composer, son of a small farmer, was born at the village of Vergnies, in Belgian Hainaut, and became a choir-boy at Antwerp He went to Paris in 1751 and was introduced by Rameau to La Popelinière, a wealthy amateur, who made him conductor of his private band His first symphony was performed in 1754, and as conductor to the Prince de Condé's orchestra he produced several operas and some 30 symphonies Gossec gave enormous stimulus to the development of orchestral and chamber music in France He died at Passy on Feb 16, 1829

See the *Lives* by P Hédouin (1852) and E G J Gregoir (1878), also F Hellouin, *Gossec et la musique française à la fin du XVIIIe siècle* (1903).

GOSSIP, originally a god-parent (from the O E *godsibb, i e,* God, and *sib,* akin, standing in relation to) "Gossip" soon came to mean a friend or acquaintance, either of the parents of the child baptized or of the other god-parents, and hence women friends of the mother, present at a birth, the transition of meaning to an idle chatterer is easy

GOSSON, STEPHEN (1554–1624), English satirist, was baptized at St George's, Canterbury, on April 17, 1554 He entered Corpus Christi college, Oxford, 1572, and on leaving the university in 1576 he went to London In 1598 Francis Meres in his *Palladis Tamia* mentions him with Sidney, Spenser, Abraham Fraunce and others among the "best for pastorall," but no pastorals of his are extant He is said to have been an actor, and by his own confession he wrote plays, for he speaks of *Catiline's Conspiracies* as a "Pig of mine own Sowe" To this play and some others, on account of their moral intention, he extends indulgence in the general condemnation of stage plays contained in his *Schoole of Abuse, containing a pleasaunt invective against Poets, Pipers, Players, Jesters and such like Caterpillers of a Commonwelth* (1579). Gosson justified his attack by consideration of the disorder which the love of melodrama and of vulgar comedy was introducing into the social life of London The tract was dedicated to Sir Philip Sidney, and Spenser, writing to Gabriel Harvey (Oct 16, 1579) of the dedication, says the author "was for hys labor scorned" He dedicated, however, a second tract, *The Ephemerides of Phialo . and A Short Apologie of the Schoole of Abuse,* to Sidney on Oct 28, 1579 Gosson's abuse of poets seems to have had a large share in inducing Sidney to write his *Apologie for Poetrie,* which probably dates from 1581 The publication of Gosson's polemic provoked many retorts, the most formidable of which was Thomas Lodge's *Defence of Playes* (1580) The players themselves retaliated by reviving Gosson's own plays Gosson replied to his various opponents in 1582 by his *Playes Confuted in Five Actions,* dedicated to Sir Francis Walsingham Meanwhile he had taken orders, was made lecturer of the parish church at Stepney (1585), and was presented by the queen to the rectory of Great Wigborough, Essex, which he exchanged in 1600 for St Botolph's, Bishopgate He died on Feb 13, 1624 *Pleasaunt Quippes for Upstart New-fangled Gentlewomen* (1595), a coarse satiric poem, is also ascribed to Gosson

GOT, FRANÇOIS JULES EDMOND (1822–1901), French actor, was born at Lignerolles on Oct 1, 1822, and entered the Conservatoire in 1841, winning the second prize for comedy that year and the first in 1842 After a year of military service he made his début at the Comédie Française on July 17, 1844, as Alexis in *Les Héritiers* and Mascarelles in *Les Précieuses ridicules* He was immediately admitted *pensionnaire,* and became *sociétaire* in 1850 His golden jubilee at the Théâtre Français was celebrated in 1894 He made his final appearance in 1895 Got was a fine representative of the grand style of French acting, and was much admired in England as well as in Paris He wrote the libretto of the opera *François Villon* (1857) and also of *L'Esclave* (1874)

GÖTA, a river of Sweden, draining the great Lake Vener The name is also applied to the canal which leads from Gothenburg to Stockholm The river flows out of the southern extremity of the lake almost due south to the Cattegat, which it enters by two arms enclosing the island of Hisingen, the eastern forming the harbour of the port of Gothenburg The Gota river is 50 m long and is navigable for large vessels, a series of locks surmounting the falls of Trollhattan (*q v*) Passing the wooded Halleberg and Hunneberg (royal shooting preserves) Lake Vener is reached at Venersborg From Sjotorp, midway on the eastern shore, the western Gota canal leads south-east to Karlsborg Over 20 locks raise it from the Vener level (144 ft) to its extreme height of 300 ft, and lower it over the subsequent fall through the small lakes Viken and Botten to Lake Vetter (289 ft), which the route crosses to Motala The eastern canal then descends through five locks to Lake Boren, after which the canal crosses a rich plain Lake Rox with its ruined castle of Stjernarp is next traversed

At Norsholm a branch canal connects Lake Glan to the north, giving access to the manufacturing centre of Norrkoping Passing Lake Asplången, the canal follows a cutting, and then resumes an elevated course to Soderkoping, after which the Baltic is reached at Mem The whole distance from Gothenburg to Stockholm is about 360 m, and the voyage takes about two and one-half days The length of artificial work on the Gota canal proper is 54 m, and there are 58 locks The idea of a canal dates from 1516, but the construction was organized by Baron von Platten and engineered by Thomas Telford in 1810–32

GOTARZES or **GOTERZES,** king of Parthia (*c* AD 42–51) In an inscription on the rock of Behistun he is called Γωτάρζης Γεόποθρος, *i e,* "son of Gēw," and seems to be designated as "satrap of satrap" When the troublesome reign of Artabanus II ended in AD 39 or 40, he was succeeded by Vardanes, probably his son, but against him in 41 rose Gotarzes, who also belonged to the king's family He soon made himself

detested by his cruelty—among many other murders he even slew his brother Artabanus and his whole family (Tac. *Ann.* xi. 8)—and Vardanes regained the throne in 42; Gotarzes fled to Hyrcania and gathered an army from the Dahan nomads, but the war was ended by a treaty, as both kings were afraid of the conspiracies of their nobles. When Vardanes was assassinated in 45, Gotarzes was acknowledged in the whole empire. He now takes on his coins the usual Parthian titles, "king of kings Arsaces the benefactor, the just, the illustrious (*Epiphanes*), the friend of the Greeks (*Philhellen*)," without mentioning his proper name The hostile party brought from Rome an Arsacid prince Meherdates (*i e*, Mithradates), who lived there as hostage, but he was taken prisoner by Gotarzes, who died soon afterwards.

An earlier "Arsakes with the name Gotarzes," mentioned on some astronomical tablets from Babylon (Strassmaier in *Zeitschr. fur Assyriologie*, vi, Mahler in *Wiener Zeitschr. fur Kunde des Morgenlands*, xv), appears to have reigned in Babylonia *c.* 87 B.C.

GOTHA, a town of Germany, in the republic of Thuringia, alternately with Coburg the former residence of the dukes of Saxe-Coburg-Gotha, on the Leine canal, 6 m. N of the slope of the Thuringian forest, 17 m. W. from Erfurt, on the railway to Cassel Pop. (1925) 45,780.

Gotha (in old chronicles called *Gotegewe* and later *Gotaha*) existed as a village in the time of Charlemagne In 930 its lord, the abbot of Hersfeld, surrounded it with walls It was a town as early as 1200, when it came into the possession of the landgrayes of Thuringia. On the extinction of that line it fell to the electors of Saxony, and later to the Ernestine line of dukes. After the battle of Muhlberg in 1547 the castle of Grimmenstein was partly destroyed, but it was again restored in 1554. At the end of the 16th century it came into the possession of Ernest the Pious, founder of the line of the dukes of Gotha. In 1825 it was united to the dukedom of Coburg

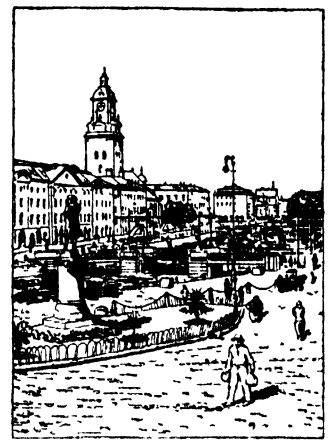
The old inner town is encircled by suburbs, and is dominated by the castle of Friedenstein, begun by Duke Ernest the Pious in 1643, lying on the Schlossberg, the site of the old fortress of Grimmenstein, at an elevation of 1,100 feet. The new museum, south of the castle, contains the picture gallery, cabinet of engravings, natural history museum, Chinese museum and a collection of Egyptian, Etruscan, Roman and German antiquities The church of St Margaret has a beautiful portal and a lofty tower (12th cent.), twice burnt down, and rebuilt in its present form in 1652, the church of the Augustinian convent, has an altar-piece by the painter Simon Jacobs; and the old town-hall dates from the 11th century. The schools include a gymnasium founded in 1524

Gotha is most active commercially, making sausages, porcelain, tobacco, rubber, machinery, mechanical instruments, musical instruments, shoes, furniture and toys There are also a number of nurseries and market gardens. The book trade is represented by about a dozen firms, including that of the great geographical house of Justus Perthes, founded in 1785. Gotha is also noted for its insurance societies

GOTHAM, WISE MEN OF, the early name given to the people of the village of Gotham, Nottingham, in allusion to their reputed simplicity. But if tradition is to be believed the Gothamites were not so very simple. The story is that King John intended to live in the neighbourhood, but that the villagers, foreseeing ruin as the cost of supporting the court, feigned imbecility when the royal messengers arrived Wherever the latter went they saw the rustics engaged in some absurd task. John, on this report, determined to have his hunting lodge elsewhere, and the "wise men" boasted, "We ween there are more fools pass through Gotham than remain in it." The "foles of Gotham" are mentioned as early as the 15th century in the *Towneley Mysteries;* and a collection of their "jests" was published in the 16th century under the title *Merrie Tales of the Mad Men of Gotham, gathered together by A B, of Phisicke Doctour* As typical of the Gothamite folly is usually quoted the story of the villagers joining hands round a thornbush to shut in a cuckoo so that it would sing all the year The localizing of fools is common to most countries

See W. A Clouston, *Book of Noodles* (1888); R H. Cunningham, *Amusing Prose Chap-books* (1889).

GOTHENBURG (Swed. *Goteborg*), a seaport of Sweden, on the river Göta, 5 m. above its mouth in the Cattegat, 285 m. S.W. of Stockholm by rail, and 360 by the Göta canal-route Pop. (1928) 233,247 Founded by Gustavus Adolphus in 1619, Gothenburg was from the first designed to be fortified, a town of the same name, founded on Hisingen, in 1603, having been destroyed by the Danes during the Calmar war. The great development of its herring fishery in the latter part of the 18th century gave a new impulse to the city's trade, which was kept up by the influence of the "Continental System," under which Gothenburg became a depot for the colonial merchandise of England In 1807 its walls were demolished. Its closer connection with the interior of the country by the Gota canal (opened 1832) and Western railway rapidly advanced both its population and trade.



BY COURTESY OF THE SWEDISH TRAVEL BUREAU
GREAT HARBOUR CANAL AT GOTHENBURG

The inner city is contained almost entirely between the river and the Rosenlunds canal, continued in the Vallgraf, the moat of the old fortifications; and is crossed by canals. The old East India Company's house is now a museum and art gallery Gustaf-Adolfs-Torg is the business centre, and contains the town-hall (1670) Among several churches in this quarter of the city is the cathedral (*Gustavi Domkyrka*), of 1633, rebuilt after fires in 1742 and 1815 At the west end of Vasa Street is the city library, the most important in the country except the royal library at Stockholm and the university libraries at Upsala and Lund The university (*Hogskola*) was a private foundation (1891), but is governed by a board, the members of which are nominated by the state, the town council, Royal Society of Science and Literature and others The navigation school was rebuilt in 1916 and a marine museum was opened in 1913 The principal railway lines run to Trollhattan, and into Norway (Oslo); Stockholm, Falun and the north, Borås and beyond, and Helsingborg, etc

Gothenburg is the first port in Sweden and the chief centre of the shipbuilding industry The harbour has been enlarged and was made a free port in 1922 Its principal industrial establishments are mechanical works, saw-mills, dealing with the timber which is brought down the Gota, flour-mills, margarine factories, breweries and distilleries, tobacco works, cotton mills, dyeing and bleaching works (at Levanten in the vicinity), furniture factories, paper and leather works In 1927 the ships registered numbered 289, with a gross-tonnage of 520,624 Gothenburg is the principal port of embarkation of Swedish emigrants for America

"GOTHENBURG" LICENSING SYSTEM. The distinctive and basic principle of this system is the elimination of private profit interest in the sale of spirituous liquors The system takes its name from Gothenburg, the second largest city and principal seaport of Sweden, where the system was first established on a statutory basis The Swedish Licensing Law of 1855, which reorganized and greatly extended drink control, gave to urban municipalities the right to transfer the whole of the retail spirit licences (on and off) in their areas to a specially constituted "bolag" (controlling company), subject to the condition that the whole of the profits (after payment of the current rate of interest on the capital subscribed) should be devoted to public purposes. The precise use of the profits was not prescribed This optional right was destined in a comparatively short time to revolutionize licensing in Sweden, Norway and Finland, and later to have a powerful effect upon licensing policy generally

In 1865 the Gothenburg municipal authorities decided to hand over to the control of a company the whole of the "on" spirit licences in the city as and when they expired The licences were granted to the company for the usual period of three years The retail "off" trade in spirits, which in Sweden is kept entirely dis-

tinct from the "on" trade and is carried on in separate premises under a different licence, was not transferred to the company until 1874. The company began its operations on Oct. 1, 1865, with 20 "on" licences. Three years later the whole of the 61 "on" spirit licences in the city were granted to the company. Twenty-seven of these were used by the company itself; nine others were sub-leased to hotels, restaurants and clubs; seven were exchanged for "off" licences, and the remainder (18) although charged with "sales" (licence) tax, were not used This policy of voluntary non-use of licences (which in effect is a policy of licence reduction) has been characteristic of the Gothenburg system throughout. Despite a great increase in the population (from 60,000 in 1874 to 227,000 in 1926), the total number of retail spirit licences ("on" and "off") in Gothenburg fell from 81 in 1874 to 66 in 1926, of which five are not used Wine and beer were not included in the company's monopoly, and the sale of beer in Sweden is still outside the control of the system; but since 1919 wine has been brought under monopoly control

Discouragement of Drinking.—The chief features of the Gothenburg system, apart from restriction and reduction of licences, have been the encouragement of the sale of food with drink, restriction of the amount of spirits sold, restriction of the hours of sale, and improvement of the premises and service While the companies are subject to the ordinary licensing statutes, and are also subject to close supervision by local and central authorities, they have had from the first considerable liberty of experimental action which has led to great improvements both in the scheme of control and in national law The Gothenburg company, for example, was able in its early years voluntarily to raise the age-limit at which young persons could be served with spirits from 15 (the then legal age) to 18; to reduce the alcoholic strength of the spirits sold, to provide eating-houses for working-men in which the purchase of spirits, although permitted (under compulsion of the law as it then stood), was not encouraged, and ultimately, in advance of the law, to make the separate purchase of food of a specified value a necessary condition of the purchase of spirits

The Gothenburg company was not an exception in this respect. Other companies, as the system spread, made valuable experiments in various directions, and, step by step, national law responded to the experience gained The "Bratt" system itself, the most remarkable development of the early Gothenburg system, originated in this wisely granted liberty of experimental action In Sweden the dram-shop as it formerly existed has completely disappeared. Its place has been taken by what are really refreshment rooms and restaurants of a popular and excellent kind, in which the purchase of spirits is compulsorily associated with the purchase of food The effect of the system as it has been progressively developed upon spirit sales has been marked

The "Gothenburg" system (now usually referred to as the "Bratt" system, in acknowledgment of the great contribution to its development made by Dr. Ivan Bratt), as it exists to-day, is greatly different in scope and character from the original form of the system Control has been centralized and improved, and the application of the basic principle of the system has been extended It is no longer an optional system but obligatory in all areas where spirit (and wine) licences are granted The profits of the controlling companies, which formerly were assigned to the municipal treasury and to certain county and provincial funds, now go to the State. The sub-leasing of licences to private traders (a necessary arrangement at first) has been wholly abolished in the case of "off" sale licences, but is still permitted, under stringent regulations, in the case of hotels, restaurants and clubs

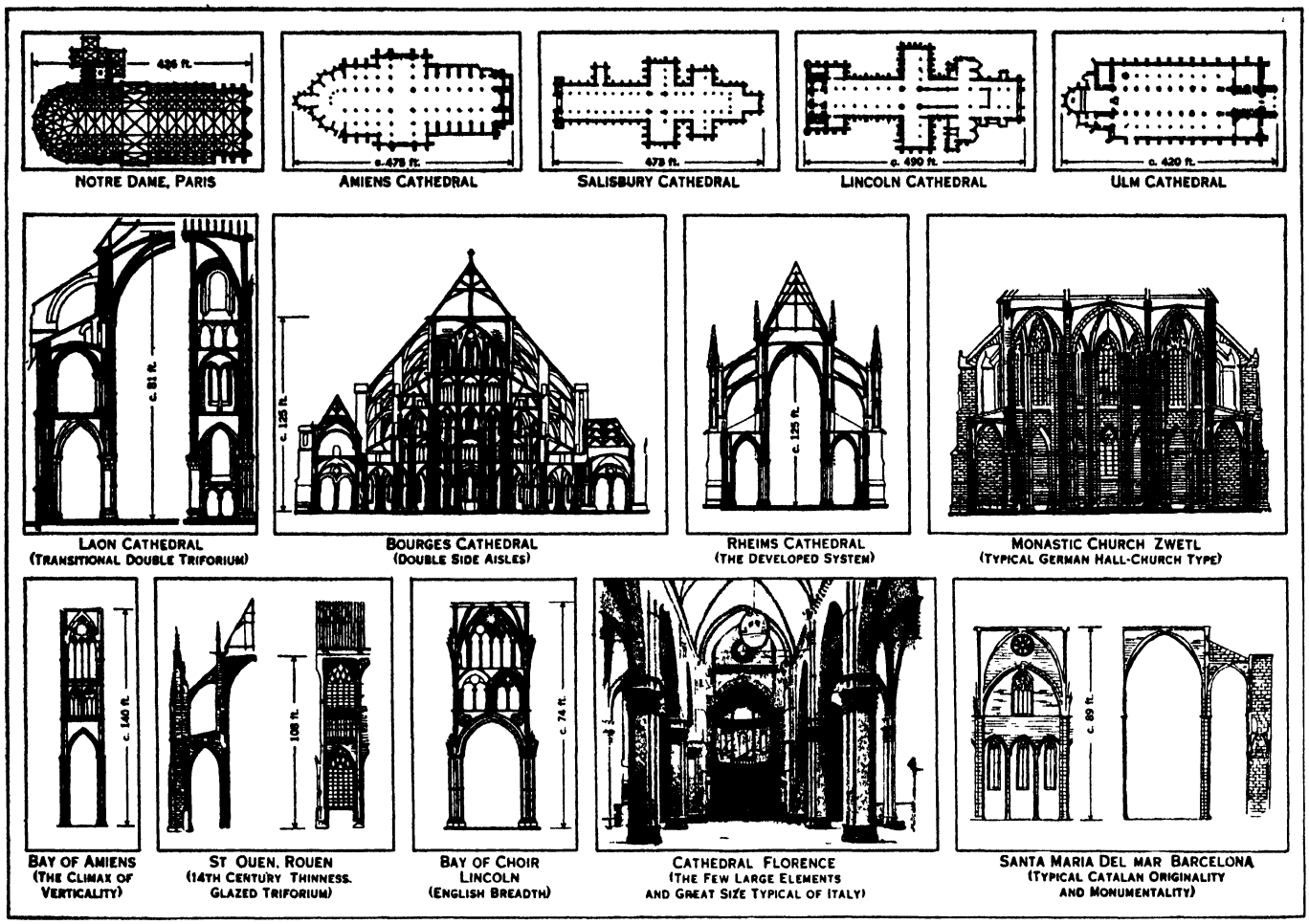
The Mot-Bok System.—The most striking development of the system in recent years is, however, the introduction, and subsequent statutory enforcement, of the *mot-bok* (pass-book) method of regulating "off" sales of spirits (which represent 90% of the total spirit sales in Sweden), under what is known as the "Bratt" system. These *mot-boks* are granted only to adults of a specified age which can be, and in fact often is, raised at the option of the control authority in each district; and spirits can only be purchased for "off" consumption (subject to a maximum quantity limit per month) on production of the *mot-bok*. *Mot-boks* are valid for use only by the actual owner.

The *mot-bok* method of sale was suggested and introduced by Dr. Ivan Bratt, a Stockholm physician, the chairman and creator of the *Vin och Sprit Centralen,* a semi-State monopoly (with a restricted share interest) which controls the entire wholesale trade in wine and spirits (including importation and manufacture) in Sweden In 1913 he successfully applied the *mot-bok* method of "off" sale to the Stockholm scheme of "bolag" management, of which he is also the head The new method made a wide appeal It was adopted in town after town, and in 1915 was standardized by statute and made obligatory for all "off" sale of spirits in Sweden as from Jan. 1, 1916 It may be premature to speak of its permanent effect, but it is noteworthy that since 1913, when the *mot-bok* method was first introduced, the national consumption of spirits in Sweden (a spirit drinking country) has fallen from 44,500,000 litres to 30,497,000 in 1927, or from eight litres to five litres per head of the population Convictions for drunkenness in the same period have declined one-half In Stockholm, the principal city (pop. 450,000), the reduction in both cases has been much greater. (*See* TEMPERANCE, LOCAL OPTION, PROHIBITION, DISINTERESTED MANAGEMENT) (A. SH)

GOTHIC ARCHITECTURE is a loose term used variously, but in general it is that type which developed from Romanesque (*see* BYZANTINE AND ROMANESQUE ARCHITECTURE) during the latter half of the 12th century, and became general in Europe, except in Italy, by the middle of the 13th century Its structural forms originated in the effort to build, simply and beautifully, churches completely vaulted in stone with ribbed vaults, with nave, clerestorey windows and side aisles, and with large areas for stained glass, its decorative details developed in the striving to find the loveliest and most appropriate ornament for such structural forms Its basis is thus structural, and some authorities limit the use of the word Gothic to the architecture of such structurally vaulted churches (Chas H Moore, *Gothic Architecture*). Although the forms known as Gothic were originally developed in church architecture they soon spread to halls, houses and barns and even affected all industrial ornament. These latter are as "Gothic" as the churches, and this general usage of the word is too wide and too descriptive to be gainsaid

Gothic architecture, thus broadly defined, has in all its phases and in almost all its local expressions certain constant characteristics. These are. (1) the use and careful decorative development of ribbed vaults; (2) the general use of the pointed arch, (3) the decorative subdivision of large window areas into smaller elements easier to glaze, by means of tracery (*q v*), (4) decorative importance given to structural features such as buttresses, piers, vaulting ribs, vaulting shafts, gables, flying buttresses, etc, achieved not only by careful design of the elements themselves, but also by accenting them by means of mouldings, carving and crockets, (5) the use of forms originally structural for ornamental purposes Thus buttress forms are frequent in the ornament of doors, choir screens, furniture, etc, gables, purely decorative and often pierced or traceried are common and arcades occur solely as ornament; (6) In carving and other decorating, a general tendency towards naturalism, (7) A frequent, but by no means universal, emphasis on vertical rather than horizontal lines and on the impression of height

Gothic architecture, because it never became bound by the canons which, in general, fixed classic details, and because it required and commanded a higher level of craftsmanship than Romanesque, was a style of continuous growth and freedom In its origin essentially ecclesiastic, it has always been bound up with the Church, even now it seems, in modified forms, particularly applicable to church design, by reason of its *sincerity,* its *directness* and its devotional atmosphere attained through height, mystery and the opportunity for rich colour that stained glass can give Successful modern adaptation of the style must be a matter, first and foremost, of the recognition of its guiding spirit—design through structural form, and sincere expression of material No dependence on mere details can do, the sterility of the Gothic revival work of the 19th century (*see* MODERN



NOTRE DAME, ULM, ZWETL, ST OUEN, SANTA MARIA DEL MAR, FROM STURGIS AND FROTHINGHAM, "HISTORY OF ARCHITECTURE" (DOUBLEDAY PAGE), SALISBURY, LINCOLN, LAON, BOURGES, RHEIMS, BAY OF CHOIR, FROM SIMPSON, "HISTORY OF ARCHITECTURE" (LONGMANS GREEN), BAY OF AMIENS FROM KIMBALL AND EDGELL, "HISTORY OF ARCHITECTURE" (HARPERS)

FIG 1.—TYPICAL GOTHIC CATHEDRALS, SHOWING THEIR PROPORTIONS AND GENERAL PLAN

ARCHITECTURE, *18th and 19th Centuries*) resulted from the fact that the revivalists took the form for the substance and forgot the essential Gothic qualities of growth, freedom and sincerity

It is the freedom of the Gothic spirit that has enabled it to be widely applied Particularly in its later phases it was fecund in developing secular types Town halls, city houses, barns, court houses, manors, hospitals, castles in all the countries of Europe bear witness to this vitality Wherever the problem demands free composition, the grouping of many windows into one large element, high roofs or an emphasis on verticality, the Gothic style can furnish inspiration It is thus much used in modern educational work and occasionally, in America, in high commercial buildings Historical Gothic architecture is, however, a style requiring rich carved ornament and sculpture, and the effect of mediaeval Gothic buildings is largely dependent upon exquisiteness of craftsmanship and that variety and personality in details which can only be produced by masons who are artists as well For this reason it is, under modern conditions, a style extremely expensive in any but a much modified form, and as the mechanization of the building trades progresses, it is more and more a style out of harmony with the 20th century

GENERAL DEVELOPMENT

On the continent of Europe the last half of the 12th century was everywhere a time of cultural rebirth The dry hand of scholasticism was slowly lifting from contemporary thought Feudalism was beginning to yield before the growth of towns and the gradual birth of a national feeling non-feudal in spirit In the ecclesiastical world the dominance of feudal monasteries was passing and the importance of bishops and the secular clergy growing apace Most important of all, a more settled civilization allowed and encouraged the secularization of culture It is significant that from this time on the designers, sculptors and masons at work on the great churches were increasingly laymen

Structural Changes.—Many solutions for difficult problems in church design, never thoroughly solved in the Romanesque style, were almost suddenly discovered These problems largely concerned the vaulting of churches (*see* BYZANTINE AND ROMANESQUE ARCHITECTURE) In the first place, the oblong bay of a church nave created many difficulties in designing the ribs of rib vaulting If semi-circular arches were used, springing from the same piers, the different lengths of wall, cross and groin ribs would bring their apexes to awkwardly different levels Moreover, if a clerestory was desired, the nave vaults were so high that it was hard to counteract their outward thrust In the second place, the ambulatories round the apses presented awkward shapes Although the old annular or ring shaped vault was simple, when it was desired to intersect this with cross vaults radiating from the apse, and constructed with ribs, the different widths of the resulting arches and the strange lines of the intersections created forms that were ugly and structurally false In the solution of these two problems lay the origin of Gothic architecture

The pointed arch was a form well known in many of the Romanesque styles and especially common in the domed churches of Aquitania Its application to the design of ribbed vaults was epoch making In the oblong nave bay, by building the diagonal ribs as semi-circles, and pointing the shorter cross and wall ribs, the apexes could be brought to approximately the same level Moreover, the pointed arch is, in essence, two sections of a circular arch, each half of which is rigid and structurally safe if its ends are properly abutted Thus in the ambulatory vault, not only could the arches be more or less pointed to regu-

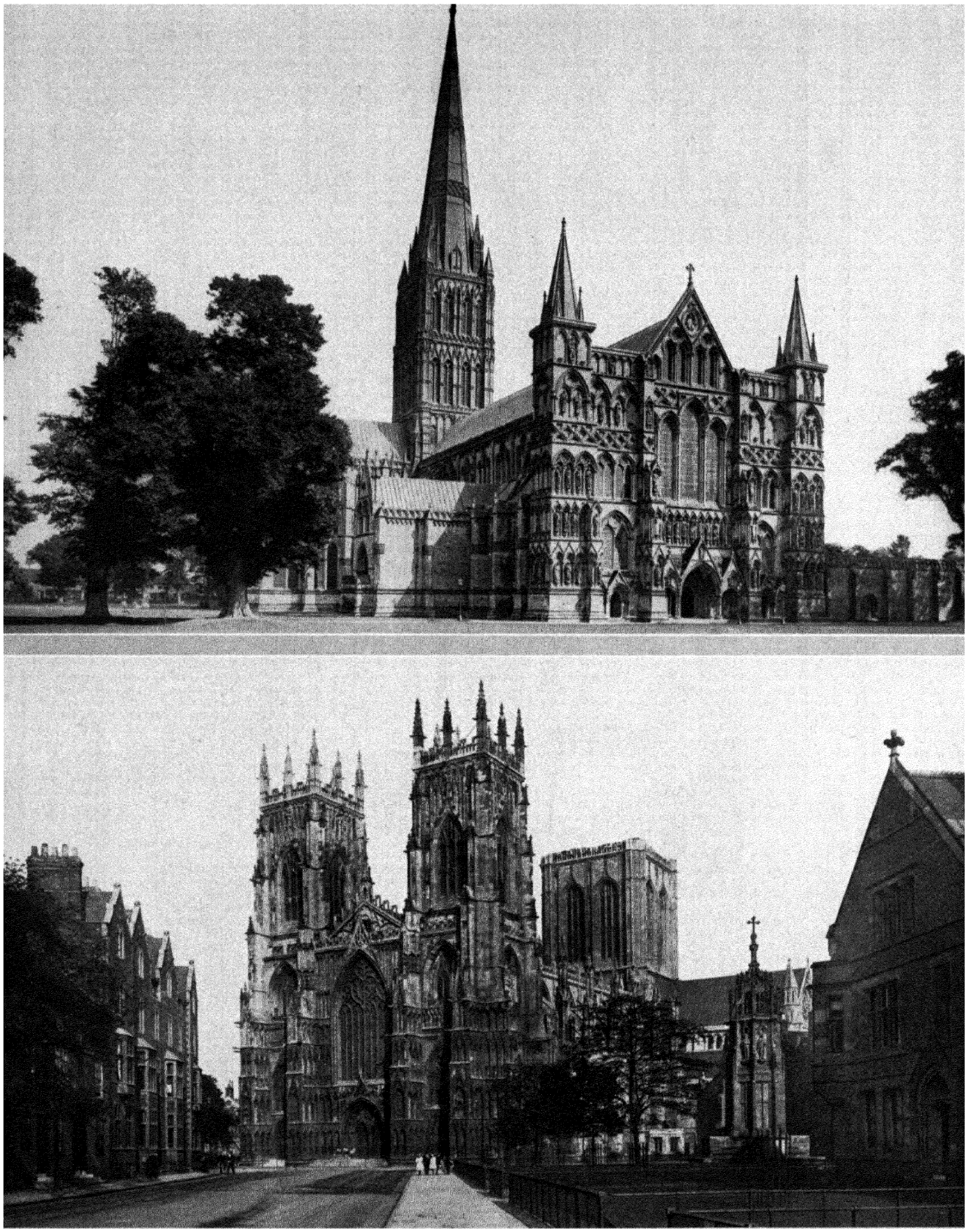


PHOTOGRAPH, LEVY AND NEURDEIN

INTERIOR OF SAINTE CHAPELLE, PARIS

This building, built 1246–48 by Pierre de Montereau for Louis IX. (Saint Louis), to enshrine the Crown of Thorns, reveals in its entirety the ideal for which Gothic Architecture was striving—a stone vaulted church with large window areas for stained glass, great height, and decorative richness based on the structural forms. The glass is largely red and blue, and the purple light through the slim jewelled windows gives a strange and magic beauty to the whole interior. Note that the wall surface is reduced to a minimum

GOTHIC ARCHITECTURE



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ENGLISH GOTHIC CHURCH EXTERIORS

1. Salisbury Cathedral (1220–60). A typical early English Cathedral; the great central tower, the informal and scattered richness, and the small entrance doors are characteristic

2. York Minster (west front, 14th century; towers, 15th century). Equally typical of the richer and later Decorated and Perpendicular styles is the lavish front of York, with its pinnacled towers and its great nave window

late their height, but also the groin ribs, rising from the four supports of the wedge-shaped radiating bay could be built independently and brought together to any desired point near the centre. This enabled the ridges of the ambulatory vault not only to be kept almost level, but also to follow graceful and simple lines, without the queer distortions produced by the round arches.

The problem of abutting the thrust of nave vaults still remained It's solution was the flying buttress by which the thrust of the vault was carried over the side aisles with struts formed of half arches to heavy buttress masses built upon the outside of the side aisles (*see* BUTTRESS) Elementary approximations of the flying buttress idea are found in certain Romanesque churches in Normandy such as the Abbaye aux Dames, Caen, *c.* 1140 (date much questioned, perhaps earlier) But the acceptance of this form and its structural and decorative development was a distinctly Gothic movement

The adoption of the pointed arch for structural purposes led almost immediately to its use as the controlling arch form. The 20 years from 1140 to 1160 saw the beginning of many French cathedrals in the design of which the pointed arch dominates, although round arches still spasmodically occurred, and by the last quarter of the century its use was common in England

Ornament.—A change in carved ornament accompanied this change in structural forms. The dying Romanesque traditions were being replaced by a growing naturalism Occasionally the designers turned direct to ancient Roman forms for inspiration, but this tentative attempt yielded to the universal use of naturalistic plant forms The grotesque feeling of Romanesque work almost completely disappeared and was replaced by works of a fantastic imagination in which there is little trace of the earlier neurotic cruelty A fresh and spring-like spirit shows in the ornament of the early Gothic period like the spirit of small leaves just broken from the bud, which are its favourite forms, the crocket (*q v*) form with its uncurling, vivid movement became common on capitals and corbels

Towards the beginning of the 13th century another element of great importance was introduced Romanesque architecture had made common use of double or triple arches under a single enclosing arch, it had occasionally used the cusp (pointed intersection between two curves) When the space between the outer enclosing arch and the smaller paired arches below is pierced, elementary tracery (*q v*) results The earlier forms, known as plate tracery, consist merely of the piercing of such an area by many large and small holes which usually approximate a circle in form and are often cusped Such openings could be glazed as well as the arched openings below them The clerestory windows of Chartres cathedral (between 1194 and 1212) show the richness possible by the use of such plate tracery From work like this it is but a small step to bar tracery, in which the openings are not pierced in a section of a wall or a slab, but are bounded by thin bars of stone separating them As the desire for large areas of stained glass increased, the size and complexity of windows with bar tracery increased as well, wall surfaces tended to become smaller and vaults higher, until the church approximated a cage

From this point, Gothic development was towards a greater freedom in the combination of these elements Perfect technical mastery having been obtained, experimentation in the details was universal Complexity of geometrical form, rectangularity, flowing curves of reverse curvature, elaboration of cusping, all appeared, and in the late Gothic there was a continual see-saw between a love of lavish and over-luxurious ornament and a tendency towards the elimination of superfluous ornament and unnecessary wall. Even though thus striving after conflicting ideals, the style retained its vitality late into the 15th century and into the 16th also, and outside of Italy profoundly affected the early Renaissance architecture that gradually succeeded it

GOTHIC ARCHITECTURE IN FRANCE

As it was in France that the basis of Gothic was first developed, so it is there that the greatest number of transitional buildings are found Of these the earliest is the great abbey church of St Denis, 1140–44, in which Abbot Suger attempted to create the most beautiful church of his time in France All the greatest painters, sculptors, metal workers and builders were called in, and the result had a profound influence, not only upon architecture, but also on the industrial arts (*see* Mâle, *L'art religieux du XIIIe Siècle*). The remaining parts of this church, the choir aisles and chapels, and the west end, show a use of both round and pointed arches, ribbed vaults and a completely developed east end plan, or chevet (*q v*). The whole system is Gothic in structural idea and in the delicacy and refinement of its effect.

Shortly afterwards the three great cathedrals of Sens, Senlis and Noyon (all three begun *c* 1150), and the cathedrals of Notre Dame at Paris (begun 1163), and Laon (1160–1205), all show transitional work in a highly developed form In all, the nave vaulting was originally in six parts, as the arch rib lengths resulting from this vault type, combining two nave bays into one composition, did not require excessively pointed arches in order to bring the ridges approximately level It was a tentative form, but one which admitted of greater height, greater delicacy and a more powerful effect than earlier Romanesque methods The internal composition of these churches is also tentative The tendency was at first towards developing the old Romanesque triforium into a full vaulted gallery, and the roof over this created a space between the top of the gallery arches and the bottom of the clerestorey windows This at once suggested a second triforium which appears as a fully developed arcade in Laon and as a series of round openings with primitive tracery in the earlier design of Paris Nevertheless, even with the greater height of these early Gothic naves, the four-fold division thus resulting—pier arcade, gallery arcade, triforium and clerestorey—was too complicated and except in rare instances disappeared by the end of the century In Paris, for instance, after a fire in 1200, the upper part of the bay was reconstructed by flattening the roof over the gallery and replacing the early clerestorey window and the triforium round opening below, by a single large window divided by simple bar tracery

The advances over Romanesque usage shown by these early cathedrals are enormous In the first place, the whole building was clearly articulated, with each pier, arch, buttress and vault rib designed for its particular purpose In the second place, flying buttresses allowed enormously increased heights, the nave vault of Notre Dame, for instance, rising roughly 110 ft above the floor A growing knowledge of the strength of stone masonry, and an increased skill in stone cutting allowed more and more slender supports, so that the sense of height and of aspiration, was vastly increased

In exterior design, the changes were even more profound The increase in buttress depths accented vertical lines, and the half-arched flying buttresses, with their sloping tops, served to carry the eye inevitably upwards to the top of the building. Around the apse, the flying buttresses, in naturally radiating lines, combined with the projecting chapels to form a type of composition new and magnificent In the west fronts, of which that at Laon is an excellent example, new effects were obtained by the emphasis of the buttresses of the two towers that were almost universal, the use of a great rose window at the end of the nave and the development of three monumental portals The whole front was tied together by bands of arcading and heavy cornices; the power and richness of this balance of vertical and horizontal lines is well shown in the front of Notre Dame at Paris

In decorative detail, the development was towards finer and more delicate mouldings, the use of naturalistic and crocket forms in place of Romanesque foliage and a new skill in figure sculpture The west portals of Chartres cathedral (*c* 1145) show the richness and facility of the best sculpture of the time This is Romanesque in its conventionality and occasional awkwardness, but the powerful individualization of the figures, the blending of sculpture with architectural lines and the general composition were all prophetic of the Gothic portals to come

The Second Phase, Rayonnant.—With the beginning of the nave and choir of Chartres cathedral in 1194, French Gothic architecture entered its second phase Mastery replaced experi-

mentation. From that time, the problems were how gradually to refine detail, but to increase height and lightness, and how to find the best possible relationship for the natural church forms. The six-part vault gave way to the more simple and more direct four-part vault. The loss of the rhythmical alternation of the heavy and light supports of the six-part vault was more than compensated by the direct power of the parade of similar bays and similar piers down the length of the church nave The effect of height was sought by increasing clerestoreys and pier arcades and diminishing the triforium. In the cathedral at Bourges (early 13th century) transepts are omitted, there are five aisles; and the side aisles run continuously around the apse. Moreover, the inner aisle is 70 ft. high, much higher than the outer aisle. There is a complete triforium and a clerestorey on the outer side of the inner aisle, above the arches. The nave has a similar triforium and clerestory which, with the tall, slim arches leading into the outer aisles, give an impression of height greater than the actual dimensions indicate. The whole scheme is daring, impressive and produces a sense of great openness.

Nevertheless, the general tendency of this period was towards the greater emphasis that a simpler plan produces, and the cathedrals of Rheims (*c.* 1210–50) and Amiens (*c.* 1220–70), which represent the apogee of the style, have in the naves but three aisles, and gain their effect from great height, refinement and the repetition of exquisitely proportioned bays In both, the size of supports is reduced to a minimum and freely developed geometrical bar tracery is used for windows throughout In Amiens, particularly, the construction seems almost foolhardy; perfection in technique has allowed that display of knowledge and skill for their own sake which sometimes detracts from pure beauty The summit of this development came in the choir of Beauvais cathedral (begun 1247). Here the architect strove to place a vault higher than any other, on slimmer piers Rheims and Amiens had both had ceiling heights of approximately 140 ft, with naves about 46 ft. wide; in Beauvais, the vault rose to 154 feet. The result was disastrous—the vault fell, it was rebuilt in 1274 only to fall again ten years later. In 1320, the number of bays was doubled by building intermediate piers between those of the earlier scheme, and the vault on this doubled support has remained stable. The stupendous impression of height given by these narrow bays was gained at a sacrifice and the whole seems cramped and thin

The qualities of the developed Rayonnant are even better shown in the little St Chapelle, Paris, built by St Louis (1247–50). In the upper chapel the wall has almost disappeared Instead there is a series of slim, heavily buttressed piers supporting a soaring vault. The entire area of the spaces, between the under side of the vault and the piers, down to a point only slightly above the chapel floor, is glazed The effect of these high traceried windows with rich blue, red and purple glass is incredibly warm and light

Such windows as these necessitate the greatest perfection in the design and execution of window tracery. It is, in fact, window tracery, and especially the radiating tracery of the great rose windows, which gives the period its French name of Rayonnant. All the tracery is geometrical in pattern, consisting generally of pointed arches, cusps, cusped circles and curved sided triangles. The tracery bars are slender and delicate, usually with a roll moulding on the edges In mullions these were frequently treated like colonnettes The rose windows of Notre Dame and the clerestorey and choir windows at Amiens and Rheims are notable examples of this type of tracery To display such a magnificent decorative element, the French architects of the later 13th and early 14th centuries, did everything to increase window areas. By making aisle roofs flat, it was possible to glaze the triforium, as in the choir of Amiens. And in the church of St Urbain at Troyes (begun 1262), the triforium disappears

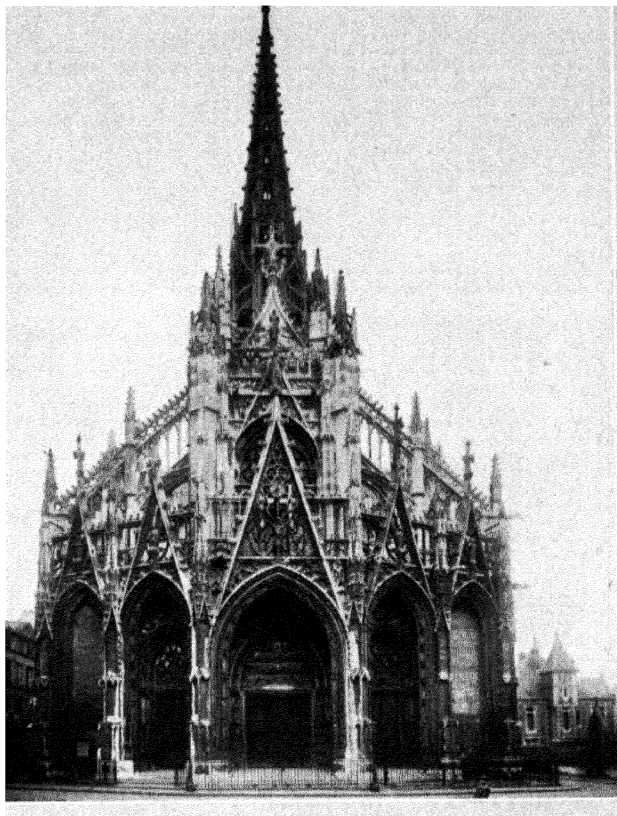
In exterior design, Rayonnant churches merely elaborate the earlier ideas. Portals are deeper, with gables above them as in Amiens and Rheims Buttresses are decorated with tracery and crowned with pinnacles. Foliage decoration in arches and bands increases in extent and plain walls tend to disappear behind arcades, tracery and sculpture. More and more, structural details are purely decorative, as in the magnificent pierced and traceried gable of the Gate of the Libraries in the cathedral of Rouen (end of the 13th century). Crockets appear on every gable, pinnacle and spire edge, and frequently in the hollows of mouldings. Gargoyles and grotesque animals are common. In figure sculpture realism and technical skill are growing Despite this lavishness, however, late Rayonnant work of the early 14th century shows a tendency towards mechanical perfection, thinness and coldness.

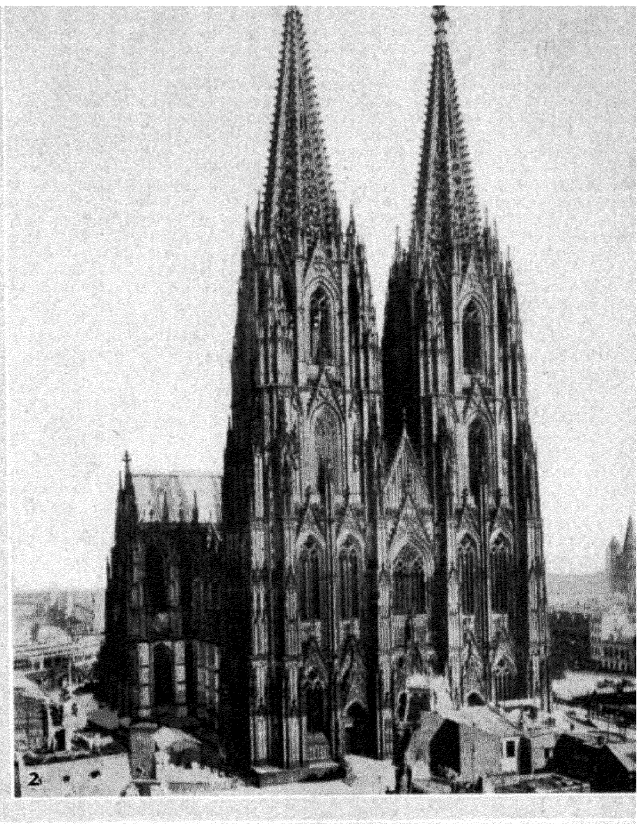
Third Phase, Flamboyant.—The 14th century in France was a discouraging period of foreign dominion and internal stress Little great work remains. But at the end of the century there came a recrudescence of building activity. In it the influence of England was marked by the introduction of the ogee or double curve and the consequent development of flamboyant, or flame-like, forms Flamboyant work is characterized by structural simplicity and lavish ornament Flowing tracery is used for wall surfaces, balustrades and gables as well as for windows. Towards the end of the period, elliptical arches came into use over doors, and openings were crowned by sweeping up the enclosing, or hood, mould into a tall finial. In church interiors the triforium was frequently omitted. Vaulting ribs and pier arch mouldings of many small members were often carried unbroken down the piers to the floor, or else were allowed to die on the surface of simple cylindrical piers Mouldings were made to intersect in all sorts of curious ways, and double or triple bases are common Figure sculpture was much used, but on a small scale, and individualization and the expression of emotion were carried to the point of exaggeration The church of Notre Dame at Alençon and those of St Maclou at Rouen, St Gervais at Paris, St Jacques at Dieppe and St. Wulfram at Abbéville, are beautiful examples of the developed flamboyant church of the 15th and early 16th centuries So vital was this flamboyant style, that, in ecclesiastical work, it remained in vogue until long after the Renaissance dominated secular building, and its structural ideas, even longer, as shown in the large church of St Eustache in Paris, which is structurally late Gothic

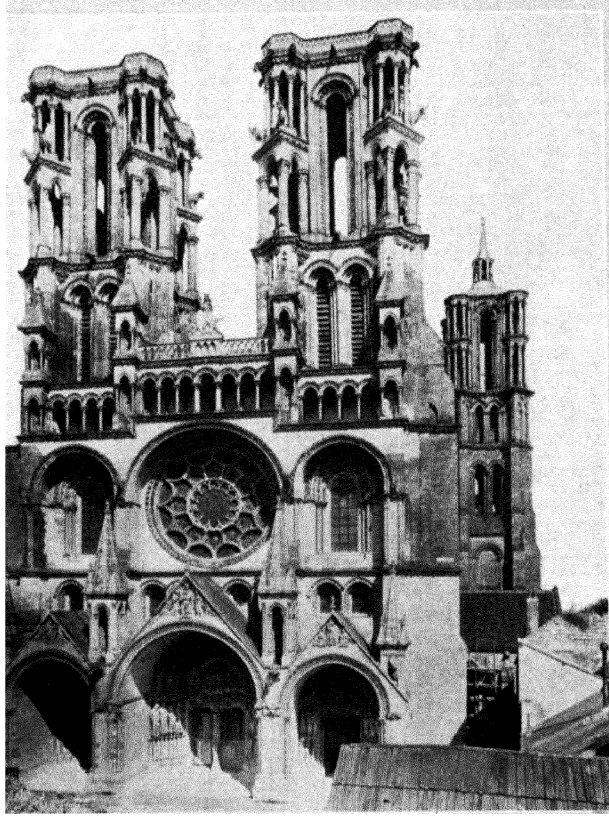
GOTHIC ARCHITECTURE IN ENGLAND

Although pointed arches occur spasmodically in England in various buildings dating from the last half of the 12th century, English Gothic first appears in a complete form in the choir of Canterbury cathedral, built by the French architect William of Sens (1175–78). This was designed according to a predominantly French scheme, with a six-part vault, a developed chevet and crocketed capitals Nevertheless, certain English characteristics appear in the generally low proportions and the amount of wall surface Similarly, in Westminster Abbey (begun 1245), although the high vault and some of the tracery details are French in type, the ornament and arch shapes are purely English Two main influences caused the difference between English and French work The first was that in England no break or rivalry between the regular and secular clergy occurred such as that which had taken place in France. The monasteries were everywhere powerful Especially important architecturally was the influence of the Cistercian order, with its insistence upon simplicity and restraint, to which was due, in no small part, the English abandonment of the chevet plan in favour of the square east end, as well as the development of the moulded capital without foliage, and the English skill in the invention of varied moulding profiles. The tradition of Norman church building strengthened the English Gothic love of simple wall and textured surface in place of the rigid French articulation Thus the English never sought the soaring heights of the French churches, or the lavish use of carved ornament and sculpture.

Early English.—The first of the national English styles thus developed is known as the Early English, embracing, roughly, all the English Gothic up to the middle of the 13th century In this period, the complete English church plan was developed. This is characterized by great length, a square east end, sometimes with an additional square-ended eastern chapel, as in Salisbury cathedral (1220–66), the placing of the main transept almost in the centre of the length, and the addition of a second eastern transept of small size. Except for the length, 473 ft., the dimensions of Salisbury are comparatively modest, the width across nave and aisles









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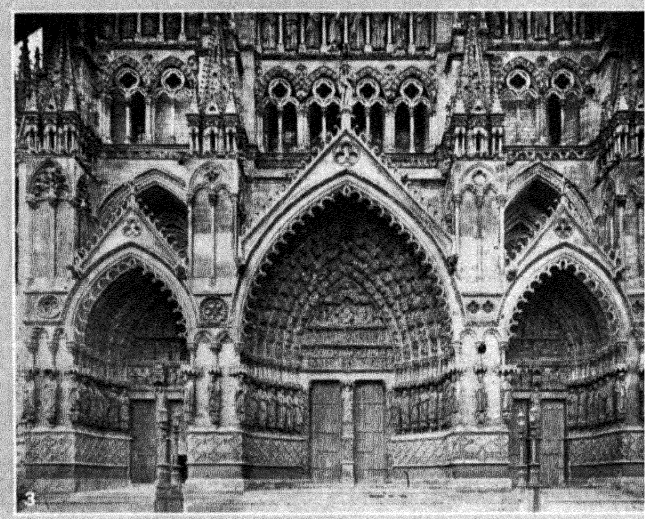
GOTHIC CHURCH EXTERIORS

1. San Maclou, Rouen, France (15th century). An originally conceived polygonal front with the greatest richness of Flamboyant Gothic tracery and carving, and the typically Flamboyant false gables. 2. Cologne Cathedral. Lower portion (14th cent.) shows French influence in early German Gothic; the towers, built in the 19th century from mediaeval drawings, are typically German in their height, richness and openwork spires. 3. Laon Cathedral, France (West front *c.* 1200). A typical early French Gothic front, with triple gabled porches, two western towers, and western rose window. 4. East end, Erfurt Cathedral, Germany (1349–70), Choir windows show the slimness and height characteristic of German Gothic

GOTHIC ARCHITECTURE











BY COURTESY OF (2) THE GREAT WESTERN RAILWAY OF ENGLAND; PHOTOGRAPHS, (1, 4) W. F. MANSELL, (3) LEVY AND NEURDEIN, (5) ALINARI

FRENCH, ENGLISH AND ITALIAN GOTHIC

1. The Nave of Amiens Cathedral, built for the most part between 1218 and 1269, by Robert de Luzarches, and Thomas and Regnault de Cormont, represents almost the highest point in the development of Rayonnant French Gothic church architecture. The construction is daringly light, yet sound; the upward sweep of the shafts most effective; the resulting effect of lightness, delicacy and aspiring height is superb. Decorative detail is restrained, and carefully limited to such important places as the column and shaft capitals, and the window tracery; everything is designed to emphasize the soaring ribbed vault. 2. The interior of Exeter Cathedral. By contrast with Amiens, the nave of Exeter Cathedral, built between 1280 and 1370 seems long, low, quiet. Typically English is the search for richness of light and shade as manifested in the clustered nave piers, the rich arch mouldings, the multiple vaulting ribs. As is usual in English works, height is sacrificed to length; structural expressiveness to surface richness; monumentality to intimate charm. 3. The West Portals, Amiens Cathedral. The French Gothic designers sought to obtain large, welcoming, impressive church entrances. Thus they developed the great western portals, of which these are typical; row on row of angels under delicate canopies ring the deeply recessed arches and saints are ranked below. Architecture and sculpture are merged into one unified expression of worship and beauty; each art would be incomplete without the other. The three doors are deeply recessed between the base of the towers and the buttresses that mark the end of the nave and aisles; thus structural essence is expressed; and the richness of the porches only makes more plain the simple basis of the whole. 4. The Presbytery or Rectro-choir of Lincoln Cathedral. Like Exeter, Lincoln Cathedral is impressive for its length, its richness, its intimate beauty. Built 1255–80, this the east end of Lincoln is usually known as the Angel Choir, from the angels carved above the arches of the triforium arcade (the gallery between the pier arches below and the clerestory windows above). Horizontal lines are strongly accented, mouldings intricate, carving everywhere luxuriant. The Angel Choir is thus almost completely expressive of the Decorated Period of English Gothic. 5. Santa Croce, Florence. This 14th century Italian interior shows the great difference between the Gothic of Italy and that of the countries farther North. The simple octagonal piers, the great plain surfaces, the unmoulded arches, the bracketted cornice above, and the open timber ceiling are typical of many Italian churches; the wide spacing of the piers tends to make the whole appear smaller than a French or English church of equal size

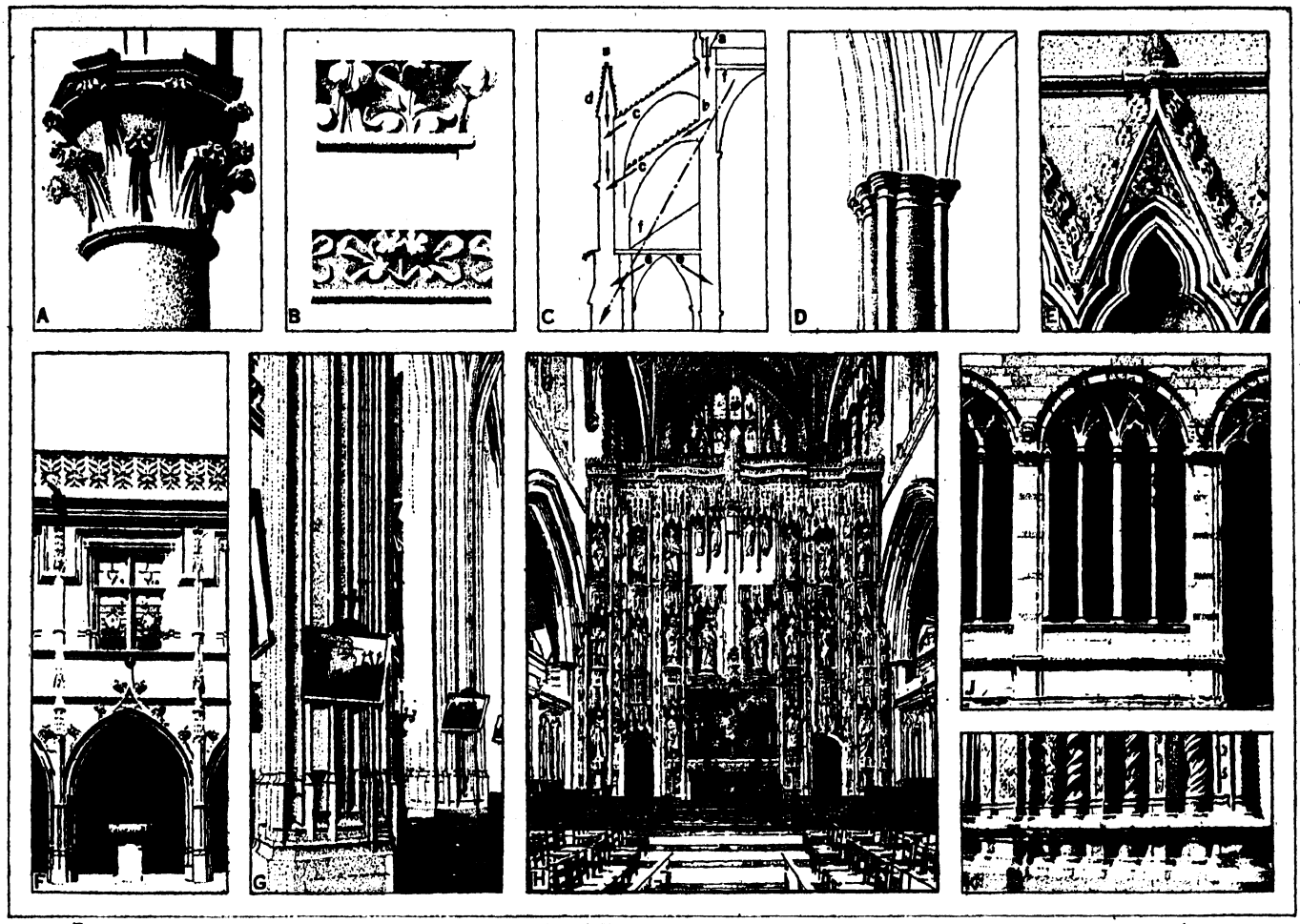


FIG. 2.—A. FRENCH GOTHIC, CROCKET CAPITAL (MIDDLE 13TH CENTURY). B. CROCKET CORNICES, SAINTE CHAPELLE, PARIS (1246–1248). C. GOTHIC VAULTING THEORY. D. EARLY ENGLISH CAPITAL, SALISBURY CATHEDRAL (1220–1260). E. SOUTHWELL MINSTER. F. FLAMBOYANT FRENCH, HOTEL DE CLUNY, PARIS (1485–1498). G. FLAMBOYANT FRENCH, ABBEVILLE (EARLY 16TH CENTURY). H. ENGLISH PERPENDICULAR, WINCHESTER CATHEDRAL (1475). J. ITALIAN GOTHIC, CAMPO SANTO, PISA (13TH AND 15TH CENTURIES). K. ORVIETO CATHEDRAL (14TH CENTURY)

being 82 ft. and the height 84 ft. Salisbury also illustrates the great difference of interior effect between the French and the English cathedral. The vaulting shafts continue only down to the spandrels of the triforium arches. The clerestory has a group of three slim lights, known as lancets, in each bay. Triforium arches are segmental and the band course above the pier arcade runs through continuously so that the horizontal elements predominate. Tracery exists only in a rudimentary form in the triforium. Capitals are simply moulded, without carving and the abacus is circular. Yet quiet richness is obtained by the slim black marble shafts clustered around the nave piers and the complexity of pier arch mouldings consisting of a series of small rounds and deeply cut hollows. In the Lady Chapel the vault is supported entirely on black marble shafts so slim that they seem tenuous and hardly adequate for their work. In the choir and nave of Lincoln cathedral (1192–1250) there is the same use of marble shafts and lancet windows. The design, however, is more advanced; the English richness appears in the interlaced wall arcades at the base of the side aisle walls, in the introduction of carved capitals and especially in the vault. This shows an early example of a characteristic love for experiment in vaulting. Additional ribs running from pier to crown, known as tiercerons, and a favourite means of obtaining rich interior decorative effect, are combined in a most original manner so that the cross ridges of the vault are oblique.

In exterior effect even greater divergences from French usage are present. Flying buttresses are rudimentary and frequently covered by the aisle roof. Buttress pinnacles, except at corners, are rare, and the west fronts become more and more mere decorative screens, often of great richness, but with little organic relation to the building behind. Entrance doors are usually extremely small, though occasionally, as in Lincoln cathedral and in Peterborough (west front 1200–14), composed in enormous arched recesses. The comprehensive effect is usually long, low, rambling and picturesque, building up gradually to the central tower over the crossing, which was becoming almost universal. Other important examples are Wells (1170–90), especially noted for its west front (1220–39); and the choir of Worcester cathedral (1222).

Decorated.—By the middle of the 13th century the use of rich tracery had become common, and the decorative lavishness that was general, gave rise to the second type of English Gothic, known as *decorated.* In its earlier phase, known as *geometric,* which includes the last half of the 13th century, there is a consistent development of geometrical bar tracery. It first followed the French general idea of double or triple lights combined with one or three cusped circles, but soon broke away from this precedent and every conceivable combination of simple geometrical curves is found. The arches over the lights were made interlacing. Curved sided triangles are common, and frequently gables with finials were placed under the arched heads of the lights. Trefoil, quatre-foil and sexfoil were used without enclosing circles, At the same time the richness and complexity of mouldings, and the use of sculpture and ornament increased greatly. The earlier stiff leaves gave place to naturalistic treatment and decorative figure sculpture of a high order is frequent, as in the Angel choir of Lincoln (1255–80) and the west front of Wells cathedral.

Yet even such decorative enrichment as that of the Angel Choir of Lincoln did not give sufficient scope for the English imagination, and about the beginning of the 14th century the introduction of reversed curves and flowing lines in tracery brought about the second phase of English decorated Gothic, known as *cur-*

vilinear. - Although at first merely developing varieties of geometric forms, like the reticulated windows in which, as in the early 14th century church of New Romney, the whole arched head is filled with a regularly arranged network of flowing bars, in later examples, the geometric basis was forgotten, and the tracery patterns often simulate leaf, tree or branch forms. The great west window of York cathedral (1338), and the rose window of Lincoln, known as the "bishop's eye" (1350), show beautifully this freer type of curvilinear work There was too, an immense development of vaulting by the introduction of many tiercerons, and a growing enrichment of carving throughout Moulding profiles are, however, simplified The effect can best be seen in the cathedral at Exeter, which was built in the curvilinear style (1290–1367) Here the ranked colonnettes of the clustered piers, the richly simple pier arches, the vaulting shafts resting on carved corbels, the tiny triforium and the forest of branching vaulting ribs combine to produce an effect of warmth, richness, invitation and mystery. The choir, Lady Chapel and octagon of Ely cathedral (1321–49), form another combination with the same characteristics, and the octagon, with its wooden vault, is remarkable as an example of the inventiveness of the curvilinear architects, in this case Alan of Walsingham There was an accompanying lavishness in all types of church furniture and minor work, such as tombs, chantries, screens and choir stalls. In these, the richest use was made of gablets, false gables, finials, foliated cusping, crockets and foliage The choir stalls at Ely, the choir screen of Southwell minster and the Percy tomb at Beverly (1365) are examples.

The decorated period also saw the development of the characteristic English simple, slim, stone spires. That of Salisbury (1329–75), rising in simple lines 406 ft high, is only one of many instances which show how felicitously the English combined the octagonal spire with a square tower

Perpendicular.—Meanwhile, a new style, the *perpendicular*, was developing. It started at Gloucester abbey where, between 1327 and 1377, the entire Norman choir interior was altered, refaced and vaulted In this alteration curvilinear lines are forgotten. Wall surfaces are covered with rectangular, arched headed panels, and the lines of the tracery carried vertically down to the floor. In the south transept window (1337), the main divisions are vertical, although reminiscences of curvilinear tracery exist, but in the great east window (1377) the fully developed perpendicular scheme is apparent, with its light and heavy mullions, its horizontal ranges of arched lights capped by a cornice, and the smaller subdivisions of the upper portion Moreover, in the vault (*q.v.*), the additions of liernes (small connecting ribs between the tiercerons), and the elaboration of carved bosses, produced a veritable network of lacy richness At the same time, mouldings were flattened and carved ornament reduced At Winchester, between 1345 and 1394, a similar alteration using the same forms was made in a Norman fabric Furthermore, the use of the four-centred arch appeared in pier arches At Gloucester, in the cloister (begun 1351), fan vaulting appeared in an entirely developed form Thus the final step in the decorative development of vaulting was achieved; ribs, at first structural, had become so numerous and complicated, that their decorative function overbalanced the structural, and in fan vaulting they are only decorative, being carved in the form of tracery on the lower side of a completely cut stone vault. The climax of fan vaulting development was reached in Kings college chapel at Cambridge and the Henry II. chapel at Westminster abbey. (*See* FAN VAULT)

The perpendicular period is also notable for the tremendous number of lavish parish churches, such as St. Mary Redcliffe, Bristol and Lavenham church in Suffolk Many of these are extremely rich on the outside and distinguished by the use of polychrome masonry of flint and free-stone and the exquisite square towers which are so characteristic of the period and were so frequently added to earlier churches In decorative detail the same love of rectangularity seen in the tracery finds complete expression The four-centred arch is almost universal. When used for doors and windows it is enclosed within a rectangular frame and the spandrils filled with tracery or carving. Battlemented parapets, frequently pierced with tracery, are found, sometimes even on interior work. The capital almost disappears and takes the form of the simple band of mouldings with occasional rudimentary foliage. Moulding profiles are flat, delicate rather than strong, and sometimes decorated with rosettes repeated at intervals. This style was reaching its highest development just when Renaissance architecture (*q.v.*) was being gradually introduced, and its influence was strong

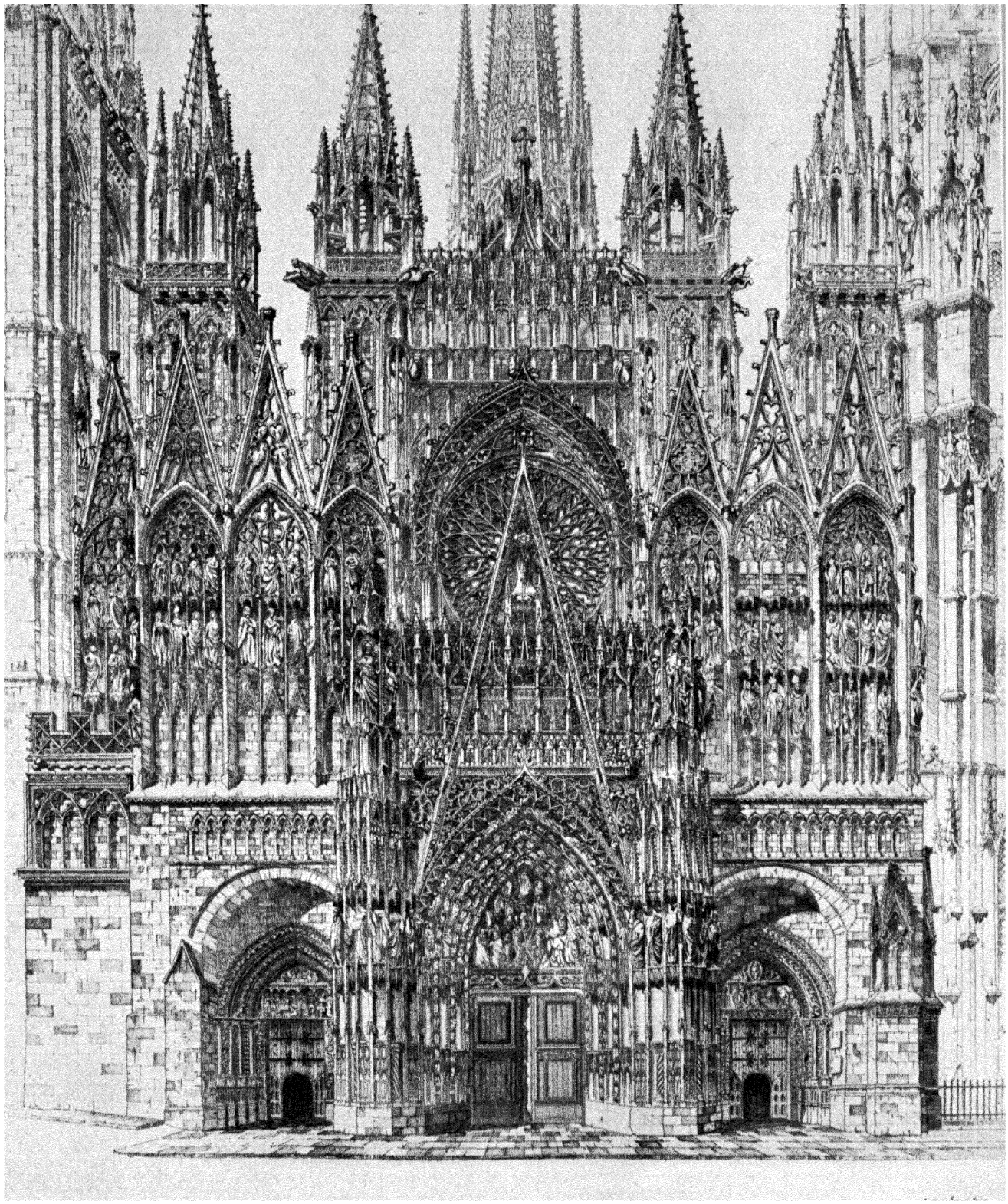
GOTHIC ARCHITECTURE IN GERMANY

The Gothic in Germany was largely an imported style Little transitional work occurred, and in most of the 13th century Gothic buildings, such as Cologne and Strasbourg cathedrals, the French touch is obvious It was not long, however, before national taste exerted a change in the direction of increased picturesqueness and the emphasis on vertical lines, as in the west front of Strasbourg cathedral (1298), by Erwin of Steinbach, with its lacy free-standing mullions and tracery and its exquisite sculpture. The Cathedral of Regensburg (1275–1309, façade 1500) is equally impressive, and in its choir illustrates another German characteristic, the omission of ambulatory and chapels around the apse, so that continuous windows from floor to vault on the same plane are possible Here these are divided into two storeys, but in the western apse of St Sebald's church, Nuremberg (1361–77), and in the magnificent choir of Erfurt cathedral (1349–70), the logical step has been taken and the windows are continuous slim openings, of enormous height, producing an impression of incredible lightness.

The same love for high windows is perhaps responsible for another German peculiarity, the popularity of the so-called *hall type* church, in which nave and aisles are of the same height Examples occurred throughout Germany and Austria during the 14th century and its frequency would indicate an independent invention. The monastic church at Zwetl (1343) and St Stephen's cathedral at Vienna (1340–1433), that of the Holy Cross at Gmund in Swabia (1351–1414) and the Frauenkirche at Nuremberg (1355–61) show, both outside and inside, the impression of slim height that long windows and high, narrow supports produce. In the Nuremberg example another German peculiarity is present, for the west front has a porch with stepped, traceried gable, and turret above, distinguished by the combination of rich carving and fantastic shapes. This fantastic quality ran riot in the German Gothic of the 15th and 16th centuries The vaults of the double side aisles of Ulm cathedral (1478) have an intricacy of vault ribbing unknown outside Germany Similar complex patterns occur at St George in Dinkelsbuhl and in the throne room of the castle at Prague in Czechoslovakia (1502) But it is in tracery, and other decorative details that this quality is most evident Both geometric and flamboyant or curvilinear types are used, composed with an unbridled imagination and a great complexity of cusping and intersecting lines, particularly in some of the later secular work The most bizarre forms are found in balconies, corbels, etc At times tracery bars are carved like tree branches with twigs and knots and bark.

In north Germany, especially in the Hanseatic towns, an interesting Gothic of entirely different type, based upon the use of brick instead of stone, was developed. The Marienkirche at Lubeck (1270–1310) and St Mary's at Wismar, slightly later, have a simple nave and lower side aisles, but it is the hall church which is most characteristic. The Marienkirche at Danzig (begun 1403) is especially interesting in its elaborate and frank brick treatment Even more remarkable use of brick and terra-cotta appears in some of the secular work of this locality, as for instance, city gates in Neu-Brandenburg (14th century) and Stendal (*c.* 1300) and in the monumental town hall at Tängermunde (*c.* 1460), remarkable for its great screen façade.

Typical of the German fondness for picturesqueness and height are the numerous rich stone spires, almost all of them dating from the 15th century. That of Strasbourg is notable for the daring slimness of the stone supports which form the receding stages of the pinnacles of the spire top In Regensburg (spires late 15th century) and Cologne, built in the 19th century from



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THE FAÇADE OF THE CATHEDRAL AT ROUEN

From an etching, "Lace in Stone" by John Taylor Arms, of the west front (late 15th century) of the Cathedral at Rouen, showing the fragile and delicate elaboration of stone carving, characteristic of the Flamboyant style of later Gothic architecture

original Gothic drawings, a different treatment appears; the spires are pyramidal, with crockets up the edges, and the sides are filled with open work tracery. At Ulm, also, as in Cologne, the spire was built in modern times from 15th century drawings It is the culmination of the type and rises with a remarkable air of lift and power for more than 500 feet.

GOTHIC ARCHITECTURE IN THE LOW COUNTRIES

Gothic design throughout Belgium and Holland is a mixture of influences from France and Germany. Little transitional work exists, but, especially in Belgium, there are many delightful 13th and 14th century examples which show the dominance of French forms. It is noticeable that a circular column in place of the clustered pier is retained much later than elsewhere in Europe

The cathedral at Brussels (choir 13th, nave 14th century) and the beautiful church of St. Martin at Ypres, of the same period, are typical. In the flamboyant period of the 15th century German influence became stronger. The cathedral at Antwerp (begun 1352, completed 1474, spire 1518) is remarkable for being a seven aisle church and for its rich, late Gothic spire, obviously indebted to German precedent. The richest of all the flamboyant work is St Jaques at Liège (1513–38), in which Renaissance elements appear, but without modifying the delicate Gothic structure or harming the lacy intricacy of detail. In Holland, the cathedral at Utrecht (middle 13th century) is a typical French design; much more characteristic are the brick churches of the 15th century, frequently with wooden vaults, such as the new church at Amsterdam and the Great church in Haarlem

Throughout the Low Countries, however, civic buildings are universally more interesting than ecclesiastical The great Cloth Hall at Ypres (1200–1304, destroyed during the World War), with its simple range of traceried arcades, and its great central tower, was the largest and most monumental Others, of the 14th and 15th centuries, though smaller, show greater richness The town-halls of Brussels, Gouda and Middleburg show the lavish use of pinnacles, tracery and niches that was common This ornateness of the late Gothic reached a climax in the town-halls of Louvain (1448–63) (now destroyed), and Ghent (1518–35). Certain brick houses at Bruges and other places, in which simple window arrangements are decorated with brick piers and flamboyant wall tracery, and in which stepped gables top the façade, are also interesting

GOTHIC ARCHITECTURE IN SPAIN

Although Gothic seems to have been introduced into Spain from the south of France by Cistercian monks whose work is shown in the monastery of Poblet (early 13th century), national characteristics were swift in their development. These consist of a tendency toward reducing window sizes, increasing the height of the pier arcades and omitting the triforium, and a love of large scale and lavish ornament, in the use of which Moorish ideas are obvious (as in the contrasting of plain wall surface with rich, concentrated decoration and the tendency to elaborate door compositions until they fill large areas). The cathedrals of Burgos (begun 1221), León (1204–1303) and Toledo (begun 1227) all adhere faithfully to French detail, yet the effect both inside and out, except in the case of León, is non-French. Flat roofs, rugged masonry and large wall surfaces change the exterior effect, and on the interior, the relatively small size of windows, the great widths of bays and the lowness of the nave vault give characteristically Spanish effects Even the spires of Burgos (1442), though designed by a German architect (Juan de Colonia) in a strictly German style have this Spanish feeling It was in Catalonia that this feeling achieved its most congenial expression, as in the cathedral of Barcelona (1298) by Jaime Fabre, an architect of great genius from Majorca, Sta. María del Mar, Barcelona (1329), and the nave of Gerona cathedral (begun 1417) All of these are distinguished by tremendous scale and the subdivision of one bay of nave and aisles into two or more chapels at the sides. The two first examples are modified hall type churches. The nave of Gerona cathedral spans in one great sweep (73 ft.) the entire width of the earlier nave and aisles of the choir; it is thus the widest Gothic vault in Europe, and its great size and simple wall surfaces give an effect of striking grandeur.

In the flamboyant work further south, the Moorish influence of the many columned mosques is obvious The effect of such a plan as that of the old cathedral at Saragossa (15th century), or of Seville (begun 1412) is not of the simple cross plan of north Europe, but rather that of a great rectangular hall with a bewildering succession of piers. Again the love of great scale is evident, Seville is the largest Gothic church in the world. It is in exterior detail that the Moorish influence showed most strongly and developed that peculiar blend of Moorish and Christian forms known as Mudejar, in which Moorish brick panels simulate Gothic forms, as in the tower at Saragossa (1504). The exuberant character of the flamboyant work in the Iberian peninsula achieved an amazing climax in the two monasteries of Batalha and Belem in Portugal. At Batalha a tomb chapel, never completed, was added in 1500 to the early 15th century monastery. In this there occurs a unique lavishness of massy ornament Some find in it the influence of Indian forms (*see* INDIAN ARCHITECTURE; and INDONESIAN AND FURTHER INDIAN ARCHITECTURE) The monastery at Belem (1517) shows the same extravagance with interlacing and intersecting cusps, twisted piers and fantastic tracery, but here Renaissance details are already present.

GOTHIC ARCHITECTURE IN ITALY

The persistence of classic detail throughout the middle ages and the vitality of Romanesque construction traditions rendered impossible in Italy any adoption of true Gothic architecture The Italians never understood the structural basis of northern Gothic Pointed arches, crockets, pinnacles, tracery, were all considered merely as convenient adjuncts for buildings otherwise Romanesque or basilican Yet the Italian genius for grand scale and polychrome decoration makes such works as Siena (1260–67) and Orvieto (1290–1330) cathedrals of distinguished and living beauty The brilliant fronts of Siena and Orvieto, with their coloured marble mosaics and paintings, are mere screens, without relation to the roof lines behind, and the banded interior of Siena, although it uses tracery and pointed arches, is as little Gothic as can be imagined Everywhere the acanthus leaf, classic moulding decoration and other Roman details are used for ornament, and the richness of inlaid marble floors, of black and white marble banding and of painted vaults and walls makes the effect one of colour rather than of line. The structural basis of tracery disappeared entirely; tracery became a free pattern, often of fantastic richness, in pierced stone Buttresses and gables are mere surface decorations, as in the cathedral at Florence (14th century) The climax of this development is shown in the exquisite Campanile at Florence (begun 1334), designed, characteristically enough, by Giotto and his pupils (*see* illustration under CAMPANILE)

Italian fondness for large dimensions is responsible for one of the greatest defects in Italian Gothic churches—the lack of an adequate sense of scale. The piers are so few, the arches so simple, the bays so wide that judgment of size is impossible For instance, the cathedral at Florence, designed by Arnolfo (begun 1298), the nave vault of which is 150 ft high, and the pier arches almost 55 ft wide, gives an impression of barren smallness

In Venice a local school of great interest and vitality was developed, especially in connection with palace architecture, by treating a Byzantine-like surface decoration of coloured marble with pointed arches and tracery Walls were covered with large sheets of veined marble and the Gothic detail applied only to the openings. The result is an impression of great delicacy and richness as in the famous Ca d' Oro (1430) by Giovani and Bartolommeo Bon; the Doge's Palace (begun 1340) by Pietro Baseggio, is more severe, but its Porta della Charta (15th century), by the Bons, is one of the most lavish examples of the style, interesting in its fantastic crockets combined with human figures

SECULAR GOTHIC ARCHITECTURE

The 12th century left Europe fundamentally ecclesiastic and feudal. The 16th century found it essentially secular. This development is expressed architecturally by the growing importance in

the design, not only of town and country houses, but also in such civic buildings as town halls and court houses In secular buildings where floors and roofs are more usually beamed than vaulted, no such structural articulation as that which gave character to Gothic churches was possible, and no imitation was attempted As a rule, simple wall surfaces predominate; Gothic detail was reserved for doors, windows and occasionally gables. Nevertheless, by the frank treatment of the materials and construction, great beauty was often achieved Interiors were generally simple, with exposed masonry walls, originally hung with tapestries, ceiling beams were moulded and polychromed and where the hall went into the peaked roof, an interesting carpentry treatment was developed In France, the tendency in such halls was toward the use of barrel vault forms; in England, toward separate, strong roof trusses The council hall of the Palais de Justice, Rouen (*c* 1500), and Westminster Hall, London (1394–98) show these two trends The development of that method of construction known as half timber work (*q v*) was also important In its frank expression of structural elements, it is essentially Gothic, although only occasionally admitting Gothic ornamental forms While the fortified castle (*q v*) was developing into the palatial manor house (*q v*), town houses were becoming richer and more complicated, reaching their climax in such exquisite examples as the house of Jacques Coeur at Bourges (early 15th century) and the Hotel de Cluny, Paris, slightly later (For a full discussion of this development *see* HOUSE *See* also the articles dealing with CUSP; FLYING BUTTRESS; SEX PARTITE; VAULT; SPIRE, TOWER; TRACERY; GOTHIC ART, IRON IN ART; SCULPTURE; ARCHITECTURE, STAINED GLASS; STONE CARVING, TAPESTRY; WOOD CARVING, *Gothic*)

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GOTHIC ART. Giorgio Vasari, a pupil of Michelangelo, in writing in the 16th century on the arts of architecture and sculpture, speaks of the monuments of the middle ages as being built in a style originated by the Goths, those Germanic races untutored in the classics, and describes the "Gothic" style as being a fantastic heap of spires, pinnacles and grotesque decoration lacking in all the simple beauty of the classical orders It was not until the middle of the 19th century that this statement was widely discounted

At the present time the term "Gothic art" is everywhere accepted, though many other names have been suggested The Gothic period commenced in the 12th century in modern France and spread through Europe during the 13th, 14th and 15th centuries when it was at length superseded first in Italy and later in the other countries by that huge revival of the classic known as the Renaissance

Architecturally, the style is primarily perpendicular, consisting of tall slender pillars supporting graceful pointed arches which often spread like the fronds of a palm tree and which are groined similar to those of the Romanesque period. The thrust of these arches was taken up on the outside of the building by the use of buttresses, sometimes solid but often hollowed out to form ogival flying buttresses which act as props against it, and thus we have a style, when brought into use in cathedrals, not unlike the inverted hull of a ship, supported, as is notably the case in the cathedral of Notre Dame of Paris, with widely set props. Upon this general form, often complicated by the addition of various other abutting structures, is erected point upon point and colonnade upon colonnade, a series of spires or pinnacles, the entire formation presenting a structurally beautiful framework (*See* GOTHIC ARCHITECTURE)

Ornamentation.—The ornamentation became, as the style advanced, more and more widely different from that of the Romanesque, more and more detailed and ornate Yet this tremendous amount of detail as is seen in some of the 15th century examples was always well-related and took its proper place in the structural ensemble (*See* illustrations, GOTHIC ARCHITECTURE) It consisted of a combination of geometrical designs based upon the circle inherited from the Romanesque period and upon similar curvilinear treatments of the triangular spaces left between the circle and the point of the arch These shapes can best be likened to motives of the three- or four-leaved clovers or rose designs On a structure of design so developed added ornamentation of two sorts was employed: first, naturalistic forms or very slightly conventionalized forms of foliage, flowers and birds, with perhaps a more general use of ivy leaves and other leaves, second, grotesque forms of almost unbelievably dreadful and imaginative monsters seeming to spring suddenly from their beautiful surroundings like legendary gnomes, goblins and dwarfs from the forest

Stained Glass.—Like jewels mounted in these delicately ornate settings of stone, the stained glass windows in all their variety of rich colours cast a burning glow of mysterious and ever-changing light throughout the interiors of the cathedrals in which they were used and incorporate in the design not only the architectural motives with which they were related but many subjects derived from the paintings of the time, including human figures and illustrating various biblical and historical texts (*See* STAINED GLASS; SCULPTURE, and PAINTING) These illustrative figures also were derived from the wealth of sculpture which was added to the exteriors and interiors of buildings and which, though during the 12th century they were treated with severely straight and often stiff and highly conventionalized draperies, soon developed in the 13th and 14th centuries into a beauty which has seldom been surpassed, incorporating what seemed to be living beings in carefully imposed restrictions which make them fall naturally into the spirit of the design

The paintings followed this same development and were executed either for the illustrations of books or missals or for architectural application in fresco or altar adornment, often for the enhancement of the reredos There was not much mural treatment as there was little wall space upon which to execute it Painting and sculpture alike were often treated with the richest of colours and enhanced by the application of gold or jewels Much of the sculpture which was not primarily architectural was executed in wood, ivory and similar mediums, but the element which marks it all is its beautiful suitability in which never for one instant was the sense of structure forgotten

Applied Arts.—It veritably seems that during this period every carver of stone or wood or every metal-worker and every carpenter was an artist, for in the making of the simplest furnishings, ornaments or objects of art, it seemed to be natural for them to use structural ornamentation. A simple casket was beautifully decorated by the enhancement of the hinges and lock, the metal studs of a door were made to reflect the feeling of the whole building in design and proportion, the latch became an ornament of rare beauty

It is evident that a comparatively small amount of pottery and glass was executed aside from the glass used in archi-

tectural ornamentation, but in the carving of wood and stone and in the designing of furniture, such as beds, chairs, chests, etc., the greatest of artistry found its place. Among the most beautiful examples of this art are the choir stalls of which a number of perfect examples exist Notable among the crafts was the work of the great goldsmiths of this period in their execution of chalices, reliquaries, monstrances, caskets and jewellery helped to enhance the glory of this period (*See* SILVERSMITHS' AND GOLDSMITHS' WORK; IRON IN ART, ENAMEL, JEWELLERY; WOOD-CARVING; IVORY CARVING; POTTERIES AND PORCELAINS; STONE CARVING; INTERIOR DECORATION)

Textiles and Tapestries.—Only a comparatively few textiles have come down to us through the ages but in the paintings and illuminations, superbly beautiful brocades and velvets are shown as they were worn by the personages portrayed Many of these textiles were executed in Italy, more especially in Venice, and in the 15th century we find a distinct tendency toward the feeling of the Renaissance rather than an upholding of the traditions of the Gothic

Tapestry weaving, however, became one of the chief arts and in the very closely and finely woven wall-hangings which were executed a new expression of art took place. The treatment of the "verdure" types favoured foliage designed to include beautifully related curves forming concavities terminated by sharp points This design enhanced by the rich colours at that time obtainable developed possibilities of all-over treatment which were exceptionally happy The *mille fleur* examples, depending upon a dark background sprinkled with beautifully related and delicately executed little plants or flowers with their sensitive curling foliage, were even more exquisite and this type often incorporated figures of animals beautifully drawn and wonderfully executed

The human figure was also often employed in tapestry weaving and developed all of the life and structural beauty which has been noted in the sculpture of the period (*See* TAPESTRY; WEAVING)

Even though the great wave of the Renaissance engulfed much that was Gothic during its development, yet so fundamentally true and beautiful was this style that through all following periods it has from time to time been employed Most Christian churches reflect its influence in their architecture and many of the most recent sky-scrapers of the New World will be found upon examination to incorporate certain of its elements (W E Cx)

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GOTHS, a Teutonic people who in the 1st century A D appear to have inhabited the middle part of the basin of the Vistula. They were probably the easternmost of the Teutonic peoples According to their own traditions they had come originally from the island Scandza, *i e* Skåne or Sweden and landed first in a region called Gothiscandza. Thence they invaded the territories of the Ulmerugi (the Holmryge of Anglo-Saxon tradition), which were probably in the neighbourhood of Rugenwalde in eastern Pomerania, and conquered both them and the neighbouring Vandals

Early History.—Under their sixth king Filimer they migrated into Scythia and settled in a district which they called Oium The rest of their early history, as it is given by their historian Jordanes, is due to an erroneous identification of the Goths with the Getae, an ancient Thracian people The credibility of the story of the migration from Sweden has been much discussed by modern authors The legend was not peculiar to the Goths, similar traditions being current among the Langobardi, the Burgundians and apparently several other Teutonic nations Although so many populous nations can hardly have sprung from the Scandinavian peninsula the existence of these traditions certainly requires some explanation In part, at least, they are probably due to a Scandinavian element in the royal families of the various nations which participated in them It is also probable that a portion of the Gothic nation came from the island of Gotland in the Baltic, for it is clear from archaeological evidence that this island had an extensive trade with the coasts about the mouth of the Vistula

The first certain references to the Goths in ancient literature go back to the first years of the Christian era, when they seem to have been subject to the Marcomannic king Maroboduus They do not enter into Roman history until the 3rd century, when their frontier seems to have been advanced considerably farther south, and the whole country as far as the lower Danube was frequently ravaged by them The emperor Gordian is called "victor Gothorum" by Capitolinus, and further conflicts are recorded with his successors, one of whom, Decius, was slain by the Goths in Moesia The emperor Gallus was forced to pay tribute to them, and during the next twenty years they frequently ravaged the maritime regions of Asia Minor and Greece Aurelian is said to have won a victory over them, but the province of Dacia had to be given up In the time of Constantine the Great, Thrace and Moesia were again plundered by the Goths, A D 321 Constantine drove them back and then concluded peace with their king Ariaric

Though by this time the Goths had extended their territories far to the south and east, it must not be assumed that they had evacuated their old lands on the Vistula Jordanes records several traditions of their conflicts with other Teutonic tribes, in particular a victory won by Ostrogotha over Fastida, king of the Gepidae, and another by Geberic over Visimar, king of the Vandals, about the end of Constantine's reign, in consequence of which the Vandals sought and obtained permission to settle in Pannonia Geberic was succeeded by the most famous of the Gothic kings, Hermanaric (Eormenric, Iormunrekr), one of the greatest figures of Germanic saga, whose deeds are recorded in the traditions of all Teutonic nations According to Jordanes he conquered the Heruli, the Aestii, the Venedi and a number of other tribes who seem to have been settled in the southern part of Russia From Anglo-Saxon sources it seems probable that his supremacy reached westwards as far as Holstein To his time belong a number of other heroes whose exploits are recorded in English and Northern tradition, amongst whom we may mention Wudga (Vidigoia), Hama and several others, who in *Widsith* are represented as defending their country against the Huns in the forest of the Vistula Hermanaric committed suicide in his distress because of an invasion of the Huns about A D. 370, and the portion of the nation called Ostrogoths then came under Hunnish supremacy (F G M B)

Later History.—From about this time the history of the East and West Goths parts asunder The East Goths do not at first enter into the history of the Empire In 376 a great part of the West Gothic people, under their chief, Frithigern, crossed the Danube into the Roman province of Moesia with the approval of the imperial government Disputes between the new settlers and the Roman officials soon led to a war, marked by the great Gothic

victory at Adrianople in 378, when the emperor Valens was killed His successor Theodosius the Great made terms with the Goths in 381 and the mass of the Gothic warriors entered the Roman service as *foederati* Athanaric, the Gothic leader, came to Constantinople in 381, he was received with high honours, and had a solemn funeral when he died

The death of Theodosius in 395 broke up the union between the West Goths and the Empire The Goths threw off their allegiance, and chose Alaric as their king Under him, the Goths are an independent people under a national king, their independence is in no way interfered with if the Gothic king, in a moment of peace, accepts the office and titles of a Roman general But under Alaric the Goths make no lasting settlement Cessions of territory are offered to them, provinces are occupied by them, but as yet they do not take root anywhere; no Western land becomes *Gothia*

Greece was the scene of Alaric's first great campaign, in 395–6. His Italian campaigns fall into two great divisions, that of 402–3, when he was driven back by Stilicho, and that of 408–10, after Stilicho's death In this second war he thrice besieged Rome (408, 409, 410) The second time it suited a momentary policy to set up a puppet emperor of his own, and even to accept a military commission from him The third time he sacked the city The intricate political and military details of these campaigns are of less importance in the history of the Gothic nation than the stage which Alaric's reign marks in the history of that nation It stands between two periods of settlement within the Empire and of service under the Empire Under Alaric there is no settlement, and service is quite secondary and precarious, after his death in 410 the two begin again in new shapes

Under Ataulf, the brother-in-law and successor of Alaric, another era opens, the beginning of enterprises which did in the end lead to the establishment of a settled Gothic monarchy in the West His position is well marked by the speech put into his mouth by the Roman historian Orosius He had at one time dreamed of destroying the Roman power, of turning *Romania* into *Gothia*, and putting himself in the place of Augustus; but he had learned that the world could be governed only by the laws of Rome and he determined to use the Gothic arms for the support of the Roman power In many shiftings of allegiance, Ataulf seems never to have wholly given up the position of an ally of the Empire His marriage with Placidia, the daughter of the great Theodosius, was taken as the seal of the union between Goth and Roman, and, had their son Theodosius lived, a dynasty might have arisen uniting both claims But the career of Ataulf was cut short by his murder at Barcelona in 415 Under Wallia, who became king in that year, a more settled state of things was established The Empire received again, as the prize of Gothic victories, the Tarraconensis in Spain, and Novempopulana and the Narbonensis in Gaul The Roman "Aquitania Secunda" became the West Gothic kingdom of Toulouse The dominion of the Goths was strictly Gaulish, their lasting Spanish dominion had not begun

Under Wallia's successor Theodoric I (419–451) Goths and Romans became for a time united against their common enemy Attila King of the Huns But they met Gothic warriors in his army By the terms of their subjection to the Huns, the East Goths came to fight for Attila against Christendom at Châlons, just as the Serbs came to fight for Bajazet against Christendom at Nicopolis Theodoric fell in the battle (451) After this momentary meeting, the history of the East and West Goths again separates for a while The West Gothic kingdom of Toulouse grew within Gaul at the expense of the Empire, and in Spain at the expense of the Suevi Under Euric (466–485) the West Gothic power again became largely a Spanish power The kingdom of Toulouse took in nearly all Gaul south of the Loire and west of the Rhone, with all Spain, except the north-west corner, which was still held by the Suevi Provence alone remained to the Empire The West Gothic kings largely adopted Roman manners and culture; but, as they still kept to their original Arian creed, their rule never became thoroughly acceptable to their Catholic subjects They stood, therefore, at a great disadvantage when a new and aggressive Catholic power appeared in Gaul through the conversion of the Frank Clovis In 507 the West Gothic king Alaric II. fell before the Frankish arms at Campus Vogladensis, near Poitiers, and his kingdom, as a great power north of the Alps, fell with him That Spain and a fragment of Gaul still remained to form a West Gothic kingdom was owing to the intervention of the East Goths under the rule of the greatest man in Gothic history

When the Hunnish power broke in pieces on the death of Attila, the East Goths recovered their full independence Even before this time, in 406, a large body of Goths, apparently belonging to the eastern branch of their race, had invaded Italy under their king Radagais Later in the century, the East Goths entered into relations with the Empire and obtained a settlement in Pannonia Subsequently, they play in south-eastern Europe nearly the same part which the West Goths played in the century before Towards the close of the 5th century their royal house produced a great figure, famous alike in history and in romance, in the person of Theodoric, son of Theodemir Theodoric the Great is sometimes the friend, sometimes the enemy, of the Empire, but in all cases alike he remains the national East Gothic king It was both as Gothic leader and as ally of the Empire that he set out in 488, by commission from the emperor Zeno, to recover Italy from Odoacer By 493 the East Gothic power was fully established over Italy, Sicily, Dalmatia and the lands to the north of Italy. Under Theodoric the history of the East and West Goths converges again, through the marriage of a daughter of Theodoric to the Visigothic king Alaric II After Alaric's fall in 507 his heir was protected by Theodoric, in whose later years the kingdoms of the East and West Goths were in effect united

The East Gothic dominion was now again as great in extent and far more splendid than it could have been in the time of Hermanaric But it was now of a wholly different character The dominion of Theodoric was not a barbarian but a civilized power. His twofold position ran through everything He was at once national king of the Goths, and successor, though without any imperial titles, of the Roman emperors of the West The two nations, differing in manners, language and religion, lived side by side on the soil of Italy; each was ruled according to its own law, by the prince who was, in his two separate characters, the common sovereign of both The Goths seem to have been thick on the ground in northern Italy, in the south they formed little more than garrisons In Theodoric's theory the Goth was the armed protector of the peaceful Roman, the Gothic king had the toil of government, while the Roman consul had the honour All the forms of the Roman administration went on, and the Roman polity and culture had great influence on the Goths themselves

Such a system as that which Theodoric established needed a Theodoric to carry it on On his death (526) the East and West Goths were again separated Amalaric, son of Alaric II, succeeded to the West Gothic kingdom in Spain and Septimania Provence was added to the dominion of the new East Gothic king Athalaric, the grandson of Theodoric through his daughter Amalaswintha But the essential weakness of the East Gothic position in Italy now showed itself The long wars of Justinian's reign (535–555) recovered Italy for the Empire, and the Gothic name died out

The West Gothic kingdom lasted much longer, and came much nearer to establishing itself as a national power in the lands which it took in But its history was long influenced by the difference of race and faith between the Arian Goths and the Catholic Romans of Gaul and Spain The Arian Goths ruled over Catholic subjects, and were surrounded by Catholic neighbours The Catholics everywhere preferred either Roman, Suevian or Frankish rule to that of the heretical Goths; even the unconquerable mountaineers of Cantabria seem for a while to have received a Frankish governor In some other mountain districts the Roman inhabitants long maintained their independence, and in 534 a large part of the south of Spain, including the great cities of Cadiz, Cordova, Seville and New Carthage, was, with the good will of its Roman inhabitants, reunited to the Empire, which kept some points on the coast as late as 624 That is to say, the same work which the Empire was carrying on in Italy against the East Goths was at the same moment carried on in Spain against the West Goths But in Italy the whole land was for a while won back, and

the Gothic power passed away for ever In Spain the Gothic power outlived the Roman power, but it outlived it only by itself becoming in some measure Roman. The greatest period of the Gothic power as such was in the reign of Leovigild (568–586) He reunited the Gaulish and Spanish parts of the kingdom which had been parted for a moment; he united the Suevian dominion to his own; he overcame some of the independent districts, and won back part of the recovered Roman province in southern Spain He further established the power of the crown over the Gothic nobles, who were beginning to grow into territorial lords The next reign, that of his son Recared (586–601), was marked by a change which took away the great hindrance which had thus far stood in the way of any national union between Goths and Romans. The king and the greater part of the Gothic people embraced the Catholic faith A vast degree of influence now fell into the hands of the Catholic bishops; the two nations began to unite; the Goths were gradually romanized and the Gothic language began to go out of use In short, the Romance nation and the Romance speech of Spain began to be formed The kingdom, however, still remained a Gothic kingdom "Gothic," not "Roman" or "Spanish," is its formal title, only a single late instance of the use of the formula "regnum Hispaniae" is known In the first half of the 7th century that name became for the first time geographically applicable by the conquest of the still Roman coast of southern Spain The Empire was then engaged in the great struggle with the Avars and Persians, and, now that the Gothic kings were Catholic, the great objection to their rule on the part of the Roman inhabitants was taken away The modern Spanish nation is the growth of the long struggle with the Mussulmans, which followed the overthrow of the Visigothic kingdom in 711 Nevertheless, the Goths hold altogether a different place in Spanish memory from that which they hold in Italian memory In Italy the Goth was but a momentary invader and ruler In Spain the Goth supplies an important element in the modern nation And that element has been neither forgotten nor despised Part of the unconquered region of northern Spain, the land of Asturia, kept for a while the name of Gothia, as did the Gothic possessions in Gaul and in the Crimea The name of the people who played so great a part in all southern Europe, and who actually ruled over so large a part of it has now wholly passed away; but it is in Spain that its historical impress is to be looked for

Among the West Goths written laws had already been put forth by Euric Alaric II (484–507) put forth a *Breviarium* of Roman law for his Roman subjects, but the great collection of West Gothic laws dates from the later days of the monarchy, being issued by King Recceswinth about 654 Of special Gothic histories, besides that of Jordanes, already so often quoted, there is the Gothic history of Isidore, archbishop of Seville, a special source of the history of the West Gothic kings down to Svinthala (621–631) Not for special facts, but for a general estimate, no writer is more instructive than Salvian of Marseilles in the 5th century, whose work *De Gubernatione Dei* is full of passages contrasting the vices of the Romans with the virtues of the barbarians, especially of the Goths In all such pictures we must allow a good deal for exaggeration both ways, but there must be a ground-work of truth The chief virtues which the Catholic presbyter praises in the Arian Goths are their chastity, their piety according to their own creed, their tolerance towards the Catholics under their rule, and their general good treatment of their Roman subjects He even ventures to hope that such good people may be saved, notwithstanding their heresy. For the Gothic language see below. (E A F)

There is now an extensive literature on the Goths, and among the principal works may be mentioned T Hodgkin, *Italy and her Invaders* (Oxford, 1880–99), F Dahn, *Die Konige der Germanen* (1861–99); E von Wietersheim, *Geschichte der Volkerwanderung* (1880–81), R. Pallmann, *Die Geschichte der Volkerwanderung* (Gotha, 1863–64); B. Rappaport, *Die Einfalle der Goten in das romische Reich* (Leipzig, 1899), and K. Zeuss, *Die Deutschen und die Nachbarstamme* (Munich, 1837) Other works which may be consulted are· E Gibbon, *Decline and Fall of the Roman Empire*, edited by J B Bury (1896–1900), J B Bury, *History of the Later Roman Empire* (1889); P Villari, *Le Invasioni barbariche in Italia* (Milan, 1901); and F. Martroye, *L'Occident à l'époque byzantine: Goths et Vandales* (Paris, 1903) There is a popular history of the Goths by H. Bradley in the "Story of the Nations" series (London, 1888) For the laws see the *Leges* in Band I of the *Monumenta Germaniae historica, Leges* (1902); A. Helfferich, *Entstehung und Geschichte des Westgotenrechts* (Berlin, 1858), F Bluhme, *Zur Textkritik des Westgotenrechts* (1872); F. Dahn, *Lex Visigothorum Westgotische Studien* (Wurzburg, 1874), C Rinaudo, *Leggi dei Visigoti, studio* (Turin, 1878); and K Zeumer, "Geschichte der westgotischen Gesetzgebung" in the *Neues Archiv der Gesellschaft fur altere deutsche Geschichtskunde* See also THEODORIC

Gothic Language.—Our knowledge of the Gothic language is derived almost entirely from the fragments of a translation of the Bible which is believed to have been made by the Arian bishop Wulfila or Ulfilas (d 383) for the Goths who dwelt on the lower Danube The mss which have come down to us and which date from the period of Ostrogothic rule in Italy (489–555) contain the Second Epistle to the Corinthians complete, together with more or less considerable fragments of the four Gospels and of all the other Pauline Epistles The only remains of the Old Testament are three short fragments of Ezra and Nehemiah There is also an incomplete commentary on St John's Gospel, a fragment of a calendar, and two charters (from Naples and Arezzo, the latter now lost) which contain some Gothic sentences All these texts are written in a special character, which is said to have been invented by Wulfila It is based chiefly on the uncial Greek alphabet, from which indeed most of the letters are obviously derived, and several orthographical peculiarities, *e g*, the use of *ai* for *e* and *ei* for *ī* reflect the Greek pronunciation of the period Other letters, however, have been taken over from the Runic and Latin alphabets Apart from the texts mentioned above, the only remains of the Gothic language are the proper names and occasional words which occur in Greek and Latin writings, together with some notes, including the Gothic alphabet, in a Salzburg ms of the 10th century, and two short inscriptions on a torque and a spear-head, discovered at Buzeo (Walachia) and Kovel (Volhynia) respectively The language itself, as might be expected from the date of Wulfila's translation, is of a much more archaic type than that of any other Teutonic writings which we possess, except a few of the earliest Northern inscriptions This may be seen, *e g*, in the better preservation of final and unaccented syllables and in the retention of the dual and the middle (passive) voice in verbs It would be quite erroneous, however, to regard the Gothic fragments as representing a type of language common to all Teutonic nations in the 4th century Indeed the distinctive characteristics of the language are very marked, and there is good reason for believing that it differed considerably from the various northern and western languages, whereas the differences among the latter at this time were probably comparatively slight (*see* TEUTONIC LANGUAGES) On the other hand, it must not be supposed that the language of the Goths stood quite isolated Procopius (*Vand* i 2) states distinctly that the Gothic language was spoken not only by the Ostrogoths and Visigoths but also by the Vandals and the Gepidae, and in the former case there is sufficient evidence, chiefly from proper names, to prove that his statement is not far from the truth With regard to the Gepidae we have less information, but since the Goths, according to Jordanes (cap 17), believed them to have been originally a branch of their own nation, it is highly probable that the two languages were at least closely related Procopius elsewhere (*Vand* i 3, *Goth* i 1, iii 2) speaks of the Rugii, Sciri and Alani as Gothic nations. The fact that the two former were sprung from the north-east of Germany renders it probable that they had Gothic affinities, while the Alani, though non-Teutonic in origin, may have become gothicized in the course of the migration period

In the 4th and 5th centuries the Gothic language—using the term in its widest sense—must have spread over the greater part of Europe together with the north coast of Africa It disappeared, however, with surprising rapidity. There is no evidence for its survival in Italy or Africa after the fall of the Ostrogothic and Vandal kingdoms, while in Spain it is doubtful whether the Visigoths retained their language until the Arabic conquest In central Europe it may have lingered somewhat longer in view of the evidence of the Salzburg ms. mentioned above Possibly the in-

formation there given was derived from southern Hungary or Transylvania where remains of the Gepidae were to be found shortly before the Magyar invasion (889). According to Walafridus Strabo (*de Reb Eccles* cap 7) also, Gothic was still used in his time (the 9th century) in some churches in the region of the lower Danube Thenceforth the language seems to have survived only among the Goths (*Goti Tetraxitae*) of the Crimea, who are mentioned for the last time by Ogier Ghislain de Busbecq, an imperial envoy at Constantinople about the middle of the 16th century. He collected a number of words and phrases in use among them which show clearly that their language was still essentially a form of Gothic (H. M. C.)

The more important phonetic changes are.—

(1) *e* became *i* always; e.g., *wigs* (road) But *i* later became *e* (written *ai* in Ulfilas' orthography) before *r, h;* e.g., *hairdeis* (herdsman).

(2) *u* became *o* (written *au*) before *r, h;* e.g., *baurgs* (In Ulfilas' orthography the letters transcribed *e, o* are used for long vowels only.)

(3) *ai, au* became *ē, ō;* but the digraphs were still written.

(4) short vowels (except *u*) in final syllables were lost; e.g., *dags, gasts. dazaz, -gastiz*

(5) final nasals and explosives were lost, e.g., *sunu* (Acc sing.) Skr. *sūnum*

(6) final long vowels (including those which had become final through the last change) were (in general) shortened (*i*>*i*, *ō*>*a*, *ē*>*a*); e.g., *waurhta* (1 sing pret.) (N. inscr.) *worahtō; liuba* (N. sing fem.). (N inscr.) *liubu*

(7) voiced spirants when final (also before *s*) became voiceless; e.g., *bap* (3 sing pret of *bidjan*)

All these changes which occurred before or during the 4th century rendered the Gothic language hardly intelligible to a person who spoke a northern or western language At a later date Gothic underwent further changes which do not appear in Ulfilas' version (*c* 370 AD), or only to a slight extent

(1) *i* became a close *e*- sound, e.g., *Venethae* (Jordanes), for *Winid-*.

(2) *u* became a close *o* sound. *e.g.*, Πόγοι (Procopius) *Rugii;* later *o* became *a* in unaccented syllables, e.g., *ūraz* (for *-us*)

(3) *ē* became *ī*, e.g., *leikeis* for *lekeis* (not infrequently in the MSS.).

(4) *ō* became *ū;* e.g., *sunjus* for *sunjos*

The Gothic and Scandinavian (*q.v.*), languages have one or two characteristics in common, the most important of which is the treatment of intervocalic *j* and *w* in a number of words In the former case we find Goth *-ddj-* and O.N. *-ggi-*, whereas in German a diphthong developed, *e.g.*, Goth *twaddje* (Gen of *twai*, "two"). In the latter case both Goth and Scand had *ggw* while a diphthong appears both in English and German, *e.g.*, Goth *triggws* ("true"), Anglo-Saxon *getrīowe, getrīewe,* Old High German *gitriuwi.* Gothic and Scandinavian preserved the ending *-t* in the 2 singular of the strong Preterite, while English and German had a different form with the stem of the plural By the 4th or 5th century the Scandinavian languages had far more resemblance to English and German than to Gothic

See H. C. von der Gabelentz and J. Loebe, *Ulfilas* (Altenburg and Leipzig, 1836–46); E. Bernhardt, *Vulfila oder die gotische Bibel* (Halle, 1875) For other works on the Gothic language *see* J. Wright, *A Primer of the Gothic Language* (Oxford, 1892), p. 143 f. To the references there given should be added C. C. Uhlenbeck, *Etymologisches Worterbuch d. got. Sprache* (Amsterdam, 2nd ed., 1901); F. Kluge, "Geschichte d. got. Sprache" in H. Paul's *Grundriss d. germ. Philologie* (2nd ed., vol. 1, Strassburg, 1897), W. Streitberg, *Gotisches Elementarbuch* (Heidelberg, 1897), Th. von Grienberger, *Beitrage zur Geschichte d. deutschen Sprache u. Literatur,* xxi. 185 ff., L. F. A. Wimmer, *Die Runenschrift* (Berlin, 1887), p. 61 ff., G. Stephens, *Handbook to the Runic Monuments* (London, 1884), p. 203, F. Wrede, *Über die Sprache der Wandalen* (Strassburg, 1886) For further references *see* K. Zeuss, *Die Deutschen,* p. 432 f. (where earlier references to the Crimean Goths are also given), F. Kluge, *op. cit.*, p. 515 ff., O. Bremer, *ib.* vol. iii., p. 822, and W. Streitberg, *Gotisches Elementarbuch,* 1920

GOTO RETTO, a group of islands belonging to Japan, lying west of Kyushu, in 33° N., 129° E. The southern of the two principal islands, Fukae-shima, measures 17 m. by 13½, the northern, Nakaori-shima, measures 23 m. by 7½. The islands are distant some 50 m. from Nagasaki and are highly cultivated.

GOTO, SHIMPEI, Viscount (1856–), Japanese politician, was born in Iwate-Ken and studied medicine in Germany As the first civil administrator of Taiwan (Formosa) under Gen. Kodama in 1898, and as the first president of the South Manchuria railway in 1906, he laid the groundwork of Japan's colonial enterprises He was Minister of Communications in 1908 and 1912, of Home Affairs in 1916, Foreign Affairs in 1918; and mayor of Tokyo (1921–2) He exchanged conversations with M. Joffe regarding the reopening of Russo-Japanese relations upon his own initiative and personal responsibility in 1922. After the great Japanese earthquake in 1923 he became again Minister of Home Affairs and president of the reconstruction board

GOTTER, FRIEDRICH WILHELM (1746–1797), German poet and dramatist, was born on Sept. 3, 1746, at Gotha After the completion of his university career at Gottingen, he was appointed second director of the Archive of his native town, and subsequently went to Wetzlar, the seat of the imperial law courts, as secretary to the Saxe-Coburg-Gotha legation In 1768 he returned to Gotha as tutor to two young noblemen, and here, together with H. C. Boie, he founded the famous *Gottinger Musenalmanach* In 1770 he was once more in Wetzlar, where he belonged to Goethe's circle of acquaintances Four years later he settled in Gotha, where he died on March 18, 1797. Gotter was the chief representative of French taste in the German literary life of his time His own poetry is elegant and polished, and in great measure free from the trivialities of the Anacreontic lyric of the earlier generation of imitators of French literature, but he was lacking in imaginative depth His plays were mostly based on French originals

Gotter's collected *Gedichte* appeared in 2 vols. in 1787 and 1788, a third volume (1802) contains his *Literarischer Nachlass See* B. Litzmann, *Schroder und Gotter* (1887), and R. Schlosser, *F. W. Gotter, sein Leben und seine Werke* (1894)

GOTTFRIED VON STRASSBURG (*fl.* 1210), one of the chief German mediaeval poets The dates of his birth and death are unknown, but he was the contemporary of Hartmann von Aue, Wolfram von Eschenbach and Walther von der Vogelweide, and his epic *Tristan,* which bears witness to his education, was written about 1210 The story of *Tristan* had been evolved from its shadowy Celtic origins by the French *trouvères* of the early 12th century, and had already found its way into Germany before the close of that century, in the unpolished version of Eilhart von Oberge It was Gottfried who gave it its final form, his version being based on that of a *trouvère* Thomas, of which only fragments remain The story centres in the fatal voyage which Tristan, a vassal to the court of his uncle King Marke of Kurnewal (Cornwall), makes to Ireland to bring back Isolde as the king's bride. On the return voyage Tristan and Isolde drink by mistake a love potion, which binds them irrevocably to each other The epic resolves itself into a series of love intrigues in which the two lovers ingeniously outwit the trusting king They are ultimately discovered, and Tristan flees to Normandy where he marries another Isolde—"Isolde with the white hands"—without being able to forget the blond Isolde of Ireland. At this point Gottfried's narrative breaks off and the conclusion is supplied by Ulrich von Turheim and Heinrich von Freiberg After further love adventures Tristan is fatally wounded by a poisoned spear in Normandy; the "blond Isolde," as the only person who has power to cure him, is summoned from Cornwall. The ship that brings her is to bear a white sail if she is on board, a black one if not Tristan's wife, however, deceives him, announcing that the sail is black, and when Isolde arrives, she finds him dead

Though following closely the narrative of events found in Thomas, Gottfried has introduced into the story an astounding fineness of psychological motive, which, to judge from a general comparison of the Arthurian epic in both lands, is German rather than French; he has spiritualized and deepened the narrative, he has, above all, depicted with a variety and insight, unusual in mediaeval literature, the effects of an overpowering passion. Yet, glowing and seductive as Gottfried's love-scenes

are, they are never disfigured by frivolous hints; the tragedy is unrolled with an earnestness that admits of no touch of humour, and also with a freedom from moralizing The mastery of style is no less conspicuous Gottfried had learned his best lessons from Hartmann von Aue, but he was a more original and daring artificer of rhymes and rhythms than that master; he delighted in the sheer music of words, and indulged in antitheses and allegorical conceits to an extent that proved fatal to his imitators As far as beauty of expression is concerned, Gottfried's *Tristan* is the masterpiece of the German court epic.

Gottfried's *Tristan* has been frequently edited: by H. F. Massman (Leipzig, 1843), by R Bechstein (2 vols, 3rd ed, Leipzig, 1890–91), by W Golther (2 vols, Stuttgart, 1889), by K. Marold (1906) There is a good German trans. by W. Hertz (Stuttgart, 1877), and an abbreviated English trans. by J. L Weston (1899). The continuation of Ulrich von Turheim will be found in Massman's edition, that by Heinrich von Freiberg has been separately edited by R Bechstein (Leipzig, 1877) *See* also R Heinzel, "Gottfrieds von Strassburg Tristan und seine Quelle" in the *Zeit fur deut Alt* xiv (1869), W Golther, *Die Sage von Tristan und Isolde* (Munich, 1887), F Piquet, *L'Originalite de Gottfried de Strasbourg dans son poème de Tristan et Isolde* (Lille, 1905); K. Immermann (*q v*) has written an epic of *Tristan und Isolde* (1840), R Wagner (*q v.*) a musical drama (1865) *See* R Bechstein, *Tristan und Isolde in der deutschen Dichtung der Neuzeit* (Leipzig, 1877); B Dittrich, *Die Darstellung der Gestalten in Gottfrieds "Tristan"* (Greifswald, 1914), L I. Wolff, *Der Gottfried von Strassburg Zugeschriebene Marienpreis und Lobgesang auf Christus,* text and comment (Jena, 1924).

GOTTHELF, JEREMIAS: *see* BITZIUS, ALBRECHT

GÖTTINGEN, a town in the Prussian province of Hanover, at the west foot of the Hainberg, in the valley of the Leine, 67 m. S from Hanover, on the railway to Cassel Pop (1925) 41,240 A village of Goding or Gutingi is named in documents of about AD 950 The place received municipal rights from the German king Otto IV. about 1210, and during the 14th century it held a high place in the Hanseatic League In 1531 it joined the Reformation movement, and in the following century it suffered considerably in the Thirty Years' War After a century of decay, it was anew brought into importance by the establishment of its university, and a marked increase in its industrial and commercial prosperity has again taken place in recent years Towards the end of the 18th century Gottingen was the centre of a society of young poets of the *Sturm und Drang* period of German literature, known as the *Gottingen Dichterbund* or *Hainbund* (*see* GERMANY. *Literature*).

The town is traversed by the Leine canal, which separates the Altstadt from the Neustadt and from Masch, and is surrounded by ramparts. The old streets are crooked and narrow Gottingen possesses a mediaeval town hall, built in the 14th century and restored in 1880. Industries include branches of the publishing trade, manufacture of cloth and woollens and of scientific instruments The university, founded by George II in 1734 and opened in 1737, rapidly attained fame Political disturbances, in which both professors and students were implicated, and the expulsion in 1837 of seven professors—*Die Göttinger Sieben*—for protesting against the revocation by King Ernest Augustus of Hanover of the liberal constitution of 1833, reduced the prosperity of the university. The events of 1848, on the other hand, told somewhat in its favour; and, after the annexation of Hanover in 1866, it was carefully fostered by the Prussian government The main university building lies on the Wilhelmsplatz, and, adjoining, is the library with the richest collection of modern literature in Germany There are zoological, ethnographical and mineralogical collections, the most remarkable being Blumenbach's collection of skulls The Society of Sciences (*Sozietat der Wissenschaften*) is well known and publishes the *Gottingische gelehrte Anzeigen*

GOTTLAND, an island in the Baltic sea belonging to Sweden, lying between 57° and 58° N, and having a length from S S W to N N E of 75 m, a breadth not exceeding 30 m, and an area of 1,220 sq. miles The nearest point on the mainland is 50 m from the westernmost point of the island With the island Fåro, off the northern extremity, the Karlsoe, off the west coast, and Götska Sandö, 25 m N by E, Gottland forms the administrative district (*lan*) of Gottland The island is a level plateau of Silurian limestone, rising gently eastward, with a few low isolated hills inland, and with steep coasts fringed with free-standing columns of limestone (*raukar*) The climate is temperate, and the soil, although in parts dry and sterile, is mostly fertile Rye, wheat and oats are grown, and especially barley, which is exported to the breweries on the mainland The sugar-beet is also produced and exported, and there are beet-sugar works on the island Sheep and cattle are kept; there is a Government sheep farm at Roma, and the cattle may be noted as belonging principally to an old native breed, yellow and horned Some lime-burning, cement-making and sea-fishing are carried on The capital of the island is Visby, on the west coast The shrunken walled town of Visby was one of the richest commercial centres of the Baltic from the 11th to the 14th century, and its prosperity was shared by the whole island It retains ten churches besides the cathedral The massive towers of the village churches are often detached, and doubtless served purposes of defence The churches of Roma, Hemse, with remarkable mural paintings, Othen and Lärbo may be specially noted Some contain fine stained glass, as at Dalhem near Visby The natives of Gottland speak a dialect distinguished from that of any part of the Swedish mainland. Pop. of *lan* (1925) 56,981 Density per sq m 46

HISTORY

Gottland has a remarkable history the most important part of which goes back to mediaeval times Already in the early period of the Stone Age the island was a centre of trade and shipping in the Baltic, and its commercial importance increased during the Bronze and Iron Ages Out of the 7,000 Roman coins dating from the two first centuries after Christ which have been found in Scandinavia more than 5,000 have come from Gottland, while most of the Byzantine *solidi* and of those from the Western empire were dug up on the island of Gottland, Öland and Bornholm. About 30,000 Arabic coins have been found in Scandinavia, more than half of them in Gottland Hence it is deduced that the island was a commercial centre for Sweden, Denmark, Germany and eastern Europe with connections extending far beyond this region After the Scandinavian countries had been converted to Christianity pilgrims from Norway and Sweden often travelled to the Holy land by way of Gottland

During the 9th century Gottland ranked as part of Sweden although in administration and government it was largely autonomous The peasants of the island were also traders and their wealth was famous far and wide Nearly 100 churches were built or restored during the island's great days A town came into existence at Visby and German merchants took up their abode there. The peasant-traders found their competition injurious and open strife broke out between the towns-folk and the country-folk. About AD 1280 the Swedish king, Magnus Ladulås, bound the island closer to Sweden and levied taxes as a punishment for these disturbances During the 14th century Visby continued to be talked about as the richest city in Scandinavia Covetous neighbours were tempted by this and the Danish king, Valdemar Atterdag, invaded the island in the year 1361 and defeated an army of peasants outside Visby, which became his prey Visby was a member at this period of the Hanseatic league which now united with Sweden and Norway against Denmark, but owing to dissensions among the allies the Danish king went unscathed During the later portion of the middle ages Visby and the whole island of Gottland were a resort for pirates and for foreign invaders such as the *Vitelianerna* (from Mecklenburg), the Teutonic knights, the Danes, and Erik of Pomerania who from the vantage point of the newly-built castle of Visborg spread terror over this part of the Baltic during the years 1437–49 The Danish country nobles, the brothers Tott, exercised the lofty calling of Sea-rovers from the island during the years 1449–87 The island belonged *de facto* to Denmark and was formally transferred to the Danish throne by Sweden by the Peace of Stettin in 1570 Through the Peace of Bromsebro, in 1645, Sweden regained the island, which has since continued to belong to her except during the years 1676–79 when the Danes occupied it and for some weeks in 1808

During the middle ages the special laws of Gottland were kept on the island The importance of Visby in the sea-trade of the

world is conclusively attested by the famous code of maritime law which bears its name This "sea law which the merchants and seamen have made at Visby" (*"Waterrecht dat de Kooplude en de Schippers gemakt hebben to Visby"*) was a compilation based upon the Lubeck code and was first printed in Low German in 1505 but probably dated back to about 1240 (*see* SEA-LAWS)

Visby boasts a number of fine ruins of churches and a large portion of its walls dates from mediaeval times It has become in consequence one of Sweden's principal tourist resorts

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GÖTTLING, CARL WILHELM (1793–1869), German classical scholar, was born at Jena, where he was professor from 1822 till his death In his early years Gottling devoted himself to German literature and published two works on the Nibelungen; *Über das Geschichtliche im Nibelungenliede* (1814) and *Nibelungen und Gibelinen* (1817) The greater part of his life, however, was devoted to the study of classical literature The contents of his *Gesammelte Abhandlungen aus dem klassischen Altertum* (1851–63) and *Opuscula Academica* (published in 1869 after his death) show the varied nature of his studies

See memoirs by C Nipperdey, his colleague at Jena (1869), and G. Lothholz (Stargard, 1876)

GOTTSCHALK [GODESCALUS, GOTTESCALE] (*c.* 808–867?), German theologian, was born near Mainz, the son of a Saxon noble who obliged him to enter the Benedictine monastery of Fulda, then under the abbot Hrabanus Maurus In 829, at the synod of Mainz, on the pretext that he had been unduly constrained by his abbot, he obtained his liberty, withdrew first to Corbie and then to Orbais where his study of St Augustine led him to support the doctrine of absolute predestination and the denial of liberty and responsibility Between 835 and 840 Gottschalk was ordained priest, and went to Italy. Driven out through the influence of Hrabanus Maurus, now archbishop of Mainz, he travelled through Dalmatia, Pannonia and Norica, preaching and writing In 848 he presented to the synod at Mainz a profession of faith and a refutation of the accusations by Hrabanus Maurus He was convicted of heresy however, obliged to swear that he would never enter the territory of Louis the German, and handed over to Hincmar, archbishop of Reims

The next year at a provincial council at Quierzy, presided over by Charles the Bald, Gottschalk attempted to justify his ideas, but was again condemned, was degraded from the priesthood, and shut up in the monastery of Hautvilliers There Hincmar tried again to induce him to retract, but he continued to defend his doctrine, and a great controversy resulted Prudentius, bishop of Troyes, Wenilo of Sens, Ratramnus of Corbie, Loup of Ferrières and Florus of Lyons wrote in his favour Hincmar wrote *De praedestinatione* and *De una non trina deitate* against his views, and called in Erigena The question was discussed at the councils of Kiersy (853), of Valence (855) and of Savonnières (859) Finally Pope Nicolas I took up the case, and summoned Hincmar to the council of Metz (863) Hincmar declared that Gottschalk might defend himself before the pope Nothing came of this, and Gottschalk died without recanting Of his many works we have only the two professions of faith (*cf* Migne, *Patrol. Lat.*, CXXI), and some poems, ed L Traube in *Mon Germ hist : Poetae Latini aevi Carolini* (t iii, 1896). Fragments of his theological treatises have been preserved in the writings of Hincmar, Erigena, Ratramnus and Loup of Ferrières

From the 17th century, when the Jansenists exalted Gottschalk, much has been written on him Mention may be made of F Picavet's "Les Discussions sur la liberté au temps de Gottschalk, de Raban Maur, d'Hincmar, et de Jean Scot," in *Comptes rendus de l'acad. des sciences morales et politiques* (1896), and A Freystedt's "Studien zu Gottschalks Leben und Lehre," in *Zeitschrift fur Kirchengeschichte* (1897). Further bibliography in Uberweg's *Gesch. der Philosophie.*

GOTTSCHALL, RUDOLF VON (1823–1909), German man of letters, was born at Breslau on Sept 30, 1823, the son of a Prussian artillery officer He studied law at Konigsberg, but was expelled on account of his Liberalism Breslau and Leipzig proved equally intolerant, and he completed his studies in Berlin During this period he wrote *Lieder der Gegenwart* (1842) and *Zensurfluchtlinge* (1843)—the poetical fruits of his political enthusiasm. In 1852 he married Marie, baroness von Seherr-Thoss, and for the next few years lived in Silesia. In 1864 he settled in Leipzig. Down to 1887 Gottschall edited the *Brockhaus'sche Blätter fur litterarische Unterhaltung* and the monthly periodical *Unsere Zeit.*

Among Gottschall's volumes of lyric poetry are *Sebastopol* (1856), *Janus* (1873), *Bunte Bluten* (1891), among his epics, *Carlo Zeno* (1854), *Maja* (1864), dealing with an episode in the Indian Mutiny, and *Merlins Wanderungen* (1887). *Pitt und Fox* (1854) was his best comedy The tragedies, *Mazeppa, Catharine Howard, Amy Robsart* and *Der Gotze von Venedig*, were written in imitation of Schiller. His historical novels, *Im Banne des schwarzen Adlers* (1875; 4th ed, 1884), *Die Erbschaft des Blutes* (1881), *Die Tochter Rubezahls* (1889), and *Verkummerte Existenzen* (1892), enjoyed great popularity. His critical work includes *Die deutsche Nationalliteratur des 19 Jahrhunderts* (1855, 7th ed, 1901–02), and *Poetik* (1858; 6th ed, 1903) *See* his autobiography, *Aus meiner Jugend* (1898).

GOTTSCHED, JOHANN CHRISTOPH (1700–1766), German author and critic, was born on Feb 2, 1700, at Judithenkirch near Konigsberg, the son of a Lutheran clergyman He studied at Konigsberg, and in 1723, on taking his degree, fled to Leipzig in order to evade Prussian military service In 1730 he was appointed extraordinary professor of poetry, and, in 1734, ordinary professor of logic and metaphysics in the university. He died at Leipzig on Dec 12, 1766

Gottsched's chief work was his *Versuch einer kritischen Dichtkunst fur die Deutschen* (1730), the first systematic treatise in German on the art of poetry from the standpoint of Boileau. His *Ausfuhrliche Redekunst* (1728) and his *Grundlegung einer deutschen Sprachkunst* (1748) were of importance for the development of German style and the purification of the language. He wrote several plays, including *Der sterbende Cato* (1732), an adaptation of Addison's tragedy In his *Deutsche Schaubuhne* (6 vols, 1740–45), which contained mainly translations from the French, he provided the German stage with a classical repertory, and prepared a bibliography of the German drama, *Notiger Vorrat zur Geschichte der deutschen dramatischen Dichtkunst* (1757–65) He was also the editor of several literary journals As a critic, Gottsched insisted on German literature being subordinated to the laws of French classicism In 1740 he came into conflict with the Swiss writers Johann Jakob Bodmer (*q v*) and Johann Jakob Breitinger (1701–76), who, under the influence of Addison and contemporary Italian critics, demanded that the poetic imagination should not be hampered by artificial rules, they pointed to the great English poets, and especially to Milton Gottsched clung the more tenaciously to his pseudo-classicism, and, in the fierce controversy which for a time raged between Leipzig and Zurich, he was inevitably defeated

His wife, Luise Adelgunde Victorie, *née* Kulmus (1713–62), wrote several popular comedies, of which *Das Testament* is the best, and translated the *Spectator* (9 vols, 1739–43), Pope's *Rape of the Lock* (1744) and other English and French works After her death her husband edited her *Samtliche kleinere Gedichte*

See T W Danzel, *Gottsched und seine Zeit* (Leipzig, 1848); J Cruger, *Gottsched, Bodmer, und Breitinger* (with selections from their writings) (Stuttgart, 1884), F Servaes, *Die Poetik Gottscheds und der Schweizer* (Strasbourg, 1887), E Wolff, *Gottscheds Stellung im deutschen Bildungsleben* (2 vols, Kiel, 1895–97), and G Waniek, *Gottsched und die deutsche Literatur seiner Zeit* (Leipzig, 1897) A movement for the rehabilitation of Gottsched, whose real merits were derided after the victory of romanticism, was undertaken by E Reichel in a series of works on Gottsched from 1900 onward, and by a new edition (1902–06) of his *Gesammelte Schriften.* On Frau Gottsched, *see* P Schlenther, *Frau Gottsched und die burgerliche Komodie* (1886)

GÖTZ, JOHANN NIKOLAUS (1721–1781), German poet, was born at Worms on July 9, 1721 He studied theology at Halle (1739–42), where he became intimate with the poets J W. L. Gleim and J P. Uz, acted for some years as military chaplain, and afterwards filled various other ecclesiastical offices He died at Winterburg on Nov 4, 1781. Götz wrote short lyrics and several translations, of which the best is a rendering of Anacreon The best known of his poems is the elegy *Die Mädcheninsel.*

Götz's *Vermischte Gedichte* were published with biography by K. W. Ramler (Mannheim, 1785; new ed., 1807) *See* also *Briefe von und an J. N. Gotz*, ed. by C. Schüddekopf (1893).

GOUACHE, a French word adapted from the Ital *guazzo* (probably in origin connected with "wash"), meaning literally a "ford," but used also for a method of painting in opaque water-colour The colours are mixed with or painted in a vehicle of gum or honey High lights are obtained by white or other light colour. "Gouache" is frequently used in miniature painting. (*See* also WATER COLOUR)

GOUDA or **TER GOUWE,** a town of Holland, in the province of South Holland, on the north side of the Gouwe at its confluence with the Ysel, and a junction station 12½ m. by rail N E of Rotterdam Pop (1925) 27,847 Tramways connect it with Bodegraven on the old Rhine and with Oudewater on the Ysel, and there is a regular steamboat service along canals in various directions The Groote Markt is the largest market-square in Holland Among the numerous churches belonging to various denominations, the first place must be given to the Groote Kerk of St John It was founded in 1485, but rebuilt after a fire in 1552, and is remarkable for a celebrated organ, and a series of 40 stained-glass windows Other buildings are the Gothic town hall, founded in 1449 and rebuilt in 1690, and the weigh-house, built in the 17th century and adorned with a fine relief

In the time of the counts Gouda was busy with brewing and cloth-weaving, but at a later date the making of clay tobacco pipes became the staple trade, and, although this industry has somewhat declined, the churchwarden pipes of Gouda are well known, while it also manufactures candles The transit and shipping trade is considerable, and as one of the principal markets of South Holland, the round, white Gouda cheeses are known throughout Europe. Boskoop, pop (1925) 6,935, 5 m N by W. of Gouda on the Gouwe, is famous for its nursery gardens; and the little town of Oudewater as the birthplace of the famous theologian Arminius in 1560

GOUDIMEL, CLAUDE (*c.* 1510–1572), musical composer of the 16th century, born about 1510 Both French and Belgians claim him as their countryman In all probability he was born at Besançon, for in his edition of the songs of Arcadelt, as well as in the mass of 1554, he calls himself "natif de Besançon" and "Claudius Godimellus Vescontinus" The excellent Latin in which his letters were written proves that, in addition to his musical knowledge, he had a good classical training In 1555 he published, with Nicolas Duchemin, a musical setting, now lost, some odes of Horace, and in 1557 and 1558 a Magnificat and two Masses He was living in Metz in 1557, and at about this time, probably, joined the Huguenots For them he composed a setting of the celebrated French version (1565) of the Psalms by Marot and Beza The French version of the Psalms was at first used by Catholics as well as Protestants, until their use was forbidden in Catholic churches Goudimel moved to Lyons, where he perished during the St Bartholomew massacres of August 27–28, 1572

Among modern books containing examples of Goudimel's work see especially O Douen, *Clément Marot et le psautier huguenot* (2 vols, 1878), and *Choix de Psaumes* (1879), H Expert, *Le Psautier huguenot du XVIe siècle* (1902), J Tiersot, *Ronsard et la musique de son temps* (Leipzig, 1903), and T Gerold, *Clément Marot, Psaumes avec les mélodies* (Bibliotheca Romanica, Strasbourg, 1919)

GOUGE, a tool of the chisel type with a curved blade, used for scooping a groove or channel in wood, stone, etc (*see* TOOL). A similar instrument is used in surgery for operations involving the excision of portions of bone "Gouge" is also used as the name of a bookbinder's tool, for impressing a curved line on the leather, and for the line so impressed In mining, a "gouge" is the layer of soft rock or earth sometimes found in each side of a vein of coal or ore, which the miner can scoop out with his pick, and thus attack the vein more easily from the side.

GOUGH, SIR HUBERT DE LA POER (1870–), British soldier, was born on Aug 12, 1870, a son of Gen Sir C Gough, V C , and joined the 16th Lancers in 1889 In 1911 he became brigadier-general commanding the III Cavalry Brigade at the Curragh, where his attitude with regard to Ulster and the use of the troops in 1914 caused a grave political crisis (*see* ENGLISH HISTORY). He took his brigade to France in August of that year, and after successive promotions, was given command of the newly constituted V Army, with this he played an important part in the battle of the Somme In 1917 he was for some time in charge of the Ypres offensive, where his conduct of the operations received considerable criticism The brunt of the great German offensive of March 1918 fell on his troops, who were unable to withstand the pressure and fell back with heavy loss in personnel and material Gough's dispositions under circumstances of the utmost difficulty were appropriate, but he was deprived of his command In 1919 he was head of the British Mission to the Baltic States. He retired in 1922, with the rank of general He then became a director of Siemens Bros Gough received K C B (1916) and the K C V O (1917)

GOUGH, HUGH GOUGH, VISCOUNT (1779–1869), Irish field-marshal, a descendant of Francis Gough who was made bishop of Limerick in 1626, was born at Woodstown, Limerick, on Nov 3, 1779 Having entered the army in August 1794, he served with the 78 Highlanders at the Cape of Good Hope, taking part in the capture of Cape Town and of the Dutch fleet in Saldanha Bay in 1796 His next service was in the West Indies, where, with the 87th (Royal Irish Fusiliers), he shared in the attack on Porto Rico, the capture of Surinam, and the brigand war in St Lucia In 1809 joining the army in Portugal under Wellington, he commanded his regiment as major in the operations before Oporto, by which the town was taken from the French At Talavera he was severely wounded, and had his horse shot under him For his conduct on this occasion he was afterwards promoted lieutenant-colonel, his commission, on the recommendation of Wellington, being antedated from the day of the duke's despatch He was thus the first officer who ever received brevet rank for services performed in the field at the head of a regiment He was next engaged at the battle of Barrosa, at which his regiment captured a French eagle At the defence of Tarifa the post of danger was assigned to him, and he compelled the enemy to raise the siege At Vittoria, where Gough again distinguished himself, his regiment captured the baton of Marshal Jourdan He was again severely wounded at the battle of Nivelle, and was soon after created a knight of S^t^. Charles by the king of Spain

After a short respite from active service he served in southern Ireland In 1837 he took command in Mysore, and was sent from there to China during the first Chinese war (1841–42) After the conclusion of the treaty of Nanking in August 1842 the British forces were withdrawn Gough was created a baronet In August 1843 he was appointed commander-in-chief of the British forces in India, and in December he took the command in person against the Mahrattas, and defeated them at Maharajpur, capturing more than fifty guns In 1845 occurred the rupture with the Sikhs, who crossed the Sutlej in large numbers Gough conducted the operations Successes in the hard-fought battles of Mudki and Ferozeshah were succeeded by the victory of Sobraon, and shortly afterwards the Sikhs sued for peace at Lahore Gough was now raised to the peerage as Baron Gough (April 1846) The war broke out again in 1848, and again Lord Gough took the field, but the result of the battle of Chillianwalla being equivocal, he was superseded by the home authorities in favour of Sir Charles Napier, before the news of the supersession arrived Gough had finally crushed the Sikhs in the battle of Gujarat (February 1849) His tactics during the Sikh wars were the subject of an embittered controversy (*see* SIKH WARS) Lord Gough now returned to England, was raised to a viscountcy, and for the third time received the thanks of both Houses of Parliament A pension of £2,000 per annum was granted to him by parliament, and an equal pension by the East India Company In November 1862, he was made field-marshal He died on March 2, 1869

See R S Rait, *Lord Gough* (1903); and Sir W Lee Warner, *Lord Dalhousie* (1904)

GOUGH, RICHARD (1735–1809), English antiquary, was born in London on Oct 21, 1753, the son of a director of the East India company. In 1756, he began antiquarian excursions in

various parts of Great Britain In 1773 he began an edition in English of Camden's *Britannia,* which appeared in 1789 His great work is *Sepulchral Monuments of Great Britain . . . from the Norman Conquest to the Seventeenth Century* (2 vols , 1786–96). Gough was director of the Society of Antiquaries from 1771 to 1791. He was elected F.R S in 1775. He died at Enfield on Feb. 20, 1809.

GOUIN, SIR LOMER, Kt. 1908, K C M G , 1913 (1861–1929), Canadian politician, was born at Grondines, Quebec, on March 19, 1861 Educated at Laval and McGill universities, he was called to the bar in 1884, and became Q C in 1900 In 1897 he was elected to the Quebec Legislature and from 1905 to 1920 was Prime Minister and Attorney-General of the province. He declined to join Sir Robert Borden's coalition Ministry, subsequently declaring his allegiance to the Liberal opposition Gouin was included in the King cabinet of 1921 as minister of justice He was a Canadian representative at the fourth assembly of the League of Nations at Geneva. In 1924 he attended the Imperial and Economic Councils in London as one of Canada's representatives. He died at Quebec on March 28, 1929

GOUJON, JEAN (*c.* 1520–*c.* 1566), the greatest French sculptor of the French Renaissance In 1541 he was employed at the cathedral of Rouen where he added to the tomb of Cardinal d'Amboise a statue of his nephew Georges, afterwards removed, and possibly carved portions of the tomb of Louis de Brézé, executed some time after 1545 On leaving Rouen, Goujon was employed by Pierre Lescot, the celebrated architect of the Louvre, on the restorations of St Germain l'Auxerrois, the building accounts—some of which for the years 1542–1544 were discovered by M. de Laborde on a piece of parchment binding—specify as his work, not only the carvings of the pulpit (Louvre), but also a Notre Dame de Piété, now lost In 1547 appeared Martin's French translation of Vitruvius, the illustrations of which were due, the translator tells us in his "Dedication to the King," to Goujon, *naguères architecte de Monseigneur le Connétable, et maintenant un des vôtres* This statement shows not only that Goujon had been taken into the royal service on the accession of Henry II , but also that he had been previously employed under Bullant on the château of Écouen Between 1547 and 1549 he was employed in the decoration of the Loggia ordered from Lescot for the entry of Henry II into Paris, which took place on June 16, 1549 At the Louvre, Goujon, under the direction of Lescot, executed the carvings of the south-west angle of the court, the reliefs of the Escalier Henry II , and the Tribune des Cariatides, for which he received 737 livres on Sept 5, 1550 Between 1548 and 1554 rose the château d'Anet, in the embellishment of which Goujon was associated with Philibert Delorme in the service of Diana of Poitiers We should probably ascribe the work attributed to him in the Hôtel Carnavalet (*in situ*), together with much else executed in various parts of Paris—but now dispersed or destroyed—to a period intervening between the date of his dismissal from the Louvre and his death

See A A Pottier, *Oeuvres de Goujon* (1844) , Reginald Lister, *Jean Goujon* (London, 1903).

GOUJON, JEAN MARIE CLAUDE ALEXANDRE (1766–1795), French publicist and statesman, was born at Bourg on April 13, 1766 After a number of years at sea, he became procureur-général-syndic of the department of Seine-et-Oise (1792), and subsequently took his seat with the Mountain in the Convention After the revolution of the 9th Thermidor (July 27, 1794) he denounced the Jacobin Club, and on the 1st Prairial (May 20, 1795) supported the demands of the populace who invaded the legislature The failure of the insurrection brought about his arrest, and he committed suicide after his trial

See J Claretie, *Les Derniers Montagnards, histoire de l'insurrection de Prairial an III d'après les documents* (1867) , *Défense du représentant du peuple Goujon* (Paris, no date). *See* also Maurice Tourneux (1890, vol i , pp 422–425).

GOULBURN, HENRY (1784–1856), English statesman, was born in London on March 19, 1784, and educated at Trinity college, Cambridge Member of parliament for Horsham in 1808, he was appointed under-secretary for home affairs in 1810, and under-secretary for war and the colonies in 1812; he became a privy councillor in 1821, and soon after was appointed chief secretary to the lord-lieutenant of Ireland, a position which he held until April 1827 Although frequently denounced as an Orangeman, his period of office was on the whole a successful one, and in 1823 he managed to pass the Irish Tithe Composition bill In January, 1828, he was made chancellor of the exchequer under Wellington. Goulburn was home secretary under Peel for four months in 1835, and in September, 1841, he became chancellor of the exchequer for the second time Although Peel himself did some of the chancellor's work, Goulburn was responsible for a further reduction in the rate of interest on the national debt, and he aided his chief in the struggle which ended in the repeal of the corn laws He left office in June, 1846. After representing Horsham in the House of Commons for over four years Goulburn was successively member for St. Germans, for West Looe, and for the city of Armagh. In May, 1831, he was elected for Cambridge university He died on Jan. 12, 1856, at Dorking

See S Walpole, *History of England* (1878–86).

GOULBURN, a city of Argyle county, New South Wales, Australia, 134 m S W of Sydney by the Great Southern railway. Pop. (1925) 12,350. The municipality was created in 1859, and Goulburn became a city in 1864 It lies in a productive agricultural district, at an altitude of 2,129 ft , and is a depot of the inland trade There are Anglican and Roman Catholic cathedrals

GOULD, AUGUSTUS ADDISON (1805–1866), American conchologist, was born in New Ipswich, N H , on April 23, 1805, and graduated at Harvard in medicine in 1830.

As a conchologist his reputation was world-wide His writings fill many pages of the publications of the Boston Society of Natural History He published with L Agassiz the *Principles of Zoology* (2nd ed , 1851), he edited the *Terrestrial and Air-breathing Mollusks* (1851–55) of Amos Binney (1803–47). The two most important monuments to his scientific work, however, are *Mollusca and Shells* (vol xii , 1852) of the U S exploring expedition (1838–42) under Lieut Charles Wilkes (1833), published by the Government, and the *Report on the Invertebrata of Massachusetts* (1841). He died in Boston on Sept 15, 1866

Among his other writings are *The Study of Botany in Connection with Medicine* (1835) , *Description of Shells* (1848) , *The Naturalists' Library* (1849) , *Animal Life in the Ocean at Great Depths* (1862) , *Otia Conchologica* (1863) , *Search out the Secrets of Nature* (1885)

See National Academy of Science, *Biographical Memoirs,* vol v , pp 91–113, and *Bibliography,* pp. 106–113

GOULD, BENJAMIN APTHORP (1824–1896), American astronomer, was born at Boston (Mass), Sept 27, 1824 He graduated from Harvard college in 1844, studied mathematics and astronomy under C F Gauss at Gottingen, and returned to America in 1848 From 1852 to 1867 he was in charge of the longitude department of the U S coast survey, he developed and organized the service, was one of the first to determine longitudes by telegraphic means, and employed the Atlantic cable in 1866 to establish longitude relations between Europe and America The *Astronomical Journal* was founded by Gould in 1849, and its publication, suspended in 1861, was resumed by him in 1885 From 1855 to 1859 he was director of the Dudley observatory at Albany (N Y), and published in 1859 a discussion of the places and proper motions of circumpolar stars to be used as standards by the U S coast survey He undertook (1868), on behalf of the Argentine republic, to organize a national observatory at Córdoba; began to observe there with four assistants in 1870, and completed in 1874 his *Uranometria Argentina* (published 1879) He then made a zone-catalogue of 73,160 stars (1884), and a general catalogue (1885) compiled from meridian observations of 32,448 stars He died in Cambridge (Mass), Nov 26, 1896

See *Astronomical Journal,* No 389; *Observatory,* xx 70 (same notice abridged); *Science* (Dec 18, 1896, S C. Chandler); *Astrophysical Journal,* vol 1 ; *Monthly Notices Roy. Astr. Society,* lvii. 218.

GOULD, SIR FRANCIS CARRUTHERS (1844–1925), English caricaturist and politician, was born in Barnstaple on Dec. 2, 1844 He joined the London Stock Exchange, where he constantly sketched the members and illustrated important events in the financial world, many of these drawings were reproduced

by lithography and published for private circulation In 1879 he began the regular illustration of the Christmas numbers of *Truth*, and in 1887 he became a contributor to the *Pall Mall Gazette*, transferring his allegiance to the *Westminster Gazette* on its foundation and subsequently acting as assistant editor. Among his independent publications are *Who killed Cock Robin?* (1897), *Tales told in the Zoo* (1900), two volumes of *Froissart's Modern Chronicles, told and pictured by F. C. Gould* (1902 and 1903), and *Picture Politics*—a reprint of his *Westminster Gazette* cartoons. He was knighted in 1906 He died on Jan 1, 1925

GOULD, JAY (1836–1892), American financier, was born in Roxbury, Delaware county (N Y), on May 27, 1836 Though he left school in his 16th year, he devoted himself assiduously thereafter to private study, chiefly of mathematics and surveying. In 1852–56 he worked as a surveyor in preparing maps of Ulster, Albany and Delaware counties in New York, of Lake and Geauga counties in Ohio, and of Oakland county in Michigan, and of a projected railway line between Newburgh and Syracuse, in New York state. In 1863 he was appointed manager of the Rensselaer and Saratoga railway He bought and reorganized the Rutland and Washington railway

In 1859 he removed to New York city, where he became a broker in railway stocks, and in 1868 he was elected president of the Erie railway, of which he and James Fisk, Jr, (*q v*), had gained control The management of the road under his control, and especially the sale of $5,000,000 of fraudulent stock in 1868–70, led to litigation, and Gould was forced out of the company in March 1872 and compelled to make restitution. It was during his control of the Erie that he and Fisk admitted Tweed to the directorate of the Erie, and Tweed in turn arranged favourable legislation for them at Albany With Fisk in Aug 1869 he began to buy gold, his hope being that, with the advance in price of gold, wheat would advance to such a price that western farmers would sell, and there would be a consequent great movement of bread-stuffs from west to east, which would result in increased freight business for the Erie road His speculations in gold culminated in the panic of "Black Friday," on Sept 24, 1869, when the price of gold fell from 162 to 135

Gould gained control of the Union Pacific, from which in 1883 he withdrew after realizing a large profit Buying up the stock of the Missouri Pacific, he built up the "Gould System" of railways in the South-western States In 1880 he was in virtual control of 10,000m of railway. He obtained a controlling interest in the Western Union Telegraph Company, and after 1881, in the elevated railways in New York city He died on Dec. 2, 1892

His eldest son, GEORGE JAY GOULD (born 1864), was prominent also as an owner and manager of railways, and became president of the Little Rock and Fort Smith railway (1888), the St Louis, Iron Mountain and Southern railway (1893), the International and Great Northern railway (1893), the Missouri Pacific railway (1893), The Texas and Pacific railway (1893), and the Manhattan Railway Company (1892); he was also vice president and director of the Western Union Telegraph Company It was under his control that the Wabash system became transcontinental

The eldest daughter, HELEN MILLER GOULD (born 1868), became widely known as a philanthropist, and particularly for her gifts to American Army hospitals in the war with Spain

GOUNOD, CHARLES FRANÇOIS (1818–1893), French composer, was born in Paris on June 17th, 1818, the son of F L. Gounod, a talented painter He studied at the Paris Conservatoire under Reicha, Halévy and Lesueur, and won the "Grand Prix de Rome" in 1839 In Rome he devoted much of his time to the study of the works of Palestrina and Bach In 1843 he went to Vienna, where a "requiem" of his composition was performed. On his return to Paris he tried in vain to find a publisher for some songs which he had written in Rome. He became organist to the chapel of the "Missions Étrangères," and seems to have contemplated entering holy orders Through the intervention however of Madame Viardot, the celebrated singer, he was commissioned (1851) to compose an opera on *Sapho*, a text by Émile Augier, for the Académie Nationale de Musique Its success was not very great but it brought its composer's name to the fore, though for a time not to any great purpose, since neither his second dramatic attempt consisting of some choruses written for *Ulysse*, a tragedy by Ponsard, played at the Théâtre Français in 1852, conducted by Offenbach, nor his third *La Nonne sanglante*, given at the Paris Opéra in 1854, advanced his reputation

Goethe's *Faust* had for years exercised a strong fascination over Gounod, and he at last determined to turn it to operatic account The performance at a Paris theatre of a drama on the same subject delayed the production of his opera for a time In the meanwhile he prepared a pleasing operatic version of Molière's comedy, *Le Médecin malgré lui* (Théâtre Lyrique, 1858) The first performance of *Faust* took place at the Théâtre Lyrique on March 19, 1859 The subject had already inspired in various ways Spohr, Schumann, Berlioz, Liszt and Wagner among others *Faust* was given in London in 1863, when its success at first doubtful, became enormous, so that it was heard concurrently at Covent Garden and Her Majesty's theatres

Gounod's next opera was *Philémon et Baucis* a charming setting of the mythological tale (Théâtre Lyrique, 1860) in which the composer followed the traditions of the Opéra Comique, employing spoken dialogue, though without abandoning the individuality of his own style *La Reine de Saba* (Grand Opéra, Feb 28, 1862) a four-act opera, was a more ambitious work, but had little success, although the score contains some of the composer's happiest inspirations *La Reine de Saba* was adapted for the English stage under the name of *Irene*. *Mireille*, which followed (Théâtre Lyrique, March 19, 1864), founded upon the *Mireio* of the Provençal poet Mistral, contains much charming and characteristic music, but again the public was unresponsive, nor did *La Colombe*, heard at Baden in 1860, and at the Opéra Comique, succeed

Gounod next sought inspiration in Shakespeare, and in the result *Roméo et Juliette* (Théâtre Lyrique, April 27, 1867) had a success second only to that of *Faust* Some have even preferred it to the latter. Gounod expressed his own opinion of the relative value of the two operas enigmatically by saying, "*Faust* is the oldest, but I was younger, *Roméo* is the youngest, but I was older" The success of *Roméo et Juliette* in Paris was great from the outset In London it was not until the part of Romeo was sung by Jean de Reszke that the work was fully recognized

Corneille's *Polyeucte* provided the subject of Gounod's next opera, but its production was delayed by the Franco-German war, during which Gounod visited London There he composed the "biblical elegy" *Gallia* for the inauguration of the Royal Albert Hall, and a number of songs to English words, many of which have attained an enduring popularity, such as "Maid of Athens," "There is a green hill far away" On his return to Paris he hurriedly set to music an operatic version of Alfred de Vigny's *Cinq-Mars* (Opéra Comique, April 5, 1877), which found little favour *Polyeucte*, which appeared at the Grand Opéra on Oct 7, 1878 was no better received, nor was *Le Tribut de Zamora* (1881)

But Gounod had other strings to his bow besides the theatre As Saint-Saens put it in his *Portraits et Souvenirs*·

> Gounod did not cease all his life to write for the church, to accumulate masses and motets, but it was at the commencement of his career, in the *Messe de Sainte Cécile*, and at the end, in the oratorios *The Redemption* and *Mors et vita*, that he rose highest

Saint-Saens held that the three works mentioned will survive all the master's operas and however this may be they certainly contain many beautiful pages which have won them warm admirers along with the *Messe du Sacré Coeur* (1876) and the *Messe à la mémoire de Jeanne d'Arc* (1887) *The Redemption*, a "sacred triology," dedicated to Queen Victoria, and produced at the Birmingham Festival of 1882 bears the unmistakable imprint of the composer's hand, but the work in its entirety is not exempt from monotony *Mors et vita*, dedicated to Pope Leo XIII, was first produced in Birmingham, at the Festival of 1885

Gounod was a great worker Besides the works already mentioned may be named two symphonies which were played during the '50s, but have long since fallen into neglect He also attempted to set Molière's comedy, *Georges Dandin*, to music, keeping to the original prose, but this work was never performed Gounod died at St Cloud on Oct 18, 1893

See his own posthumous *Mémoires d'un artiste* (1896), C. Saint-Saens, *Charles Gounod et le Don Juan de Mozart* (1893) and *Le Livret de Faust* (*Monde Musicale*, 1914–19) *See* also P L Hillemacher (1906); C. Bellaigue (1910), and Prod'homme and Daudelot (1911).

GOURAUD, HENRI JOSEPH ÉTIENNE (1867–), French general, was born at Paris on Nov. 17, 1867. He entered St Cyr in 1888, and was commissioned to the infantry in 1890 In 1894 he was seconded for duty under the colonial administration, and thereafter he served in the French Sudan for two years. He was serving in Morocco at the outbreak of the World War.

On Sept. 17, 1914, Gouraud was promoted temporary general of division, and the following Jan was appointed commander of the Colonial Army Corps On Feb 15, 1915, he was made a substantive general of division. In May he replaced D'Amade as commander of the force in Gallipoli, where he was so badly wounded that his right arm had to be amputated He was awarded the *médaille militaire* on July 10, 1915 On recovering from his wound he went to Italy in charge of a mission, and then in Dec 1915 he was appointed to command the IV Army A year later he was sent temporarily, as commissioner general, to Morocco; but he again took command of the IV Army in June 1917 From 1915 to the summer of 1918 the sector of the IV. Army was relatively quiet, save for one moment in the spring of 1917 in which it was drawn into the ambit of Nivelle's offensive on the Aisne, and at that time Gouraud was in Morocco Thus, when on July 15, 1918, the Germans launched their last offensive on the Champagne front, Pétain had difficulty in winning him to the necessity of a "coil spring" defence But when the time came Gouraud carried out its principles admirably, and brought the Germans' last effort to a standstill in his battle zone. In Oct. 1919 he became high commissioner in Syria and commander-in-chief in the Levant He was succeeded by General Weygand in 1923 and was appointed military governor of Paris in 1924.

GOURD, a name given to various plants of the family *Cucurbitaceae,* especially those belonging to the genus *Cucurbita,* monoecious trailing herbs of annual duration, with long succulent stems furnished with tendrils, and large, rough, palmately-lobed leaves; the flowers are generally large and of a bright yellow or orange colour, the barren ones with the stamens united, the fertile are followed by the large succulent fruit that gives the gourds their economic value The most important of the gourds, from an economic point of view, is perhaps *C maxima,* the red and yellow gourd of British gardeners It is grown in southern Asia and Europe In Turkey and Asia Minor it yields, at some periods of the year, an important article of diet to the people; immense quantities are sold in the markets of Constantinople. The yellow kind attains occasionally a weight of upwards of 240lb It grows well in central Europe and the United States, while in the south of England it will produce its gigantic fruit to perfection in hot summers In France and in the East it is used in soups and ragouts, while simply boiled it replaces other table vegetables In some countries the larger kinds are employed as cattle food The seeds yield by expression a large quantity of a bland oil, which is used for the same purposes as that of the poppy and olive The "mammoth" gourds of English and American gardeners (known in America as squashes) belong to this species The pumpkin (summer squash of America) is *Cucurbita Pepo.* Some of the varieties of *C maxima* and *Pepo* contain a considerable quantity of sugar, amounting in the sweetest kinds to 4 or 5%, and in the hot plains of Hungary efforts have been made to use them commercially The young shoots of both these large gourds may be given to cattle, and can be eaten as a green vegetable when boiled The vegetable marrow is a variety (*ovifera*) of *C Pepo* Many smaller gourds are cultivated in India and other hot climates

The bottle-gourds are placed in a separate genus, *Lagenaria,* chiefly differing from *Cucurbita* in the anthers being free instead of adherent The bottle-gourd proper, *L vulgaris,* is a climbing plant with downy, heart-shaped leaves and beautiful white flowers: the remarkable fruit of which first begins to grow in the form of an elongated cylinder, but gradually widens towards the extremity, until, when ripe, it resembles a flask with a narrow neck and large rounded bulb, it sometimes attains a length of 7ft. When ripe, the pulp is removed from the neck, and the interior cleared by leaving water standing in it; the woody rind that remains is used as a bottle The ripe fruit is bitter and cathartic, but while immature it is eaten by the Arabs and Turks The snake-gourds of India and China (*Trichosanthes*) are used in curries and stews

All the true gourds have a tendency to secrete the cathartic principle *colocynthin,* and in many varieties of *Cucurbita* and allied genera it is often elaborated to such an extent as to render them unwholesome, or even poisonous The seeds of several species therefore possess some anthelmintic properties

The abundance of varieties found in India would seem to indicate that part of Asia as the birthplace of the present edible forms; but some appear to have been cultivated in all the hotter regions of that continent, and in North Africa, from the earliest ages, while the Romans were familiar with at least certain kinds of *Cucurbita,* and with the bottle-gourd *Cucurbita Pepo* is probably a native of America

GOURGAUD, GASPAR, Baron (1783–1852), French soldier, was born at Versailles on Sept 14, 1783. He served in the campaigns of 1803–5, at Saragossa, and in the Danubian campaign of 1809 He acted as ordnance officer to Napoleon throughout the Russian campaign of 1812, served in the campaign in Saxony, and saved the emperor's life at Brienne Though one of the royal guards of Louis XVIII in 1814, he joined Napoleon in the Hundred Days (1815), was named general and aide-de-camp, and fought at Waterloo He shared Napoleon's exile at St Helena, but tired of the life at Longwood and the friction with Montholon, and went to England, where he published his *Campagne de 1815* He returned to the army in 1830, became a deputy to the Legislative Assembly in 1849, and died in Paris in 1852

His works include: *La Campagne de 1815* (London and Paris 1818); *Napoléon et la Grande Armée en Russie; examen critique de l'ouvrage de M le comte P. de Ségur* (1824), *Réfutation de la vie de Napoléon par Sir Walter Scott* (1827), *Mémoires pour servir a l'histoire de France sous Napoléon* (with Montholon, 1822–23), *Bourrienne et ses erreurs* (with Bellard and others, 2 vols 1830), his most important work is the *Journal inédit de Ste-Hélène* (2 vols 1899)

See B Jackson, *Notes and Reminiscences of a Staff Officer* (1904), and the bibliography to the article Lowe, Sir Hudson

GOURKO, JOSEPH VLADIMIROVICH, Count (1828–1901), Russian general, of Lithuanian extraction, was born on Nov 15, 1828 He entered the imperial bodyguard, rose rapidly in the service, and at the outbreak of the Russo-Turkish war of 1877 he was placed in command of the van of the Russian invasion He took Trnovo on July 7, crossed the Balkans by the Hain Bogaz pass, debouching near Hainkioi, and, notwithstanding considerable resistance, captured Uflani, Maglish and Kazanlyk; on July 18 he attacked Shipka, which was evacuated by the Turks on the following day Thus within sixteen days of crossing the Danubè Gourko had secured three Balkan passes and created a panic at Constantinople He then made a series of successful reconnaissances of the Tunja valley, cut the railway in two places, occupied Stara Zagora (Turkish, Eski Zagra) and Nova Zagora (Yeni Zagra), checked the advance of Suleiman's army, and returned again over the Balkans In October he was appointed commander of the allied cavalry, and attacked the Plevna line of communication to Orkhanie with a large mixed force, captured Gorni-Dubnik, Telische and Vratza, and, in the middle of November, Orkhanie itself. Plevna was isolated, and after its fall in December Gourko crossed the Balkans, totally defeated Suleiman, and occupied Sophia, Philippopolis and Adrianople, the armistice at the end of January 1878 stopping further operations (*see* Russo-Turkish Wars) Gourko was made a count, and decorated with the 2nd class of St George and other orders In 1879–1880 he was governor of St Petersburg, and from 1883 to 1894 governor-general of Poland He died on Jan. 29, 1901

GOURMANCHE, an agricultural, cattle-raising people closely related to the Mossi, whom they resemble in social characteristics, in the Gourma province of the Upper Volta, Africa. They are organized in territorial groups under a paramount chief descended from the conqueror of the Mossi (*See* Delafosse, *Haut Sénégal Niger* [1912]).

GOURMET, a French term for one who takes a refined and critical pleasure in good cooking and the delights of the table

GOURMONT, REMY DE (1858–1915), French critic, essayist and novelist, was born on April 4, 1858, at the Château de la Motte, Bazoches-en-Houlme (Orne). He went to Paris in 1883, after having studied at Caen and entered the Bibliothèque Nationale, where he remained for eight years; he was obliged to leave in 1891 in consequence of having published an article which was considered anti-patriotic In 1890 he founded, with several friends—including J Renard and others—the *Mercure de France,* of which he was one of the chief collaborators for about 20 years. In his critical works, a distinction must be made between (1) notes on contemporary life published in the *Mercure* under the title of *Epilogues* (1903–13), (2) the series of *Promenades Littéraires* and *Promenades Philosophiques* (1904–13) which are sometimes comparable with the *Causeries du Lundi* of St -Beuve, (3) the series of studies dealing with pure literature, style and versification (*Le Latin Mystique,* 1892; *L'Esthétique de la Langue Française,* 1899, *La Culture des Idées,* 1900, *Le Chemin de Velours,* 1902; *Le Problème du Style,* 1907). As a critic, he had the great merit of drawing attention to the intellectual importance of Villiers de l'Isle Adam, Huysmans, Mallarmé, Nietzsche, etc , when the work of these authors was still little known

He also had an original and precise conception of style He was always on the alert to break up ideas or images associated by tradition or custom and to analyse them separately in order to set up new associations which, in their turn, might eventually be broken From the philosophical point of view, Remy de Gourmont agreed, in principle, with the symbolists, in admitting that there exist other realities than those of the mind; but this idealism tended in his case to be sceptical and, at times, even cynical

Like Schopenhauer and Nietzsche, with whose works he was so fully conversant, he owed much to the French moralists of the 18th century, and to Montaigne This quality of cynicism is clearly apparent in his *Physique de l'Amour* (1903), in which he attempts to eliminate from the philosophy of love all mystical and romantic elements and to bring it into line with biology

Remy de Gourmont was also the author of plays and symbolist poems which are no longer interesting except to the student, and various novels, of which the most important are *Sixtine,* a *roman de la vie cérébrale* (1890); *Les Chevaux de Diomède* (1897), *Le Songe d'une Femme* (1899), *Une Nuit au Luxembourg* (1906) and *Un Coeur Virginal* (1907) His gift for creating living characters is lacking in these books, but those of his works inspired by the philosophical romances of the 18th century, especially Diderot, are noteworthy for their lucidity, and are marked by a fantastic and alert individuality Remy de Gourmont wrote on many subjects, and with Anatole France was one of the last representatives of the "grande culture générale" in France

JEAN DE GOURMONT (1877–), brother of the above, also contributed largely to the *Mercure de France.* He has written some poems, and a novel *Le Toison d'Or* (1908)

GOUROCK, police burgh, burgh of barony and watering-place, Renfrewshire, Scotland, on the south of the Firth of Clyde, 3¼ m. W by N of Greenock by the L M S R , which passes through long tunnels between the two places Pop (1921) 10,128 It is partly situated on a fine bay affording good anchorage, largely used by yacht clubs of the Clyde, and the quay is an important centre for passenger steamers Barrhill (480 ft high) divides the town into two parts, the eastern is Kempoch, the western Ashton Gourock became a burgh of barony in 1694

GOURVILLE, JEAN HERAULD (1625–1703), French adventurer, was born at La Rochefoucauld, and in 1646 became secretary to François de la Rochefoucauld, author of the *Maximes,* whom he served during the Fronde, in his intrigues with the parliament, the court and the princes. In these negotiations he came into contact with Condé, Mazarin and Nicolas Fouquet In 1658 he farmed the *taille* in Guienne. He bought depreciated *rentes* and had them raised to their nominal value by the treasury; he extorted gifts from the financiers for his protection, being Fouquet's confidant in many operations of which he shared the profits. In three years he accumulated an enormous fortune, increased by his luck at cards He was involved in the trial of Fouquet, and in April 1663 was condemned to death for peculation and embezzlement of public funds; but, escaping, was executed in effigy. He sent a valet to take the effigy down from the gallows in the court of the Palais de Justice, and then fled the country After five years' absence he returned, entered the service of Condé, and received diplomatic missions in Germany, Holland and Spain In 1694 he was legally rehabilitated

See his *Mémoires* (1724), of which there is a modern edition, with notes, an introduction and appendix, by Lecestre (1894–95, 2 vols) They are a useful source for certain transactions of the time.

GOUT, the name rather vaguely given, in medicine, to a constitutional disorder which manifests itself by inflammation of the joints, sometimes with deposition of sodium biurate, and also by morbid changes in various important organs

In all times this disease has engaged the attention of physicians, from its wide prevalence and the amount of suffering which it entails Sydenham, the famous English physician of the 17th century, wrote an important treatise on the subject, and his description of the gouty paroxysm, all the more vivid from his having himself suffered for 34 years, is still quoted by writers as the most graphic and exhaustive account of the symptomatology of gout Garrod, the most eminent authority on gout of recent times, distinguished *regular gout,* which affects the joints alone, and is either acute or chronic, from *irregular gout,* affecting non-articular tissues, or disturbing the functions of various organs

An attack of gout may come on without previous warning; but premonitory symptoms, especially in those who have previously suffered from the disease, are common Among the more frequent of these are disorders of the digestive organs, feeble and capricious appetite, flatulence and pain, discomfort in the region of the liver and frequent micturition These are accompanied by extreme irritability of temper, and various perverted sensations, such as that of numbness and coldness in the limbs These symptoms may persist for many days and then undergo amelioration immediately before the impending paroxysm On the night of the attack the patient retires to rest apparently well, but about two or three o'clock in the morning awakes with a painful feeling in the foot, most commonly in the ball of the great toe, but it may be in the instep or heel, or in the thumb

The affected part is swollen and deep red The overlying skin is tense and glistening, and the surrounding veins are distended After a few hours there is a remission of the pain, slight perspiration takes place, and the patient may fall asleep The pain may continue moderate during the day but returns towards night These nocturnal exacerbations occur with greater or less severity during the continuance of the attack, which generally lasts for a week or ten days As the symptoms decline the swelling and tenderness of the affected joint abate, but the skin over it pits on pressure for a time, and with this there is often associated slight desquamation of the cuticle During the attacks the patient is restless and extremely irritable, and suffers from cramp in the limbs, dyspepsia, thirst and constipation The urine is scanty and high-coloured, with a copious deposit, consisting chiefly of urates During the attack the inflammation may leave one foot and affect the other, or both may suffer at the same time After the attack is over the patient feels quite well, but it is rare that the first is the only attack of gout, symptoms recur at ever-shortening intervals In the earlier recurrences the same joints suffer again, but in time others become implicated, until in advanced cases scarcely any articulation escapes When gout assumes this form the attacks are usually less painful, but their effects are shown by disturbance of important organs, especially the stomach, liver, kidneys and heart, and by changes in the joints arising from the formation of so-called chalk-stones or tophi These deposits, characteristic of gout, appear at first as a semi-fluid material containing sodium biurate, which ultimately becomes hard and restricts movement of the joint Any of the joints may be thus affected, but most commonly those of the hands and feet The material is also deposited in tendon sheaths underneath the skin and periosteum, in the sclerotic coat of the eye, and especially on the cartilages of the external ear

The recognition of what is termed irregular gout is less easy. In general the manifestations are those of lithiasis (*see* METABOLIC DISEASES) When chronic, gout is often associated with degenerative changes in the heart and large arteries and with chronic granular kidney Less commonly the kidney is found to contain uric acid calculi; the association of gout with gravel is well recognised.

Gout is a familial disease, but luxurious living and strong sweet wines on the one hand, and chronic lead poisoning on the other, are predisposing causes. Lack of adequate exercise also plays a part, and an attack sometimes may be warded off by a sharp walk.

Gout may also affect persons who observe the strictest temperance in living, and whose only excesses are in the direction of over-work, either physical or intellectual It is more common in mature age than in the earlier years of life, the greatest number of cases in one decennial period being between the ages of 30 and 40, next between 20 and 30, and thirdly between 40 and 50 After middle life gout rarely appears for the first time. Women are less subject than men, and it most frequently appears after the menopause Persons exposed to the influence of lead poisoning, such as plumbers, painters, etc , are apt to suffer from gout

Attacks of gout are readily excited in those predisposed to the disease Exposure to cold, disorders of digestion, fatigue, and injuries of particular joints will often precipitate the paroxysm

Treatment.—During an attack rest, restriction of protein and starchy foods, alkaline diuretics, purgatives, and for the relief of pain, colchicum, are usually relied upon In the intervals attention to diet, avoidance of constipation, and certain mineral waters and baths (*see* MINERAL WATERS) are useful.

GOUTHIÈRE, PIERRE (1740–1806), French metal worker, was born at Troyes and went to Paris at an early age as the pupil of Martin Cour He executed a vast quantity of metal work of the utmost variety, the best of which was unsurpassed by any of his rivals His great patrons were the duc d'Aumont, the duchesse de Mazarin and Madame du Barry, for whom he produced much splendid work The custom of the latter, indeed, brought about his financial ruin When the collection of the duc d'Aumont was sold by auction in Paris in 1782 many objects mounted by Gouthière were bought for Louis XVI and Marie Antoinette, which gave rise to the belief that he had worked for the court The sale catalogue is in existence, with the names of the purchasers and the prices realized; nearly all the lacquer cabinets, chandeliers, candelabra, columns and vases in porphyry, Chinese and Japanese porcelains were mounted in bronze by Gouthière, and about 50 pieces bore his signature The great prices paid at this sale are the criterion of the contemporary value set upon his achievement Thus Marie Antoinette paid 12,000 livres for a red jasper bowl or *brûle-parfums* mounted by him, which was then already famous In 1865 the marquis of Hertford bought it at the prince of Beauvais's sale for 31,900 francs It is now in the Wallace Collection In the Louvre is a smaller cup and a bronze clock signed and dated 1771 When Madame du Barry's property was seized at the Revolution she owed Gouthière 756,000 livres, of which he never received a penny, and his sons stated that he died in destitution

See H Vial, "La faillite de Gouthière," in *La Correspondance historique et archéologique,* VIII., 131 (1901)

GOUVERNEUR, a village of St Lawrence county, New York, U S A , on the Oswegatchie, 25m from the St Lawrence at Ogdensburg It is on federal highway 11, and is served by the New York Central railroad The population was 4,111 in 1925 It is in a fertile agricultural and dairying region, which is also rich in minerals The village has zinc refineries, marble and talc mills, and factories making lace curtains, silk and paper It was founded as Cambray in 1805, and was renamed in honour of Gouverneur Morris The village was incorporated in 1850

GOUVION SAINT-CYR, LAURENT, MARQUIS DE (1764–1830), French marshal, was born at Toul on April 13, 1764 He studied painting in Rome, but never adopted the profession of a painter He entered the army in 1792 and from 1796 to 1800 held commands in the Rhine campaign (1796), Italy (1798), Germany, Italy, and again (1800) on the Rhine In 1801 he was sent to Spain for the intended invasion of Portugal, and when a treaty of peace was concluded with Portugal he succeeded Lucien Bonaparte as ambassador at Madrid. From 1803 he again served in the army, in Italy, Prussia, Poland and Catalonia, but eventually resigned his command in protest against orders received from Paris, and remained in disgrace until 1811. He was excluded from the first list of marshals owing to his refusal to influence the troops in favour of the Empire On the opening of the Russian campaign in command of an army corps, on Aug 18, 1812, he defeated the Russians at Polotsk and was created a marshal of France. On the fall of Napoleon he was created a peer of France, and became war minister (July–Nov 1815) In June 1817 he was appointed minister of marine, and in September again war minister, until November 1819. He was made a marquis in 1817 He died at Hyères (Var) March 17, 1830

He was the author of the following valuable works. *Journal des opérations de l'armée de Catalogne en 1808 et 1809* (1821), *Mémoires sur les campagnes des armées de Rhin et de Rhin-et-Moselle de 1794 à 1797* (1829), and *Mémoires pour servir à l'histoire militaire sous le Directoire, le Consulat, et l'Empire* (1831).

See Gay de Vernon, *Vie de Gouvion Saint-Cyr* (1857).

GOVAN, a parish of Glasgow, Scotland Pop. (1921), 372,087 (ecclesiastical parish of Govan, 58,861) There are stations on the L M S R and Glasgow subway (*See* GLASGOW)

GOVERNMENT. Government in the ancient world presents three main types—the great despotic empires of Sumeria, Egypt, Assyria, Persia, Macedon; the city-states of Asia Minor, Greece and Italy, and the unique example in Rome of a city-state gradually becoming the centre of an empire, and, in the process, changing its republican system into an autocracy, limited only by the survival of some republican institutions and traditions

The early despotic empires have exerted no direct influence upon the development of forms of government and for information on them readers are referred to the separate articles in which they are described The city-state Governments of the Mediterranean cannot be thus dismissed It is true that, in a narrow sense, their direct influence upon the history of governmental institutions has been small The disparity in size between the territory of the Athenian or Spartan State and any modern nation-state, the difference in social structure involved in the existence of slavery in the ancient world; and the relation of the political structure to a social organization unrelated to modern conditions are sufficient in themselves, to say nothing of the long interval of time which elapsed between the downfall of the Roman empire and the emergence of the modern nation-state, to account for this Yet both Greece and Rome, through the effect of the political ideas of the one, and the legal system of the other, have exerted a profound influence upon the development of government

The appearance of a number of small independent city-states in Greece and the Greek-speaking belt of Asia Minor, and later in the Greek colonies of Sicily and Southern Italy, led to the first great outburst of political speculation The fundamental questions of political theory were discussed—the nature and end of the State, the meaning of justice, the ideal polity, its aims and structure—whilst speculation was combined with an inductive method by Aristotle and led to the classification of States into good and bad, according as the Government aimed at the good of the whole or at the satisfaction of its own interest and, from another point of view, into three types under each head—monarchy, aristocracy, polity, with their corresponding perversions tyranny, oligarchy, democracy—according as the governmental power was in the hands of one, a few, or the many in each State To the political thought of the Greeks, and above all to that of Plato and Aristotle, modern political theorists have constantly returned, whilst to the Greek city-state, and especially to Athens, the modern world owes the idea of the self-governing community in which the rule of law is paramount, the citizen shares in political power and controls the destinies of the State, and the executive officers of the State are responsible to the citizen body for the exercise of the functions entrusted to them (*See* PLATO, ARISTOTLE, ATHENS)

The influence of Rome has been of another kind Though its legal writers and its legal system preserved some of the ideas of the Greeks—more especially the conception of a law of nature

transcending the positive law of a given state—the strength of the Romans lay in legal construction rather than in political speculation. The idea of the sovereignty of the State as in its nature final and unchallengeable to all its citizens, though implicit in the Greek view of the State, has indeed most clearly passed into modern political thought through Roman channels (*see* SOVEREIGNTY). Yet the direct influence of Rome is to be seen more in the influence exercised by the conception of a universal empire on the mediaeval mind, and what is still more important, in the influence of the great fabric of Roman law upon the legal systems of the modern world. The private law of France, Germany, Italy, Spain, Holland, Belgium and the Spanish American republics rests upon Roman foundations, and its only great rival, the English Common law, which was retained by the United States and has spread to some, though not all, of the Dominions and dependencies, itself owes not a little to the Roman law

The Mediaeval Period.—The barbarian invasions of the West from the 5th to the 10th centuries inaugurated a new and confused period in the history of Government from which the modern State has gradually emerged. On the one hand the new barbarian kingdoms were tribal and spread over a wide territory their character was for long "rural" rather than "civic," and even when town life became important in the later middle age the towns were no longer, for the most part, independent centres of political life but were incorporated within large territorial areas of government. On the other hand the Roman theory of universal dominion lasted on throughout the Middle Ages and, through the titular supremacy of the Holy Roman empire, delayed the emergence of national territorial states with a clear title to independence This delay was assisted by the equally universal claim of the popes to human obedience, and by the effective organization of the Church's system of Government through the canon law, and the courts which administered it, throughout the Christian world Further, within each territorial kingdom, the authority of the monarch was checked by the local authority of the feudal baron and the contractual organization of feudal tenure (*See* FEUDALISM)

But by the end of the 13th century the empire had begun to take on the character of a title appended to a German princedom, without authority over or danger to the other princes of Europe whilst in the first years of the 14th century the papacy itself fell a victim to the attack of a national king, Philip the Fair, and entered upon its "Babylonish captivity" at Avignon At the same period the force of nationality began to make itself felt both in England and France, and the development in both countries in the later middle ages of a middle class, engaged in trade, gave the kings a new source of strength upon which to rely in their struggle with the feudal nobility The great religious revolt of the 16th century carried the emergence of the national state yet a stage further. In the Protestant kingdoms—England, Sweden, Denmark for example—the universal claims of the pope were finally repudiated And even in those States which adhered to Roman Catholicism the secular power gained greatly in authority.

The greatest contribution of the later middle age to the development of modern government was the establishment of a representative system in the countries of Europe The conditions of the feudal contract always made it necessary for the king to obtain consent from his vassals for any military effort that would demand more from them in service than they were liable to perform The summoning of the great tenants-in-chief to assemblies at which such consent was asked was natural enough With the growth of the towns, many of which owed their charters to and held their immunities directly from the Crown the consent of these communities—early regarded as "persons"—became advisable and necessary, more especially as military service became commuted into money contributions The device of representation of the "estates" of the realm—nobility, clergy, commons—was adopted in the 13th century and spread rapidly over Europe. Its value as a means of solving the problem of consent in a State spread over a wide territorial area cannot be over-estimated, and though its early triumphs were not always permanent it remained the basis upon which a system of representative government could be built. The specifically feudal character implied in the term "estates" gradually gave way in England before the growing power of the Commons who, partly through the happy absence of any permanent barrier of nobility or privilege between the upper and lower classes, came to regard themselves as representative of the nation as a whole.

Modern Times.—If the modern nation-state clearly emerges in the 16th century the history of modern government falls equally clearly into two main periods since that date, the period before and the period since the French Revolution

1. In its earlier form the nation-state was almost universally autocratic and dynastic. From 1600 down to 1789 the will of each State was the will of its monarch, or of advisers chosen by himself In France, Spain, Austria, Prussia, Russia, as in most of the minor states of Europe, the will of the governed had hardly any means of constitutional expression and none of effective enforcement upon the governments The estates were either no longer summoned—1614 was the last meeting of the French States General till 1789—or were deprived of all effective power England and Holland stood almost alone in Europe as representative of a political system in which government was in constant and organized relationship with the will of the citizens as a whole, and even in these two countries the number of citizens legally entitled to express a political opinion was severely restricted

2 The American and French Revolutions form the watershed which divides the world of the autocratic from that of the modern democratic nation-state. Regarded broadly the history of government in the 19th and 20th centuries has been the history of the steady widening of the basis of political power That movement has been more gradual than is often recognized In England the Reform Act of 1832 created no more than a middle class oligarchy. 35 years elapsed before another Reform Act gave political rights to a section of the artisan class, and almost a century has been needed, together with the profound shock of the greatest war in history, to include women in the democratic structure of the State. France became a democracy in 1871, though it has shown as yet no sign of extending political rights to women. Germany, when it became united, nullified its extended franchise by a constitution which preserved the autocratic principle and has only joined the ranks of democratic states since 1918 Moreover there have been reactions against the liberal democratic system—most notably in Italy and Spain, if indeed the latter state can ever be said to have possessed a democratic organization. Nevertheless it is true that since the World War the democratic system of representative government, based on an adult franchise (with the notable exception of women in many cases) has become the predominant system of government in the world For the system has captured the New World as well as the Old Under the aegis of the British empire, Canada, Australia and New Zealand have become great democratic nation-States, whilst the Latin American States, if unstable in practice, are theoretically wedded to the same system and in Asia Japan has followed the same path, China has attempted to set up a parliamentary republic, and the Government of India Act of 1918 was intended to prepare the way for representative democracy. Of the great States of the modern world Russia and Italy (*qq v ; see* also FASCISM and COMMUNISM) present definitely antagonistic systems (*see* below)

CLASSIFICATION OF MODERN GOVERNMENTS

Modern democracies show great variations in their governmental organization and the following criteria of differentiation have become usual

Flexible and Rigid States.—States may be classified as "flexible" or "rigid" (as by the late Lord Bryce see *Studies in History and Jurisprudence* Essay III) according as their constitutions—the forms of their government—can be changed by the ordinary process of legislation or only by a specially difficult method of making changes of this kind Thus in England the successive extensions of the franchise which have changed the basis of government from aristocracy to democracy (and the still more radical change made by the Parliament Act of 1911 in limiting the veto of the House of Lords) have required only the authority of an act of parliament passed by the same procedure

as any other measure In most other countries any change in the constitution requires a special procedure attended with much greater formal difficulty than that of the ordinary mode of legislation Thus in the United States of America "the constitution cannot be amended without the consent of two-thirds of Congress and three-fourths of the States" (Wilson, *The State* p. 524); in Australia a constitutional amendment requires an absolute majority of each house of parliament, together with, by a referendum "in a majority of the States a majority of the electors voting . . . and a majority of all the electors voting," and under the new German constitution "constitutional amendments by the *Reichstag* (the popularly elected house) are only valid if two-thirds of the members are present and at least two-thirds of those present are in favour" whilst, in addition unless the consent of two-thirds of the *Reichsrat* is also obtained, that body may demand a referendum to the electorate, of which a majority must then support the amendment to secure its passage into law

The degree of "rigidity" varies considerably in different modern States In France, for example, an absolute majority of the two chambers sitting together as the national assembly is sufficient to secure amendment of the constitution It should, however, be added that the test of rigidity or flexibility cannot be allowed to rest simply on the provision of formal difficulties in the way of constitutional amendment The whole balance of a constitution is involved as well as the temper and attitude of both its legislators and citizens

Unitary and Federal States.—Of much more fundamental importance is the classification of States into unitary and federal

The unitary State has one legislature, capable of making laws of universal validity for all its citizens and subjects, one executive to apply and a unified judicial system to interpret these laws To this type belong amongst others the British, French, Belgian, Italian Governments The federal State, on the other hand, is "made up of several individual states, each of which preserves in principle its internal sovereignty, its own laws and government But the nation as a whole, comprising the total population of the individual States and leaving these States as such out of account, forms a united or federal State which also possesses a complete government and of which the citizens of the individual States are all also citizens" (Esmein, *Eléments de Droit Constitutionnel Français et Comparé* Vol I p 6 [1927]) The difference between a federal and a unitary State may be put in another way by saying that whereas in a unitary state all law-making bodies, other than the central legislature, have their powers of law-making defined for them by the central legislature which gives them juridical existence, in a federal State the law-making powers of the central federal government are defined by the constitutional agreement between the several States of the federal union, by which it was created, whilst all such legislative or executive powers as were not by that act expressly attributed to the federal government are retained by the States themselves In practice this is the arrangement in the United States and in the Swiss Federation and it was followed in the Commonwealth of Australia Act 1900 But in the British North America Act of 1867, which gave Canada its constitution, an attempt was made to define not only the powers of the Federal government but also those of the provincial government The attempt was unfortunate in view of the non-exclusive character of the powers so granted and has resulted in much litigation which might have been avoided

It follows from the existence of such a division of legislative power that the question must arise whether the federal or a state government has acted *ultra vires* in a given instance One characteristic of federal government, therefore, is the lack of finality in the legislation of either the federal or a State government All legislation is subject to the terms of the constitution, itself a result of the fact that the federal structure arises from an agreement between hitherto sovereign States, and the interpretation of the constitution belongs by its terms usually to the courts. Thus in the United States the supreme court, in Australia the high court, and in the case of Canada the judicial committee of the privy council, is constituted the interpreter of the constitution with the ultimate right to pass upon the validity of the legislation either of the federal government or of a State or province In Switzerland alone amongst federations has this question been reserved for the decision of the federal legislature itself, thus exposing it to the charge of being a judge in its own cause But even here the use of the referendum provides another, though a different, court of appeal. (*See* FEDERAL GOVERNMENT)

The Parliamentary Executive.—Still another mode of classifying modern democratic governments, which cuts across that last discussed, is to divide them into those with a parliamentary and those with a non-parliamentary executive England is the home and the source of the parliamentary executive, by which is meant that the body of ministers of State, in charge of the executive offices, is chosen from and is responsible to the members of the legislature This choice of the executive from the members of the legislature is not, however, a formal act of the legislature itself It is the result of the growth of a party system as a consequence of which the popularly elected house was always divided into a majority and a minority, with the result that the party enjoying a majority for the time being selected a leader who, on the victory of his party at the polls, became prime minister and himself selected his colleagues and offered them the vacant ministerial posts The responsibility of this body of ministers to the elected house is, in effect, a responsibility primarily to the party majority of which they are themselves members, and their continuance in power depends upon their ability to command the votes of this majority for their policy Further, in the English system, the body of ministers, or cabinet, are regarded as having a joint responsibility to each other as well as to the House of Commons as a whole All important matters of policy are considered by the cabinet as a body, and a vote of censure upon any one minister on a matter of importance is in ordinary cases a vote of censure upon the government and would be followed by its resignation (*See* also CABINET)

The advantages claimed for this system of government are those of close co-operation between executive, legislature and people and the co-ordination of policy in all the great departments of State Further the cabinet and its supporters in the House are under day to day criticism from the opposition—a criticism which is rendered both more responsible and more effective by the consideration that defeat of the government in the House, followed by success at the polls will place upon the critics the duty of carrying on the government and of giving legislative effect to the policy on which their criticisms of their opponents are based

In its broad lines this English system of the parliamentary executive has been adopted not only in the self-governing dominions of the British empire but also in a majority of modern democratic states, including now both France and Germany

The Non-parliamentary Executive.—In sharp contrast with the system of a parliamentary executive is that of the United States of America Here the supreme executive, the president, is elected by a different procedure and for a different term from the legislature in either branch He chooses his own ministers, with the consent of the Senate—a consent very rarely refused—and these must not be members of either branch of Congress The president is not responsible to Congress in the sense that an adverse vote in either or both Houses will either cause his resignation or even lead to a change in the policy of his administration His ministers are in no other sense responsible to the legislature than that they are, like the president, impeachable They are responsible to the president himself whose right it is to dismiss them at his pleasure Nor do the president and his ministers form a "cabinet" in the English sense, though the word is current in the United States There is no joint responsibility for policy. each minister is responsible directly to the president for the conduct of his own department, and in the last resort the president is responsible alone for at least all acts of the administration authorized by himself. "In America," wrote Lord Bryce in *The American Commonwealth,* "the administration does not work as a whole It is not a whole. It is a group of persons, each individually dependent on and answerable to the president, but with no joint policy, no collective responsibility" (Vol I. p. 91.)

There can be little doubt that the adherence of the framers of the United States constitution to the principle of the "separation of powers" enunciated by Montesquieu has not made the process of government as efficient, as smooth-working, or as free from corruption as it might have been. Congress, divorced from the practical problems of administration—at least in the House of Representatives, for the Senate has a definite responsibility in foreign policy—tends to become a talking-house and to fall too much under the control of party and financial interests which engage it in the task of "log-rolling" with an eye to the next election or to the furtherance of sectional economic ends. It is hardly too much to say with Professor Laski (*Grammar of Politics* p. 344) that "the American system maximises all the difficulties of law-making," and, it may be added, taking into consideration the presidential veto and the control exercised by the senate in foreign affairs and by Congress as a whole over finance, the difficulties of carrying on the executive government as well.

Switzerland.—The Swiss system is intermediate between the English and the American types The executive (federal council) is parliamentary in that it is elected by and its members are responsible to the legislature But it is non-party in character, it has no collective responsibility, its members do not resign as individuals—still less do they resign as a body—if their policy is not approved by the legislature Each executive minister is responsible to the legislature for the conduct of his department but "policy. . . belongs to the assembly" and the minister stands to it somewhat in the relation of a permanent under-secretary to his political chief in England At the same time ministers may and do address either house of the federal assembly in explanation of their administrative actions or of legislation which affects their departments. Members of the federal council, though only elected for the term of each new assembly, are almost invariably re-elected and in this continuity of tenure again approach to the position of permanent under-secretaries in the English system.

This system, which works well in Switzerland, has some clear advantages over the English type of parliamentary government It secures expert and continuous administration of the departments of State it eliminates much of the atmosphere of personal combat which is inevitable in the English system and therefore directs attention more to "measures" and less to "men." It is, moreover, compatible with the existence of more than two parties in the State This last consideration is of the first importance to all States which possess a parliamentary executive in view of the challenge to the whole basis of that system made by the appearance of more than two political parties In France the parliamentary executive has been hampered partly by the fact that the executive has not the right of dissolution, still more by the existence of numerous groups within the Chamber of Deputies. In recent years the second difficulty has been to some extent overcome by the formation of the *Bloc National* and the *Bloc des Gauches* But in England the situation in which no party can command a solid majority in the House of Commons has already occurred once in recent years (1924). Should this become a frequent situation the conventions of parliamentary government, in the English sense, must be viewed in the light of new facts

Italy and Russia.—A new and, to modern ideas, a revolutionary form of Government has, since the war appeared in Italy and Russia It should perhaps be classified under the Aristotelian heads of aristocracy or oligarchy, though political prejudice is likely to be at present the deciding factor in the decision between these alternatives At any rate both Fascism and Bolshevism exhibit certain common characteristics Both explicitly repudiate the claim of right made for the rule of a majority obtained by the ordinary method of party organization "It is our proud prophecy" writes Signor Mussolini in a preface to J. S Barnes' *Universal Aspects of Fascism* "that Fascism will come to fill the present century with itself even as Liberalism filled the 19th century" And in *The State and Revolution* Lenin wrote "To decide once every few years which member of the ruling class is to repress and oppress the people through parliament—this is the real essence of middle-class parliamentarism, not only in parliamentary and constitutional monarchies, but also in the most democratic republics" In place of Liberalism and parliamentary representation both doctrines propose and have put into practice the dictatorship of a minority—in Italy the Fascist, in Russia the Bolshevik Party This characteristic of minority rule is, however, regarded in both cases as accidental. The Bolshevik looks to see the whole mass of the proletariat, easily outnumbering all other classes combined, converted to the theory of communism. the Fascist equally hopes to convert to his doctrine of national functionalism the main body of the Italian people Whilst, therefore, both doctrines justify the dictatorship of a minority as a necessary stage in effecting the revolution against parliamentary liberalism they cannot justly be accused of an admiration for oligarchy *per se*

The more essential similarity between the two systems is in their attempt to organise government on the basis of integral relationship between the social function of the individual and his political representation In this sense both are "syndicalist," and the industrial unit which from the beginning of the Soviet regime has been the basis of its governmental hierarchy is at present being worked into the fabric of the Italian state which will become the "corporative State" when, in the judgment of its present leaders, the revolutionary stage has been passed

It must be added that there is a profound difference between the Russian and Italian solutions in one respect The Communist functional organization of the State on an occupational basis has definitely aimed at eliminating the individual capitalist employer, who has in fact been largely replaced by the State itself. The Fascist Corporative State (cf. *La Carta del Lavoro*, 1927) whilst clearly placing the interest of the State above those of the individual employer or employee ("the whole body of production must be considered as a united effort from the national point of view") proposes to recognise professional associations of employers alongside the similar associations of employees, and, it should be added, restricts membership of both to adherents of Fascism.

These two experiments, whether they prove lasting or ephemeral, are at least of great importance as attempts to solve the fundamental difficulty of representative government, *i e*, how one man can adequately "represent" the views, desires, opinions, interests, of an electorate numbering anything up to 50,000, divided into different social strata, and of whom under the party systems of parliamentary democracy it may be possible for actually more than half to be opposed to him in politics The German economic council set up under the republican constitution is, though it would be regarded with derision for its powerlessness by either Fascists or Bolsheviks, a concession to the same current of opinion, and even in England after the war a National Council of Employers and Employed was convened to consider the problems of industry, for the solution of which the organisation and available time of parliament were felt to be inadequate. Moreover, radical reconstruction of our parliamentary system on "functional" lines has been advocated by the Guild Socialists (*see* G D H Cole *Guild Socialism Re-stated*) and to a less complete degree by Mr. and Mrs Sidney Webb in their *Constitution for a Socialist Commonwealth* (*see* also FASCISM, COMMUNISM; GUILD SOCIALISM, SYNDICALISM)

Bicameral and Unicameral States.—The form of the legislature in one or two chambers provides a further distinction between States In a federal State the second chamber is primarily representative of the component States of the union, each State of whatever size receiving equal representation with all the rest whilst the principle of popular sovereignty is embodied in the "other" house, each member of which represents an approximately equal number of citizens regardless of State boundaries The primary duty of a second chamber in a federal state, from this point of view, is to protect the interests of the States as such against the encroachments of the federal government (though with the growth of national sentiment in federal states, this function steadily decreases in importance). In unitary States, on the other hand, the case for a second chamber is usually rested upon the need for a differentiation within the legislature by which the work of a popularly elected house, directly under the pressure of

public opinion, liable to gusts of passion, and, under modern conditions, usually grossly over-worked, may be reconsidered and if necessary revised in a calmer atmosphere. whilst in certain cases the period of delay involved in the process of revision may provide an appeal from "Philip drunk to Philip sober," an argument applicable to the second chambers of Federal States

Opponents of the bicameral system contend that the need for delay and revision is either sufficiently provided by the formal stages of legislation or would be better met by a provision requiring the submission of certain measures to a referendum (*q v.*). They contend further that a second chamber cannot be reconciled with the theory of democracy and they pose the dilemma "either it resembles the elected house and represents the people's will, in which case it is useless: or it opposes that will, in which case it is mischievous" The vast majority however of modern democratic states, unitary as well as federal, have bicameral constitutions. In Europe only Yugoslavia and one or two of the new Baltic States possess single chamber governments

British Empire.—A word must be added on the two great unions of States which are the most unique features of modern governmental organisation, the British empire and the League of Nations (*qq.v.*) The extension of a unitary state to cover the great aggregate of territories subject to the British Crown is a remarkable commentary on the flexibility of the British constitution. Within the territories subject to the Crown there is every variety of government, from the virtually complete autonomy of the dominions, to the direct government of backward territories by a civil service appointed by the British Government. Moreover the autonomy of the self-governing dominions has since the imperial conference of 1926 been recognised as so complete that the several governments of the dominions now stand on an equal footing with the British Government itself and in matters concerning any dominion the Crown is constitutionally bound to be advised by the ministers of the dominion, as in other matters by the British cabinet This new situation in which the Crown is apart from the appellate jurisdiction of the privy council the single legal link binding the Dominions to the mother country is the result of the growth of national consciousness in the dominions themselves, and is strikingly illustrated by their position in the League of Nations where each takes its place as a sovereign state side by side with the representatives of Great Britain, and the other States of the world

League of Nations.—The League of Nations can only be noticed here as the first effective attempt to organise on a world-wide scale the external relations of sovereign states with each other. That it does not include the great powers of the United States and Russia—as well as some minor states—seriously impairs its world-wide character. But that it should have come into existence at all, and should have maintained itself during a period of ten years of post-war weariness, is a sufficient proof of the need for some solution of the problem of a world of armed sovereign states, each jealous of its independence

THE FUNCTION OF THE STATE

The fundamental difference of opinion in this matter lies between those who, on the one hand, preserve the Greek conception of the State as an all-inclusive association in which every member should find opportunity of complete self-expression and those, on the other hand, who regard the State as an instrument created by men, in society for certain limited and specified purposes The one conception leads to a "panarchist" position, in which all the activities of individuals and groups are correlated and co-ordinated within a great scheme of social life of which the State is the supreme and all-embracing expression, the other conception is individualist in trend, seeks to limit the functions of the State to a definite sphere beyond which its "interference" is resented, regards law with Bentham as "a necessary evil," and is in its logical ideal "anarchistic," since it would conceive a society of enlightened individuals working harmoniously together without coercive rules as its utopia. Political theory moves between these two poles, and representatives of almost every possible intermediate position could be named

Panarchism.—In modern times the "panarchist" position was that upon which the nation-states began to operate. The revolt against Rome in the Protestant states is in part evidence of this In England the king in the act of throwing off the Roman allegiance, declared "that this realm of England is an empire . . . governed by one supreme head and king . . . he being also institute and furnished . . . with plenary whole and entire power . . . to render and yield justice and final determination . . . in all causes . . . without restraint or provocation to any foreign princes or potentates of the world" (Act of Appeals 1533). Nor did any doubt cross the mind of Tudor Englishmen of the right of the State to control and direct commerce and industry. The unity of national life—political, religious, economic—was more completely realized than ever before or since Not less, but more completely, was the panarchic ideal pursued upon the continent—at least in the kingdoms of France and Spain If these Catholic monarchs could not extrude the pope from all jurisdiction in their realms they could and did put the papal power in leading strings, as far as their own realms were concerned, and control its exercise· and with less deeply-rooted organized opposition to face than their English rivals they carried the control of commerce and industry, of religion and education, even of art and literature far beyond the limits possible for an English king In particular religious unity was insisted on, and the expulsion of the Moriscoes from Spain under Philip III, and of the Huguenots from France under Louis XIV is sufficient testimony of the price these monarchs were prepared to pay for unity

Yet the religious dissensions of the 16th and 17th centuries brought to the birth a new and powerful trend of opinion which has not yet spent its force The exercise of private judgment in the interpretation of the scriptures led to an increasing number of differences of opinion with the consequent formation of new sects. For long the "panarchistic" Protestant States would suffer, no more easily than their Catholic neighbours, any challenge to their internal unity. So Calvin burned Servetus, as the French king would gladly have burned Calvin, so Henry VIII. beheaded Thomas More as his daughter Mary burned Cranmer Those to whom the situation seemed intolerable at first proposed in fuller and more philosophical terms the doctrine of the Compromise of Augsburg *"Cuius regio, eius religio,"* and Bodin writing during the French religious wars, Hobbes during the Great Rebellion would seek to quiet religious strife by insisting that the sovereign power in each state must be left to settle the religious problem in its own way the individual's right being limited to that of thinking, though not of acting, speaking or writing, as he wished Not so easily could the desire of men to worship after their own fashion, to prophesy freely, to propagate their opinions, be controlled, and this reassertion of the panarchistic idea was doomed to failure It was succeeded, through the practical necessities of the situation, by a gradual movement towards toleration which gained momentum as experience showed that a dissident from the State church might yet be a good and loyal citizen How slow the movement was, how reluctant the abandonment of the idea of the State as a "partnership in all science, a partnership in all art. a partnership in every virtue and in all perfection" (Burke *Reflections on the Revolution in France*) an Englishman realizes on reflecting that Burke wrote those words in 1790, that the major civil disabilities on Roman Catholics were not removed from the Statute Book till 1829, that Jews could not sit in the House of Commons till 1859, and that the late Lord Acton (1834–1902) was, because of his Catholicism, unable as a young man to enter the university of which in his old age he became professor of Modern History

Toleration and Individualism.—The admission of the principle of toleration is of profound importance in the development of the individualist view of the function of the State, nor is it any accident that Locke, who wrote the essay on Toleration also fathered political individualism in his second Treatise on Civil Government Moreover once it was agreed that men might think as they pleased—and act in worship and in teaching as they pleased —in their relation to God, other spheres of activity were certain soon to be claimed from State control for the free occupation of

the individual. Freedom of the press was tacitly admitted in England before the close of the 17th century by the lapse and non-renewal of the Licensing Act in 1695. Freedom of trade was the next stage. Here the development of capitalist enterprise which culminated in the Industrial Revolution (*q.v.*), and which was itself the product of the critical and constructive spirit of the 17th and 18th century played a decisive part. Action and theory went hand in hand, and by the end of the 18th century state control of industry was beginning to be relaxed, whilst the doctrine embodied in the phrase popularized by the Physiocrats *laissez faire, laissez passer* had been worked out into a system of political economy by Adam Smith, had been developed by Bentham in politics and was soon to be applied in legislation by his followers The idea of free contract dominated politics as well as economics and the state was regarded widely as a limited company formed for certain defined and restricted ends Witness the prominence of the Social Contract in political philosophy in the works of Hobbes, Locke and Rousseau.

The 19th century opened, therefore, with a new conception of the function of the State This was conceived as properly confined to the maintenance of order—a term which emphatically included the enforcement of the laws of property—so that the organization of the army and navy and the enforcement of a minimum of law by the police and the courts summed up the main duties of government. Taxation was, in this view, admitted as necessary for the maintenance of the armed forces and the police and judicial systems, but the machinery of government needed hardly more than an admiralty, a ministry of war, and a home office, together with a treasury to supply the other services with money. For the rest the life of the citizen was to be left to his own unaided activities His religion, his family life, his education, his business, his amusements, were his own affair

This individualist movement was greatly assisted in the middle of the century by the application, or misapplication, of a crude version of Darwinian biological theory to the political sphere As the "survival of the fittest" was the law of nature in the realm of physical evolution, so it was held to be in the struggle of man with man in social life Not quite logically, such writers as Herbert Spencer eagerly adopted an apparently "scientific" view which supported their resistance to every form of State "interference"; whilst the view naturally gained much currency amongst those favourably placed in the economic struggle who could feel an almost moral indignation at any attempt on the part of the State to interfere with the beneficent operation of the competitive principle in economic life

Reaction against the more extreme individualism began early in the ranks of individualists themselves J S Mill made considerable modifications in the system which he had received from Bentham and his father, James Mill In particular, in his *Political Economy,* he was prepared to support, in the name of individual liberty, laws (*e g.,* limiting hours of work or providing money for education) which would redress the inequality of fortune and give opportunities of self-development to the less fortunate individuals in the State which they could not hope to obtain either by their separate or combined efforts Henry Sidgwick at Cambridge continued the modification of Utilitarian Individualism and brought ethics, even if a hedonistic ethics, again into relation with politics Yet both these writers are nearer the anarchistic than the panarchistic "pole," in principle, individualists to the end

"Panarchistic" theory of the function of the State has a continuous history in modern times and, during the last fifty years, has had the current of political experience in its favour Rousseau, in a certain sense truly regarded as an arch-individualist, is yet to be regarded as the "father of modern idealism" in that, in the *Contrat Social* he is prepared to recognize that the State is a moral being, with a life and will of its own, and that the individual may find his true liberty in being compelled to obey a law which he is neither sufficiently morally elevated to desire nor rationally enlightened to understand Still more profoundly and far more subtly was the panarchistic idea of the State worked out by Hegel, the influence of whose philosophy upon modern political thought it would be difficult to overestimate

It has been said that panarchism has had experience on its side The individualism of the early 19th century, coincident with the great industrial developments of the time, brought not only much prosperity but also deep misery in its train. Unregulated competition produced the horrors which shocked even the complacency of mid-Victorian England into the State "interference" embodied in the Factory Acts. Further the development of the spirit of nationalism, combined with the increasing acceptance of democratic principle, made the existence of the "two nations" rich and poor within the confines of each State of which Disraeli wrote, increasingly intolerable for the sensitive of both sections Tory paternalist democracy in England finds its counterpart in the Liberal Empire of Napoleon III, in the social reforms of Bismarck in Germany: and in all three countries the attempts of authority to adapt itself to the demands of the masses were by those masses condemned as insufficient and they turned to socialism to supply their demands. In time, under the pressure of socialism, united in its many divergent forms at least in condemning *"laissez faire,"* the modern State has developed new governmental institutions to deal with the complex conditions of modern life It has, on the whole reluctantly, accepted a moral responsibility for the welfare of its citizens, and has gradually been re-assuming, the more easily as its response to demands for assistance brought it new loyalty and support, the character of moral controller and co-ordinator of effort for the good life which, in the Greek conception of politics, properly belonged to it

The Development of the Functions of Government in the Modern State.—Neither in France nor in the federal legislation of America has the extension of governmental activity been so great as in England (*see* GOVERNMENT DEPARTMENTS), in the one case because of the conservatism of the senate and the distraction from social legislation caused by the struggle between Church and State, in the other case because of the individualist interpretation of the constitution by the supreme court and the fact that, for the most part, the province of social legislation falls within the reserved legislative sphere of the individual states of the union Yet the Prohibition Amendment is enough to show that Americans do not, in certain cases, shrink from the use of governmental action for attempting to secure a moral end, and in some of the individual states social legislation has been varied and wide in scope In Germany the same tendency showed itself during the "paternalist" rule of Bismarck, and the establishment of the republic, with the greatly increased political influence of the Socialist Parties, is a guarantee of its continuance. Finally the integral unity of the State, and the omnicompetence of government, is, though in different ways, most clearly and completely worked out in the governmental systems of Russia and Italy

The reaction against State interference in industry which followed upon the extension of State activity during the War seems (1928) to have spent its force, whilst on the other hand, the demand for direct state control of industrial organisation embodied in the demand for nationalisation of, *e g*, railways or coal-mines no longer implies a bureaucratic organisation of such industries by a civil service. The general tendency is to admit that some measure of legal control over industrial and commercial activities is frequently necessary in the interests of the citizen as consumer as well as in his capacity as producer, but that such control should be directed rather to the establishment of reasonable conditions of work and wages, and to the protection of the consumer from unreasonable prices, than to any direct conduct of business enterprises by officials appointed by the State

No general bibliography of so wide a subject is possible, and readers are referred to the separate bibliographies at the end of the various articles mentioned The three most important recent works of a general kind on the subject of modern government are Viscount Bryce, *Modern Democracies* (1921); A Eómein, *Eléments de droit constitutionnel français et comparé* (1927); and G Jellinek, *Allgemeine Staatslehre* (1922). (E. J P)

GOVERNMENTAL ARCHITECTURE, as discussed in this article, comprises those buildings whose function has definite relation to governmental purposes, such as town halls, State or provincial capitols, court-houses and parliament buildings

The ancestry of governmental buildings can be traced back to

three different sources—the temple, the royal residence and the communistic dwelling—according as the governmental structure was theocratic, autocratic or democratic and communistic. At times, where the king was also priest, or the primitive communism hedged around with religious taboos, the three types overlap Thus, among some savage peoples, notably in the Melanesian islands, there are houses reserved for the use of the men, which are combined temples and meeting-houses, and without doubt, served the purpose of council chambers In such autocratic civilizations as that of Egypt, on the other hand, governmental functions were centred in the royal palace, which had halls of audience and courts where the king and his councillors could meet, and where executive orders and judicial decisions could be rendered. The great columned halls of the Persian palaces at Susa and Persepolis (6th and 5th centuries B C), and the palace of Solomon at Jerusalem, especially the "House of the forest of Lebanon" (I Kings vii 2) were built, obviously, for official rather than residential use

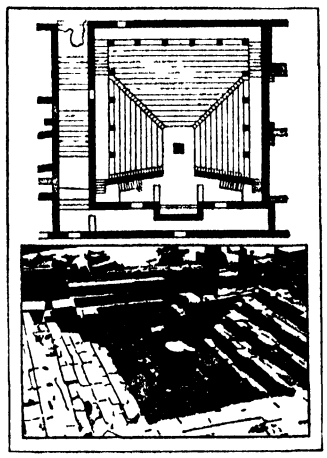


FIG. 1.—GREEK BOULEUTERION. ABOVE, GENERAL GROUND PLAN; BELOW, PORTION OF RUINS

Primitive developments of the communistic idea are found among the tribes of the American Indians Thus according to John Bartram (*Observations on his Travels . . . in 1743*, 1751) the Onandaga council house was 80 ft long and 17 ft. wide. Among the town-dwelling Indians of the south-west, the relation between religion and government seems more strong, as those Pueblo and pre-Pueblo round rooms known as *kivas* or *estufas*, occasionally built under ground, were used both for secret rites and for council meetings. These *estufas* vary in diameter from 18 to 60 ft.; they had flat roofs and were entered only from above

Greece.—In prehistoric Greece a combination of the autocratic and democratic types first appears The great flights of steps which bordered the side courts of the palaces of Cnossus and Phaestus (*c.* 1800–1200 B C.), sometimes termed theatres, were probably used as well for the meetings of large numbers of the heads of families On the mainland, during this period the autocratic element was more emphasized The result was the more purely residential type as represented by the palace at Tiryns (*c.* 1200 B C)

The growing complexity of governmental systems in the independent cities of historic Greece necessitated special governmental buildings At first, merely subdivisions of an open space or agora (*q v.*), these later became well-articulated structures, usually placed near the agora. The most important was the *bouleuterion* (*q.v*) or council hall, in which were centred the legislative and executive functions. Near by stood the *prytaneum* (*q.v*) which has no modern analogue. It was the official centre of the State as a unit, there the city hearth fire continually burned, banquets were held, and the commanding general had his official residence Courts, usually held in colonnades or *stoas*, were occasionally convened in open areas reserved for them, such as the Areopagos at Athens At Priene and Miletus extensive remains of the bouleuterion exist, which show a building nearly square with seats rising up in stages on three sides In that at Miletus they are curved like the seats of an ancient theatre At Megalopolis there is a much larger hall (late 4th century B.C) known as the Thersilion, built for the meeting of a large governmental council This building, a rectangle 220 ft. long, by 172 ft wide, had a roof supported on columns placed behind each other in radiating lines, so as to give the widest possible view of the centre of the hall where the speakers stood. In Olympia, the bouleuterion is a more complex structure consisting of a square central hall, the council chamber proper, with an apse-ended building on each side, divided by ranges of columns down the centre.

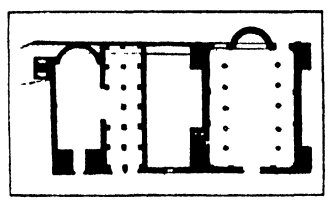
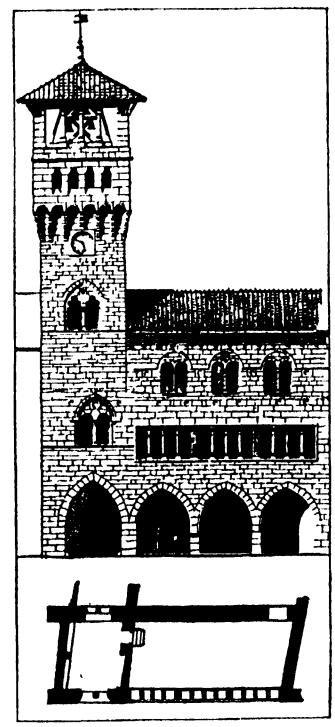


FIG 2.—GENERAL GROUND PLAN OF A ROMAN CURIA IN THE 16TH CENTURY

Two forms of pyrtaneum existed. The primitive form was circular in plan, and of tholos or bee-hive shape, thus long preserving the tradition of old hut forms. Existing remains of prytanea are, however, of a more developed sort, in which the tradition of the megaron or great hall of the Mycenean palace is recognizable In Priene, the resemblance to the typical Greek house is particularly strong, at Olympia, the hearth fire is in a hall at the front with a large court at the rear, smaller courts at each side, and halls for banquets (*See* GREEK ARCHITECTURE)

Rome.—The development of governmental life under the Roman empire is reflected in its mature types of governmental architecture. The group of government buildings surrounding the Roman Forum formed, in fact, the earliest prototype of the modern national capitol, its buildings nevertheless, are merely high developments of those of a small city such as Pompeii There one end of the forum was filled by three buildings with a common façade, the central being the curia or town council chamber, and those at the sides the offices of the duumvirs and the aediles The purpose of the central building was thus legislative and that of the side units executive All three are rectangular halls with recesses or apses at the end. Moreover, close to this group there is, on one side, an enclosed court which is supposed to have been the comitium or voting place for the citizens. On the other side stood the basilica (*q v*), so that all the functions of government were housed in buildings designed for governmental purposes



FROM VIOLLET LE DUC, "DICTIONNAIRE RAISONNE DE L ARCHITECTURE FRANCAISE"

FIG 3.—TOWN HALL OF ST ANTONIN, FRANCE, BELOW, GROUND PLAN

In Rome the details are different and additional elements appear, yet the basic idea is the same. The senate house or Curia, whose walls still stand as the church of S Adriano (rebuilt by Julius Caesar and Augustus after a fire, rebuilt again by Diocletian after the great fire of A D 283), was a rectangle 75 ft wide and 85 ft long, probably with columns dividing it in three aisles, and an apsidal tribune at the end, containing a statue of Victory. This senate house was at one end of a large structure, at the other was a smaller apsidal hall, now the church of S. Martina, and originally the *secratarium senatus;* between the two were two other halls for archives and executive offices. Stairs indicate the presence of a second floor. The whole formed a richly decorated and magnificent government building Close by on the slope of the Capitol hill was the great national archives building known as the Tabularium, built by Sulla, whose powerful masonry and monumental arcades still overlook the Forum Across the Forum from the Curia was the Roman treasury, incorporated into the temple of Saturn The crowded judicial functions were housed in numerous basilicae, especially the Basilica Aemilia and the Basilica Julia

At the other end of the Forum stood the Regia, the Roman form of the Greek prytaneum, the ritual centre of Roman life and government, and the official residence of the pontifix maximus, closely related to the Atrium Vestae and the temple of Vesta with the never-dying city fire Thus even in the sophisticated civilization of Rome, government still retained its ancient connection with religious rites, and on ceremonial occasions, even the senate

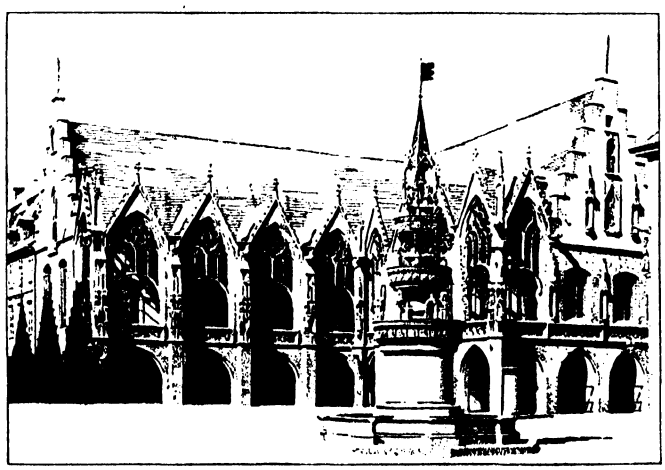
itself was convoked, not in the Curia, but in temples or sacred buildings as in the famous Area Apollonis of Augustus on the Palatine hill. (*See* ROMAN ARCHITECTURE.)

Middle Ages.—The autocracy of the later emperors and the feudal system which followed were not conducive to the development of governmental buildings. It was only with the development of the powerful municipalities of the 12th century that the modern tradition of governmental architecture began. Throughout Europe the reaction against feudalism found expression in the building of town halls in which were centred more and more of the functions that had been scattered through monasteries and feudal castles. At first the town hall was merely a meeting place for citizens, sometimes nothing more than a belfry whose bell was used to call meetings in a public square; but other rooms for offices and storage were soon added, and by the middle of the 12th century, at least in France and Italy, types had become definite.

In Italy the *palazzo pubblico* resembled the town houses of the wealthy in usually being built around a court and having high, castellated walls. It might serve both as an official building, with meeting halls for governing bodies, and also as a residence for the commanding general. Sometimes, as in Florence, two separate buildings, the Palazzo Vecchio (1298) and the Bargello (1256) were used, the former a town hall, the second the residence of the chief magistrate and the prison. Both of these, like all early Italian town halls, have campaniles or belfries attached. There are other characteristic town halls of the period at Siena (1293–1309), and the remarkable Palazzo della Ragione at Padua (1172–1219), whose upper hall was made into one room (1420) said to be the largest undivided hall in Europe, 89 ft. wide, 267 ft. long.

The French type usually combined an arcaded market hall on the ground floor with the governmental portion above and a belfry at one side. At S. Antonin there is a town hall of the 12th century in almost perfect preservation. Another 12th century example is that at La Réole. As the power of the municipalities increased, the richness of the town hall grew also, and those at S. Omer, 14th century, and S. Quentin, 16th century, with an elaborate late Gothic façade, show the development. The market hall has been completely forced out and the entire building is devoted to governmental purposes, and instead of one or two large chambers with a chapel, there now appears a more articulated plan with meeting halls, offices and storage facilities carefully differentiated.

During the 200 years from 1400 to 1600, the town hall received its greatest development in the dominantly commercial cities of



BY COURTESY OF GERMAN TOURIST INFORMATION BUREAU

FIG. 4.—TOWN HALL OF BRUNSWICK, GERMANY

the north. In these a new influence was operative, that of the gild-hall, for the merchants gilds had become closely related to municipal government; in some cases the governing body of a city was itself termed a gild. Thus the hall of the corporation of the city of London is known as the Gildhall. In some towns of the Low Countries, the town hall and a gild-hall were combined. Thus at Ypres the town hall is also known as the Cloth Hall. This magnificent building (1200–1304), is a vast rectangle 50 ft. wide and 462 ft. long. Its arcaded ground floor served as a cloth market, its upper floor contained meeting halls, law courts, banquet halls and municipal offices. The whole formed one of the most monumental examples of secular Gothic in Europe until it was destroyed in the World War. Other remarkable Flemish examples are those of Arras (finished 1494, belfry 1554), Louvain (1448–63), Brussels (1380–1442) and Ghent (completed 1533). In Germany the most beautiful town halls are those of Lübeck (13th century), Tangermünde (1373–78) with remarkable brick Gothic detail, the complex town hall of Brunswick (14th century) and the simpler 15th century example at Goslar. (*See* GOTHIC ARCHITECTURE.)

Renaissance.—This general type of town hall design continued in use throughout the Renaissance period except in Italy. There

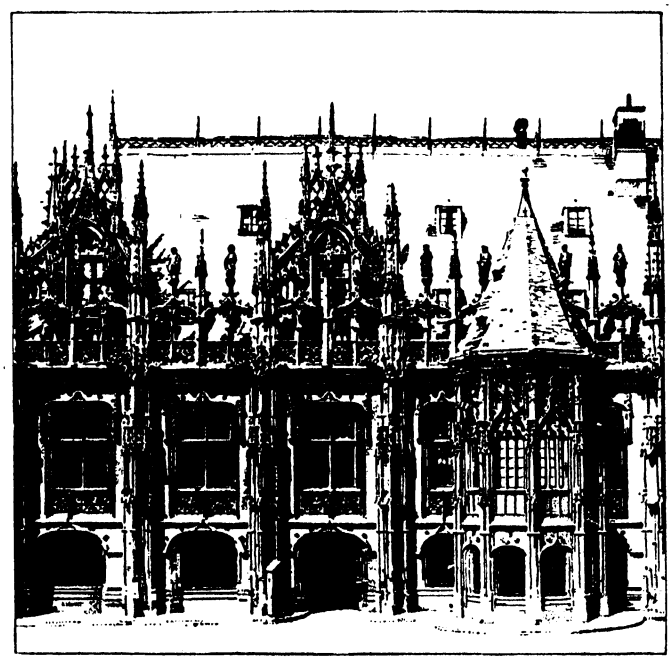


FIG. 5.—COURT-HOUSE AT ROUEN, FRANCE

the desire for classicism led to the erection of smaller and more elegant single buildings such as the beautiful Palazzo del Consiglio at Verona (*c.* 1500 by Fra Giocondo), whose exquisite early Renaissance polychrome façade was adapted by McKim, Mead and White for the old Herald building in New York, and the equally rich and somewhat similar Municipio of Brescia (*c.* 1500). Michelangelo's Palazzo del Senatore (1592–98) on the Capitoline hill at Rome is significant in its attempt to give to such an official building an architectural form dominant and monumental, and differing alike from the castellated halls of the middle ages and the delicate early Renaissance of north Italy.

Outside of Italy, where the mediaeval tradition held true, the Renaissance town halls merely clothed in classic dress such building types as had been developed before; *e.g.*, the town hall of Bremen (15th century, reconstructed 1609) and the old city hall of Paris (originally built under Francis I. and destroyed in the civil war, 1871). In rebuilding the latter, the old plan was merely enlarged and the old style preserved; the modern tradition of municipal building is thus founded on the mediaeval town hall.

The second important type of governmental building that took form during the middle ages was the court-house or *palais de justice*. Most mediaeval examples are of the late Gothic period because only then had judicial processes become sufficiently divorced from royal, monastic or feudal domination to necessitate separate buildings. The earliest existing examples are the Maison de Pierre at Chartres and the Salle le Roi at Montdidier (both of the 14th century). By far the most famous is the lavish Palais de Justice at Rouen (begun before 1474, completed before 1509). This magnificent building stands on three sides of a court and contains, not only the smaller court rooms, but two vast halls and a beautiful chapel. It is in this use of large halls that originated the tradition of having as an integral part of every court-house a great lobby where lawyers could confer with their clients.

No such development of national governmental buildings can be found during this period. Whatever national unity existed was centred in the residence of the sovereign, and when national councils or legislative bodies arose they were housed either in a royal palace or in religious buildings. To this day the French senate sits in the palace of the Luxembourg. In England, the king's council met wherever he happened to be, as at St. Albans, Oxford or Winchester, and the English parliament convened at the nearest convenient spot to the royal palace at Westminster, which was the chapter house of Westminster Abbey, until 1547 when it moved to St. Stephen's chapel within the palace itself. This remained the meeting place of the House of Commons until 1834 when the palace was burned.

It was only with the development of the government of the United States that a national capitol building, built solely for the housing of a National Government, was first projected The competition for the capitol at Washington, D.C, was advertised in March 1792 and awarded to Dr. William Thornton A carefully articulated plan, in which large halls for the meetings of a higher and a lower legislative body flank a central rotunda, appeared for the first time The capitol, in its original form, was not completed until the early '30s, and its form was then due not only to Thornton but to Stephen Hallet, B H Latrobe and Charles Bulfinch as well, all successively its architects. The old House of Representatives is now Statuary hall, and the old Senate is used for the Supreme Court; the original rotunda was roofed with a low dome. By the '50s this plan had become inadequate and two new wings were added by T. U. Walter, together with the enormous colonnaded dome that now crowns the building; one wing was designed for each of the houses. In its present condition, as completed in 1865, it is one of the largest and most monumental of national buildings, and it has furnished a basic plan idea of profound influence on almost all modern governmental architecture. (*See* RENAISSANCE ARCHITECTURE; MODERN ARCHITECTURE, *18th and 19th Centuries.*)

MODERN PRACTICE

The controlling elements of all governmental architecture are simple Most important is the convenient relationship of the necessary working units, second in importance is the means of communication between them, and from them to the outside By virtue of its public and official function, a government building must have the means of communication highly developed and designed for convenience, directness and to give the most beautiful effect possible As a result, there are many public spaces, such as lobbies, rotundas or *salles des pas perdus*, and the halls and corridors are made as monumental as possible. Axial symmetry is an almost inevitable result, as the existence of an axis is not only expressive of direct communication, but also of direct view

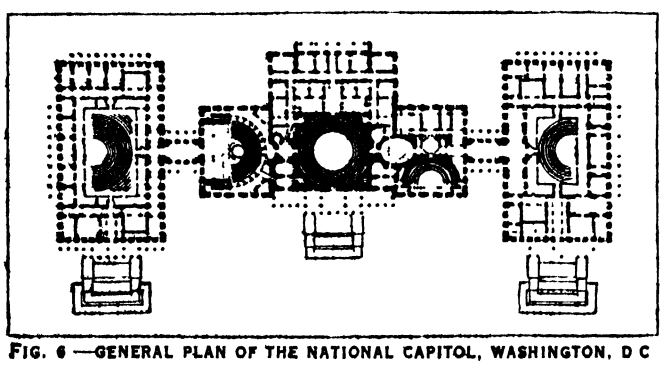


FIG. 6 —GENERAL PLAN OF THE NATIONAL CAPITOL, WASHINGTON, D C

Owing to the complexity of modern government, governmental buildings can be divided into several classes, each of which must be treated separately. These classes are: (1) Municipal; (2) judicial; (3) legislative, either State, provincial or national; (4) administrative and executive.

Modern Municipal Buildings.—The requirements governing the design of a modern town hall are as follows: First, a hall or halls for the town council meetings; second, offices for the mayor or the councillors and their secretaries, third, offices for the financial and administrative sections of the town government, such as the tax board, building department, etc. In addition, particularly in European town halls, there are frequently great suites of State rooms for receptions and official banquets (*cf.* the ancient Greek prytaneum). In America, the typical smaller building frequently also contains an auditorium for popular meetings or entertainments, and may also house the police department and the gaol. The most monumental example of the continental city hall is the great Paris Hôtel de Ville, rebuilt, after the commune, by Ballu and Deperthes (1874–82). Following the original Francis I style on the exterior, it was elaborated inside with all the decorative lavishness then characteristic, and its great Salles des Fêtes and magnificent stairways, with decorations by Puvis de Chavannes and others, form one of the most gorgeous and effective official suites in the world This precedent has affected French municipal building ever since. Characteristic examples of later mairies and hôtels de ville that show a similar type of Renaissance classicism, lavish decoration and monumental plan are those of Neuilly-sur-Seine, by Dutocq and Simonet (1885); Versailles, by le Grand (1897); Tours, by Laloux (1896–1904).

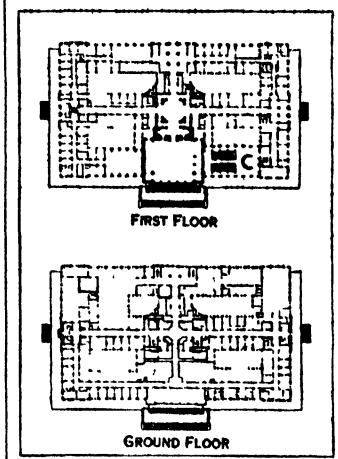


FIG 7 —PLAN OF CITY HALL AT LOS ANGELES, CAL , AUSTIN, PARKINSON & MARTIN, ARCHITECTS

In England, the dominance of the Gothic revival movement of the middle 19th century affected much municipal building. The town hall of Manchester, by Waterhouse (1868–77), is the largest example of this, and its picturesque outline and original detail are typical of the best in Gothic revival work The town hall of Halifax, by Sir Charles Barry, completed by his son after his death in 1860, is a daring and unsuccessful attempt to treat a picturesque Victorian outline, essentially Gothic, in an elaborate Renaissance style In more recent examples there is greater simplicity of composition and freedom of style. That of Sheffield, by Mountford (1897), in a free early Renaissance style, is typical of the larger examples; that of Oxford, by Hare (1897), in modified Jacobean, is characteristic of the smaller

Growing complexity of the administrative branches of city government has led inevitably to a type of building in which the council chamber and mayor's offices are subsidiary to the vast amount of office space required This movement is best expressed in the London County Council Hall, won in competition in 1908 by Ralph Knott, but only completed in 1922 This vast building, in a severely classic, late English Renaissance style, forms an impressive decoration to the south bank of the Thames.

In Germany, the most interesting recent municipal buildings are those in which modernistic expression is consciously sought In that at Mülheim, by Pfeiler and Grosymann and the *Verwaltungsgebäude* at Berlin, by Ludwig Hoffman, the style is a modernistic neo-classic, freely traditional, and the effect one of restrained and harmonious monumentality. The famous *stadhalle* at Hanover, by F. Scholer and Bonatz (1914), contains a vast circular hall, and the whole is treated in a much more bizarre and fantastic manner. This is, however, more properly a municipal auditorium similar to a common American type, of which that at San Antonio, Texas, by Ayers, Willis and Jackson, is a good example. All three show the vitality of this movement in Germany A similar imaginative quality distinguishes the exquisitely restrained town hall at Joensuu, Finland, by Eliel Saarinen.

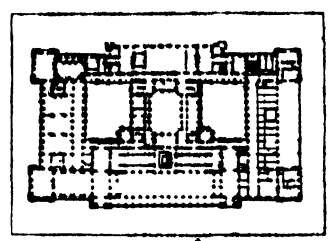
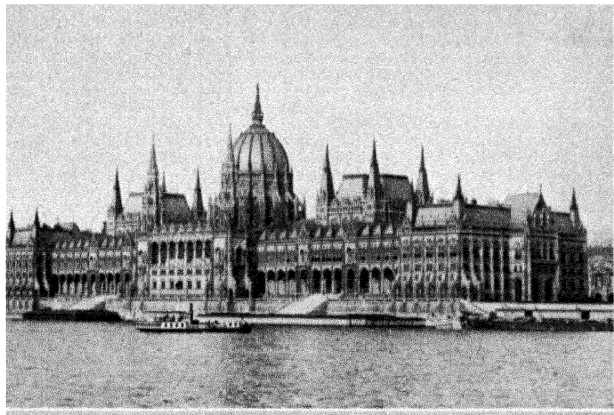
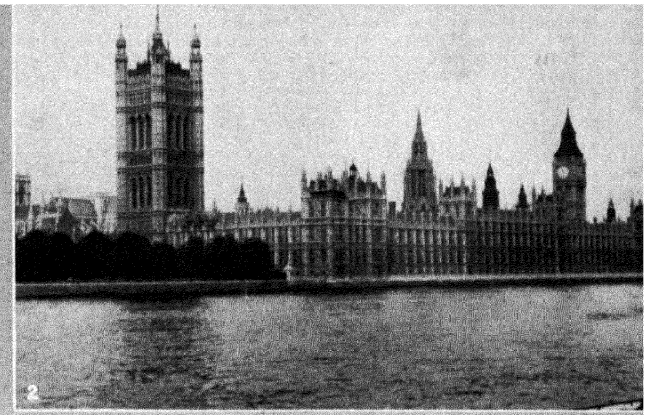


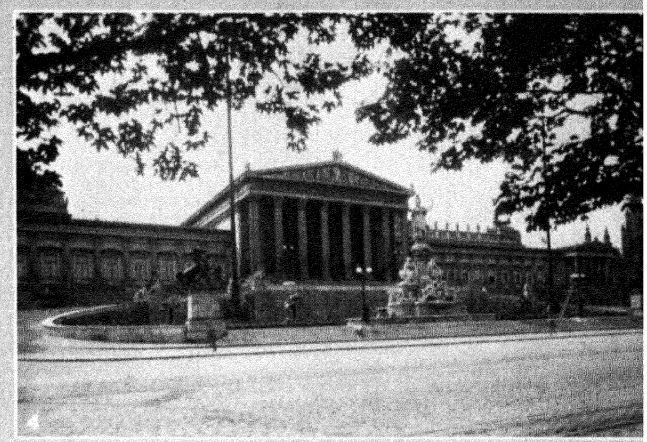
FIG. 8 —PLAN OF HÔTEL DE VILLE, PARIS

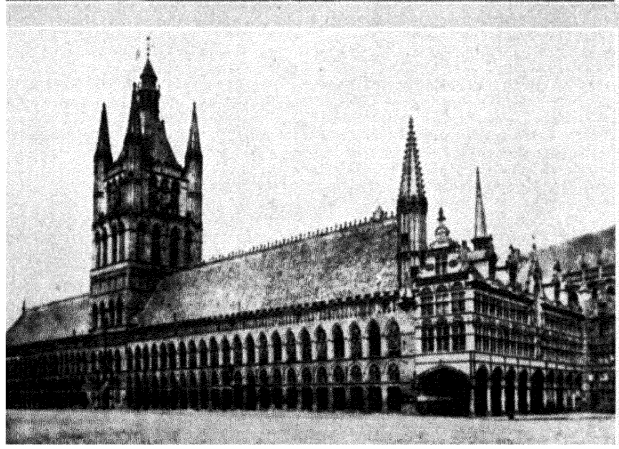
The most remarkable of the modernistic city halls is that at











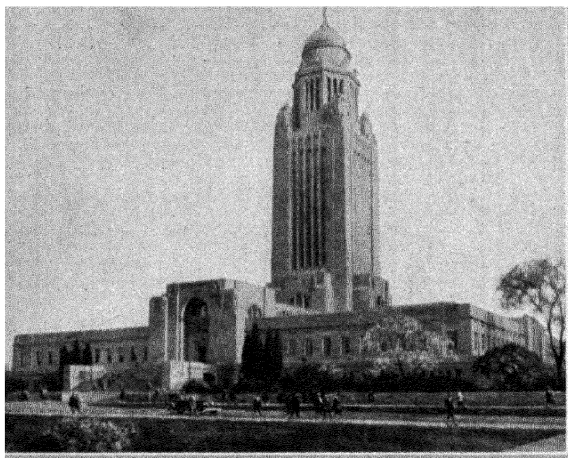


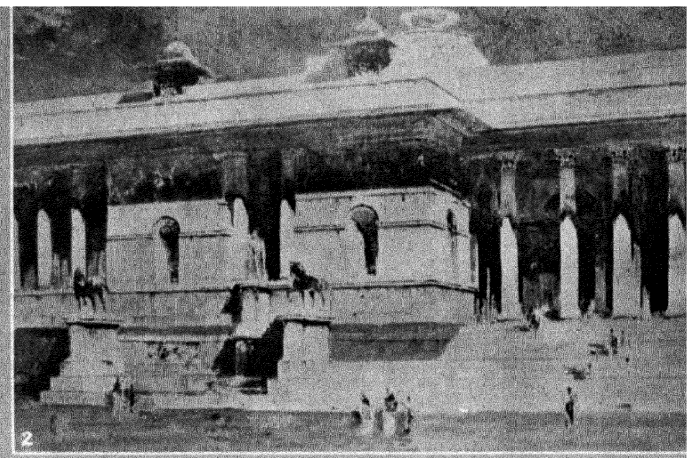
PHOTOGRAPHS, (1, 2) EWING GALLOWAY, (3, 4, 6) PUBLISHERS PHOTO SERVICE, (5) INTERNATIONAL NEWSREEL

LEGISLATIVE AND JUDICIAL BUILDINGS

1. Parliament House, Budapest, Hungary; Steindl, architect (1883–1902). An interesting attempt is made in this building to take a plan of the type set by the Capitol at Washington (fig. 3)—two wings, one on each side of a central rotunda—but to treat the whole in a picturesque and romantic Gothic style. The result is impressive, although the detail is sometimes crowded. 2. Houses of Parliament, London, England; Sir Charles Barry, arehitect (1840–50). The first great modern legislative building in an adapted Gothic style was that in London. It forms one of the most convincing examples of Modern Gothic. There is no attempt to express the plan or arrangement of the building on its exterior; on the other hand there is no attempt at false or forced picturesqueness. In addition to the legislative chambers and their offices, the building contains the Speaker's residence, and many robing rooms and other quarters required for royal ceremonials. 3. The United States Capitol, Washington, D.C. Begun in the last decade of the 18th century with Dr. William Thornton as architect, it was carried on through the early 19th century by Stephen Hallet, B. H. Latrobe, and Charles Bulfinch. In its earlier form it had the central rotunda (then with a low dome) and a wing on either side, one for the Senate, and one for the House of Representatives. In 1850 these old rooms were found too small, and a great wing was added at each end, from the designs of Thomas U. Walter. At the same time the present great dome with its column-circled drum was added. 4. The Parliament Buildings, Vienna, Austria; Hansen, architect (1874–83). One of the most monumental in plan, and most gracious in its classic detail of any of the national parliament buildings, this simple composition is one of the distinguished decorations of its city. 5. Hôtel de Ville, Ypres, Belgium. 13th–15th centuries. Sometimes called the "Cloth Hall," this building (destroyed during the World War) was an expression of the close relationship of merchants' guilds and city government which was usual in Flanders. It contained the hall of the Cloth Merchants' Guild, a market hall beneath, and the offices of the city government as well as a great banqueting hall. 6. The Palais de Justice, Brussels, Belgium; Polaert, architect (1866–83). The enormous bulk of this craggy and powerful building set on a hill top dominates the city; although lavish and in questionable taste, it conveys, nevertheless, by virtue of simple conception, monumental arrangement, and stark strength of design, a compelling impression of the dignity of government, and the power of law

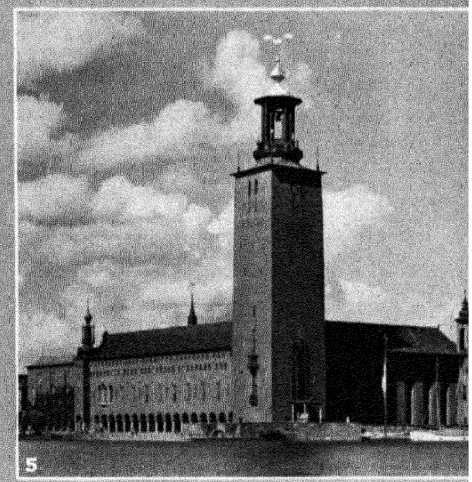
GOVERNMENTAL ARCHITECTURE















BY COURTESY OF (5) THE SWEDISH STATE RAILWAYS, (6) THE NEW YORK HISTORICAL SOCIETY; PHOTOGRAPHS, (4) UNDERWOOD AND UNDERWOOD, (3) ALINARI, (7) EWING GALLOWAY

STATE AND MUNICIPAL BUILDINGS

1. Nebraska Capitol, Lincoln, Neb.; Bertram Grosvenor Goodhue, and the Goodhue associates, architects. This, the newest of American State capitols, shows a radical departure from the earlier traditional domed type. Equally new and original is its decorative treatment—a form basically classic in its dignity with ornament which is not archaeological and in which sculpture plays a large part. 2. A detail from Government House, Delhi, India; Sir Edwin Lutyens, architect; from a water colour by William Wallcot. A daring attempt to combine Indian details with a severe and monumental classic style characterizes the buildings of the new capitol of India, Delhi. Other buildings in the group, in a similar style, are by Sir Herbert Baker. 3. Palazzo Vecchio, Florence (1298). This great castellated mass, with its high bell tower, is characteristic of many mediaeval cities in north Italy. Built round a court, its buildings (in their present form dating from the Renaissance) were the administrative centre of the Renaissance city. 4. Los Angeles City Hall, California; Austin, Parkinson and Martin, architects (1928). A comparison with fig. 6 shows how the increase in administrative offices in recent times has forced a change in city hall design; the tower in the centre, almost like an office building, expresses this trend. 5. City Hall, Stockholm, Sweden; Ragnar Ostberg, architect (1924). The climax of the lavish tradition of European city hall design is reached in the Stockholm City Hall, the great state rooms and the necessary offices of which are combined into one large simple mass; the whole design is carried out in a restrained and beautiful "modernist" style. 6. City Hall, New York City; Mangin and McComb, architects (1802–09). An exquisite piece of early American architecture, strongly influenced by French Louis XVI. work, still holds its own as one of the finest examples of the small City Hall. 7. Palazzo del Consiglio, Verona, Italy; Fra Giocondo, architect (1476). A small Renaissance palace for a city council, detailed with the delicacy that is characteristic of the early Renaissance of North Italy

Stockholm, Sweden, by Ragnar Ostberg (completed 1924) This forms a dignified mass capped with a well designed tower and embodying in its base an arcade of great beauty. Inside, it is chiefly noteworthy for the brilliant colour decoration, especially the mosaics of the great official reception hall. (*See* MOSAIC.)

American Town and City Halls.—Town and city halls in the United States can be divided into three classes The first consists of the town halls of the small towns and villages, whose needs are simple and whose buildings, therefore, are comparatively small. Faithfulness to the traditional style of the locality is general. In the East, colonial types predominate; in the far West, Spanish colonial; in the spaces between, there is more freedom The town hall of Weston, Mass., by Bigelow and Wadsworth, in a charming brick colonial, and the Plattsburg, N.Y., city hall, by John Russell Pope, in an austere Greek revival style, are characteristic of these smaller halls. Other notable examples are those at Athol, Mass., by Brainerd, Leeds and Thayer, at Huntington, N Y , by Peabody, Wilson and Brown and the village hall, Winnetka, Ill., by Edwin Clark The second type, that of the small city, is necessarily larger and more articulated, with greater office areas. This class owes much to the beautiful city hall of New York, then a small city, by Mangin and McComb (1802–09), which Lafayette's secretary, A Lavasseur, said was the only building worth looking at in New York (*Lafayette en Amérique*, 1824, trans 1829). This building is characterized by an unusual delicacy of detail that owes much to Louis XVI inspiration Its dome, rotunda and monumental staircase, council chamber, and the suite of offices and reception rooms over the entrance, are particularly noteworthy. Characteristic modern examples are those of Portland, Me , by Carrère and Hastings, with a colonial flavour, and the group at Springfield, Mass , by Pell and Corbett, in which two colonnaded buildings flank a municipal clock tower



FROM WILLIAM HELBURN "SPANISH INTERIORS AND FURNITURE" (BYRNE & STAPLEY)

FIG 9 —VALENCIA COURT ROOM

The great city hall of San Francisco, California, by Bakewell and Brown, reaches the dimensions of an important State capitol. It is, nevertheless, a compromise, lacking the intimacy of the small type, and due to its necessary small subdivisions, missing the simplicity of a great legislative building To meet the same problem, New York was compelled to erect a great municipal office building to supplement its century old city hall This, by McKim, Mead and White, is essentially a sky-scraper office building Only the lavish classicism and dignity of its exterior distinguish it from its commercial neighbours Thus far, the most successful American solution of the problem is the Los Angeles, Calif , city hall, by Austin, Parkinson and Martin, completed 1928 Here, for the first time, the two elements of town hall and municipal office building are combined in the same structure and given adequate architectural expression

Modern Judicial Buildings.—Just as the modern court system has remained close to its traditional ancestry, so the modern court-house in its essential elements has changed little Such a Renaissance court room as that in the Ayuntamiento of Valencia, which dates from 1535, could be used, even to its furniture, without change, by almost any modern court The *salle des pas perdus*, or monumental lobby, the court rooms and rooms for judges, lawyers, witnesses and archives, all appeared in court-houses of the 15th century, so that between such a building as the picturesque Law Courts of London, by G. E Street (completed 1882), and the Palais de Justice of Rouen, 400 years earlier, the difference is only one of detail The Palais de Justice at Paris is typical of the 19th century continental court-house. It is of many dates, as it is on the site of and incorporates portions of a 13th century royal palace Other portions were rebuilt after a fire in 1618, and its present form was completed by large rebuildings after the commune, and a new west front by J. L. Duc. Thus its plan represents a continual compromise between old and new.

Nevertheless, two of the most remarkable modern public buildings of Europe are court-houses. The Palazzo de Giustizia at Rome, by Calderini (1889–1910), is a vast agglomeration of pseudo-classic detail, monumental and powerful in composition, but with too much meaningless small scale ornament which detracts from the unmistakable vitality A somewhat similar type of imagination characterizes the much more interesting Palais de Justice at Brussels, by Poelaert (1866–83). Here everything is subservient to a vast and craggy grandeur.

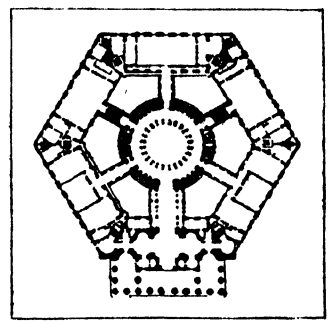


FIG 10 —PLAN OF NEW YORK COUNTY COURT HOUSE GUY LOWELL, ARCHITECT

American Court-houses.—It is in America that the court-house has received a definitive form; as early as 1724 the germs of it are seen in the charming porticoed Court House at Chester, Va The traditional elements have remained the same, and the classic tradition for governmental buildings, dating back to the beginning of the 19th century, has almost completely dominated. The wide use of elevators, and the demand for economy in land usage, have produced a compact plan, generally in several storeys. The wide development of the jury system has also necessitated careful planning to give adequate jury rooms with the necessary services The basic unit, therefore, consists of the court room proper, with its space for the public, witnesses, jury box, judge's bench and areas for counsel, clerks and stenographers and the press; the judge's office or chambers, and the jury room.

Since the time of the Gothic revival, classic treatment and an attempt to emphasize the dignity of the law are almost universal This tendency is as strong within the building as without and it is sometimes only in his court room experience that an American is brought in close contact with a dignified and beautiful room, austere in form but lavish in fittings and decoration The Shelby county court-house at Memphis, Tenn , by Hale and Rogers, with its dignified Ionic portico, and its pedimented end pavilions is characteristic of the classic grandeur obtained in many recent court-houses even in the smaller cities The Hamilton county court-house at Cincinnati, O , shows the same tradition, applied to a much larger building All of these modern trends in court-house design reached a conclusion in the court-house of New York county, at New York city, by Guy Lowell, completed in 1927, after his death In this, a plan of striking originality, a central rotunda gives access to elevators surrounding it, which, in turn, communicate simply with the court rooms on each floor

Modern Administrative Buildings.—Administrative buildings are of two broad classes, one consisting of those primarily for a public service, such as post offices and custom houses, and one of those devoted to purely administrative services, such as ministries Owing to the gradual growth of public services of the first type their housing in many European countries has until recently been neglected, they have frequently been forced into altered buildings, usually palaces, but in Rome and in Havana, Cuba, the post offices occupy former monastery buildings Only in the largest cities are there exceptions, such as the rather undistinguished general post office of Paris (1884) by Guadet, or the great late Renaissance piles in London of the general post office proper (1910) and the general post office north (1905), both by Henry Tanner. Recent years have seen greater attention paid to post office design, especially in Germany, but it is in the little Dutch city of Utrecht that the most beautiful of modern European post offices is to be found, designed by Crouwel

Custom houses are similarly of little architectural import in Europe Almost the only one that has adequate dignity and convenience, is the great custom house in London, by David Lang (1817), partially rebuilt by Robert Smirke Its vast length forms

one of the most distinguished decorations of that portion of the Thames bank, and it is remarkable for its "Long Room" over 200 ft. long, where most of the business is transacted.

The lack of any adequate buildings into which these services could be placed in America was, from the beginning, a great incentive to the development of new types of building As early as 1832 New York possessed a monumental custom house, designed by Town and Davis, in the Greek revival style, which is still (1928) standing at the corner of Nassau and Wall Sts. used for a passport office. The present New York custom house is a lavish building of Renaissance character, by Cass Gilbert. Of the smaller towns that at Wooster, O., by Wetmore, and New Haven, Conn., by J. G Rogers, are typical; a notable combined Federal Court House and Post Office building is that at Denver, Colo., by Tracy, Swartwout and Litchfield. The New York post office, by McKim, Mead and White, is interesting for its Corinthian colonnade.

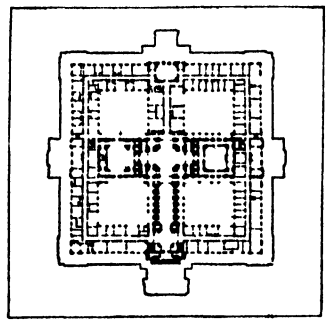


FIG 11 —PLAN OF THE STATE CAPITOL OF NEBRASKA BERTRAM GROSVENOR GOODHUE, ARCHITECT

Ministries and similar administrative buildings suffer from having a programme exactly like that of a modern office building; in general, the result is not distinguished. In European capitals, ministries are frequently housed in altered palaces, as in Paris and Vienna. In London, where they are concentrated along Whitehall and Parliament street they form a group, impressive in general effect, but without individual distinction, except in the case of the Admiralty, by Ripley (1726), with an exquisite screen by Robert Adam (1760). The Renaissance group by Scott (1873), and Brydon (1900–20), containing many ministries is noteworthy

In America, the classic tradition, under which the city of Washington, D C., was started, has led to the imposing colonnade of the Treasury building, and within the 20th century to the restrained Senate and House office buildings, by Carrère and Hastings.

Modern Buildings.—With the addition to the old Palais Bourbon (1722, by Girardini and Gabriel) of the great 12 columned pedimented front, in 1807, by Poyet, to express the dignity of the buildings used by the Chambre des Députés, modern legislative architecture began The classic tradition, there set, remained almost unbroken for 100 years all over the Western world, to this precedent was added the influence of the U S Capitol at Washington, D C., with its clear expression of two chambers, one on each side of a central public rotunda The French Chambre des Députés, reconstructed (1822–33) by de Joly, and the Senate, in the Luxembourg palace (1836–41), by de Gisors, are characteristic lavish developments of a classic amphitheatre plan already adopted in the Washington Capitol The simplicity and directness of the U S Capitol plan have inspired many modern legislative buildings of two chambers It is almost universal in American State capitols, from such early examples as the Massachusetts State house at Boston, completed 1798, by Charles Bulfinch. To such 20th century examples as that at Jefferson City, Mo., by Tracy, Swartwout and Litchfield, that of Minnesota, at St Paul, by Cass Gilbert, the Wisconsin capitol at Madison, by George B. Post and Sons, and the Territorial Capitol of Porto Rico at San Juan, by Carmaega and Nichols. In Hungary, the same type appears in the parliament building at Budapest, by Steindl (1883–1902), although the style is flamboyant Gothic. In Vienna, the parliament building by Hansen (1874–83), has a similar plan.

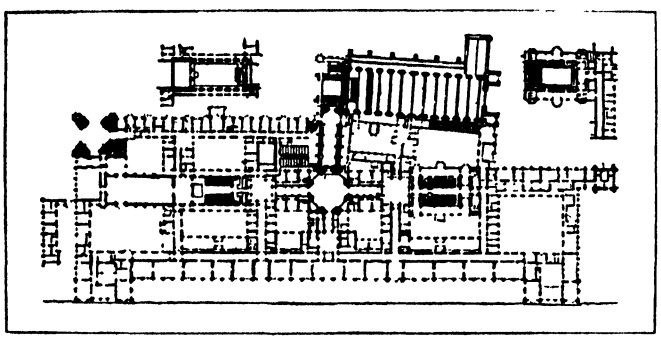


FIG 12 —PLAN OF PRINCIPAL FLOOR, HOUSES OF PARLIAMENT, WESTMINSTER

In the Wisconsin capitol the architects were forced to have four wings, forming a cross, instead of the usual two. This was at best a compromise Finally, in the masterly Nebraska State capitol, at Lincoln, the late Bertram Grosvenor Goodhue accepted the problem and solved it. In place of the usual two-winged building with a dome, there is a vast rectangle, divided by a cross into four courts. One arm of the cross contains the monumental corridor, with a central rotunda The cross arm holds the two legislative houses Above the rotunda rises a tower of many storeys, and the administrative offices ring the courts and occupy the tower as well

The Houses of Parliament in London, by Sir Charles Barry (1840–50) is an interesting and remarkable exception to the general rule in both plan and style Here, the House of Lords and the House of Commons are but incidents in a vast composition in which are placed the members' offices, dining-rooms and libraries, the speaker's residence and all the rooms required for the traditional and picturesque ritual In style, the whole is treated in lavish Perpendicular Gothic, and the exterior aim has been to achieve picturesque massing, with the Victoria tower at one end and the clock tower at the other, rather than any expression of interior function

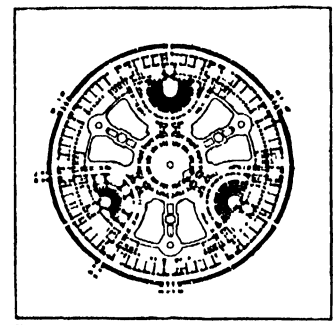


FIG. 13 —LEGISLATIVE BUILDING, DELHI SIR HERBERT BAKER AND SIR EDWIN LUTYENS, ARCHITECTS

The foundation of new provincial capitals, in Australia, 1911, and in India, 1919, furnished a new opportunity for the adequate housing of complete dominion governments In Australia, the competition for the lay-out of the city of Canberra was won by Walter Griffin of Chicago, with a most comprehensive plan The first of the buildings, in connection with this, was formally opened in the summer of 1928 The eventual scheme consists of a rectangular plaza with the departmental administrative buildings flanking it on each side, and at its head, a great structure containing the parliament and a library Behind is a circular plaza flanked by the residences of the premier and the governor-general

In Delhi, a much more lavish scheme is under construction. It consists of an enormous avenue, or plaza, flanked by two groups of administrative offices known as the secretariat buildings, by Sir Herbert Baker, and headed by the picturesque mass of the Government house, the official residence of the viceroy, by Sir Edward Lutyens At one side is the legislative building, by Baker, an enormous circle, with three interior courts, between which are the three houses, the council of princes, the assembly, and the council of State, with a circular library joining them in the centre Lower down on the main axis is a great memorial arch, by Lutyens; smaller buildings are to flank the avenue, one of them, the record office, by Lutyens, being now (1928) under construction All the buildings of this tremendous group are designed with great lavishness of plan and interior arrangement, and exteriors in which classic Renaissance and Indian detail are daringly combined and powerfully massed

An even greater opportunity is offered in the proposed group of buildings for the League of Nations at Geneva The opening created by the site on the shore of the lake, and by the programme, is one to stimulate the best efforts of modern architects

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GOVERNMENT DEPARTMENTS. While differences of internal organization and of cultural development between countries have produced inevitable differences—superficial or profound—in their governmental machinery, it will be found under modern conditions that common political, social and economic needs tend to give the same functions to Government departments in one country as another, however diverse their theory of the proper arrangement and scope of governmental organs

In comparing different countries, homogeneity is suggested by the nomenclature of their Government departments, but this is apt to be deceptive For example, the English Home Office may reasonably be thought to correspond to the Ministry of the Interior in nearly every other country This is largely true, but the Home Office has many functions which elsewhere are commonly assigned to a Ministry of Justice, and the control of local government, which in France (for example) has been said to be the main function of the Minister of the Interior, is in England (so far as control exists in England) at least as much for the Ministry of Health, as successor of the Local Government Board Again the Ministry of Public Works is in France responsible for railways, with which the English Office of Works has no concern

In England, the normal mode of creating a new department in modern times has been by statute, *e g*, the Local Government Board Act, 1871, and the acts creating Ministries of Transport and Agriculture in 1919, but the constitutional necessity for this arises—so long as existing statutory functions are not touched—only from the need of a parliamentary grant for the resulting expenditure Indeed, in the drafting of statutes care is usually taken, if the department of a secretary of State is involved, to preserve the position that the King can appoint a fresh secretary of State without parliamentary authority A good example is the Secretaries of State Act, 1926, turning the secretaryship for Scotland into a secretaryship of State the act is expressed to operate as from the date when His Majesty shall first appoint another secretary of State after the act passes, if he shall be pleased to do so With two or three exceptions all statutory functions of a secretary of State in England are assigned to a (or the) secretary of State simply, without distinction between one department and another, on the constitutional view that the King's secretariat is one, although in practice the work is divided by administrative arrangements periodically varied So in France, although jurists differ concerning the basis of the practice, it is recognized that the Government of the day can increase or reduce the number of departments and redistribute their functions at will, subject to parliamentary control of the necessary funds Transfers of duty from one department to another are made, in modern English practice, by statute or (perhaps more often) by order in council authorized by statute, but some transfers, *e g*, from one secretary of State to another, can in principle be made without formality

If functions are distributed on a theoretical basis, between various departments, this must be either according to the persons affected by performance of a function or according to the purpose for which it is performed For example, assuming Ministries of Shipping and of Health, which should be responsible for the health of seamen? Questions like this closely bear on the efficiency of Government, but they have small interest for the public—except those members of it affected personally by some fault in distribution—and no nation popularly governed has made a serious effort towards embodying a scientific answer in its legislation A re-grouping on practical lines, halving the number of departments, has been effected in Italy between 1923 and 1927 Lord Haldane's committee on the machinery of Government, reporting in 1918, suggested a re-grouping of functions for England, but this has not been carried out—and whether the particular suggestions made were sound remains a matter of opinion The central recommendation was re-grouping according to the services performed, not according to the persons affected, but exceptions were perforce admitted Thus—to take the instance already used—if shipping be nationalized the department managing it (and not a separate Ministry of Health) must be responsible for the health of its employees this applies to any nationalized service, as is seen with the army and the post office

Practical exigencies, constitutional accretion, statute, order in council, tradition and convention have played their part in making the English distribution more haphazard than that of most other countries, but in this article an attempt is made to use the English departments as a key (since their names at least will be familiar to English speaking readers), mentioning under each any points of special interest relating to the Government departments of European countries

The Treasury or Ministry of Finance.—Among English Government departments the first place is taken by the Treasury This is the office responsible for the management of the national revenue—although the actual collection of revenue is made (apart from that which is earned, *e g*, by the post office) through the commissioners of inland revenue and the commissioners of customs and excise—two departments which, while closely connected with the Treasury, are formally distinct The Treasury has an exceptional relation to the House of Commons, and the position has come to be recognized that no expenditure can be incurred by any department of Government (with certain exceptions not affecting the general proposition) without previous Treasury sanction Moreover, when money is voted by parliament, the department to which it has been granted does not get it automatically The money has still to be collected from the taxpayer, and meantime the department and all others—in short the business of Government as a whole—must be financed This involves extensive borrowing, to be repaid as taxes are forthcoming, and this borrowing in the money market is a specific function of the Treasury Similarly, the negotiating of long term loans, at as favourable a rate as the national credit will secure, is a function of the Treasury, which is thus in close and necessary touch with the city as well as with parliament Historically, the Treasury sprang from the accounts department of the Plantagenet kings, the early "exchequer," which was associated with the court of exchequer in dealing with the revenue In later days, a lord high treasurer was appointed, whose office was placed in commission in the 17th century The Treasury has since been controlled in name by a board of lords commissioners, of whom the prime minister is usually (though not of necessity) first lord, but the commissioners have formal duties merely The chancellor of the exchequer, assisted by the financial secretary of the Treasury, is the minister in charge of the Treasury's daily work, which is divided under three main heads These are supply—that is, that side of its work which relates to public expenditure, finance—that side which is related to the raising of loans, to currency, banking and the like, including since 1918 the important and complicated question of international debts, and establishments—that side which deals specifically with the problems of "management" of Government departments, salaries and wages, accommodation, and the like The field of action of the Treasury covers Scotland as well as England, but the constitution of separate parliaments for Northern Ireland and the Irish Free State has naturally led to the establishment of separate Finance Ministries The title "Ministry of Finance" is used in all countries of the British empire except Australia, and is the accepted English translation of the titles given in all European countries to the

department having functions generally similar to those of the British Treasury.

DEPARTMENTS OF A SECRETARY OF STATE

Although there is no formal order of precedence among English Government departments a certain priority, after the Treasury, may be said to attach to those whose head is one of the secretaries of State. These are eight in number under seven Ministers (that of the colonies and the dominions being held together), namely—Home Affairs, Foreign Affairs, War, the Colonies, India, Air, the Dominions, and Scotland The Board of Trade, the Board of Education, the Ministries of Agriculture and Fisheries, of Health, of Transport and of Pensions, and the General Post Office are other departments usually recognized as suitable to be placed in charge of a minister of cabinet rank, though not of a secretary of State.

The Home Office.—The Home Office in its present form dates from 1801, when colonial business was transferred to a separate secretary of State. The supervision (other than judicial) of the administration of justice, advice to the King upon the exercise of the prerogative of mercy, the supervision of police, prisons, reformatories, the liquor trade and factories, and the making of arrangements for national and local elections and for electoral registration, are among the specific duties of the home secretary He is, moreover, the primary constitutional channel of communication between the sovereign and the subject, and in this capacity no limit to his duties can be set. A duty of particular interest is to serve as intermediary between the Imperial Government and the Channel islands, which are not colonies but part of the ancient dominions of the Crown. It is his duty also to receive petitions addressed to the Crown (and refer them to other departments if necessary), to issue warrants and appoint royal commissions (even in matters not affecting his own specific duties), to settle precedence and titles of honour (for example, in 1927, a pronouncement was made that lord mayors are not entitled to be called "Right Honourable" without a grant from the Crown) and generally to deal with business involving the prerogative, or any business not definitely assigned to some other department of Government The jurisdiction of the Home Office does not extend to Scotland, which has its own secretary of State The Home Office, though new duties, *e g*, the supervision of factories, have been engrafted on it by statute, is fundamentally a peculiar product of British constitutional growth, and its position has no exact parallel elsewhere In many countries of the British empire and of Europe its duties are divided between the Ministries of Justice and of the Interior (some also being appropriate to a Ministry of Labour)—although in many countries, as is mentioned above, the Minister of the Interior is largely engaged in controlling local administration through the prefect, a functionary for whom no English parallel exists.

The Colonial and Dominions Offices.—The Colonial Office is the department which deals with questions affecting the various colonial possessions of the British Crown other than the self-governing dominions At the Restoration, a committee of the privy council was formed to deal with colonial business, and in 1695 a Board of Trade and Plantations was created for collecting information and giving advice, the executive work being performed by the secretary of State for the southern department A separate secretary of State was appointed, abolished and reappointed in the 18th century, and in 1801 this secretary was designated as secretary of State for war and the colonies In 1854 a distinct office of secretary of State for the colonies was created In 1925 a secretaryship of State for the dominions was created This is a good example of the constitutional process by which a secretaryship of State comes into existence, for there was no statute. an order was given to the king's engraver to make a new seal and this was conferred on L S Amery, to be held with the seal appertaining to the secretaryship of State for the colonies The business relating to the self-governing dominions was assigned to a separate Dominions Office, though certain services, *e g*, legal, financial, and other general business, continued common. Since the Colonial and Dominions Offices exist as the vehicle of communication between the Imperial Government and the rest of the empire, there is, in the nature of things, no counterpart in other countries of the empire. Similarly, no other State has an exact parallel to the Dominions Office, because no imperial constitution resembles the British, but France and Italy among the Great Powers have Colonial Offices, under ministers of the first rank, as had Germany before the war.

The India Office.—The India Office is another department of the British Government which is without parallel elsewhere, being the link between the imperial cabinet and parliament and the Government of India Created in 1858, it took over the duties of the Board of Control (which Pitt's act of 1784 had set up for such supervision of Indian affairs as parliament and the home Government then desired to exercise) and of the head office of the East India company in the city The office was in part reorganized in 1919, in connection with the reform of the Indian Government, but retains certain special features due to its origin, which are not found in other departments. Thus the secretary of State, who is the head of the department, exercises in part the same class of jurisdiction as any other member of the Government, but in certain matters he is bound by statute to obtain consent of, and in other matters to consult, the "Council of India." This is an advisory body, of whom half at least must have Indian experience, and is historically descended from the 18th century Board of Control on the one hand and from the board of directors of the East India company on the other It works in close touch with the several divisions of the India Office, but administratively does not control them A second peculiarity of the India Office lies in the fact that its cost is in part not charged upon British revenues· the British parliament pays (since 1919) the salary of the secretary of State and a proportion of the office charges, and the rest, calculated to represent the value of business done in England for India, falls on Indian revenues

For the departments of other secretaries of State, *see* FOREIGN OFFICE; WAR OFFICE, *see* also ADMIRALTY

OTHER DEPARTMENTS

After the departments headed by secretaries of State come a number of ministries and boards, the most important of which are here noticed in alphabetical order—their relative standing not being authoritatively defined—and the others collectively at the end of this article It will be seen that the title of "ministry" is borne by those created since the war, some of which absorbed or were mere reincarnations of "boards" with the same functions There is, it seems, a fashion in the naming of Government departments—the English tradition in the 18th century, *e g*, Board of Trade, and until the 20th, *e g*, the Insurance Commission created in 1911, being in favour of boards of commissioners, their theoretical constitution being often more or less a legal fiction The Continental titles of "minister" and "ministry" do not occur in a single English department before the war they sprang into use with the Ministry of Munitions in 1915, and—for some inexplicable reason—wholly replaced the native usage after the war A bill was introduced into parliament in March 1928 to remodel the Scottish departments (most of which existed previously in the form of boards of active members, with the secretary of State for Scotland as their president) under the name of ministries

The Ministry of Agriculture.—The Ministry of Agriculture and Fisheries, created in 1919, took over the duties of the Board of Agriculture and Fisheries, which itself sprang from the "veterinary department" of the privy council, formed in 1865 when the country was ravaged by cattle plague and renamed the "agricultural department" in 1883

Among the statutes executed by the ministry may be mentioned those relating to the diseases of animals, the weighing of cattle, the redemption of tithe, the enclosure of commons, the provision of small holdings and the drainage and improvement of land

In 1903 the powers and duties of the Board of Trade under various acts relating to fishing were transferred to the Board of Agriculture The department carries out much agricultural research, and publishes numerous pamphlets and other papers at popular prices for the assistance of farmers, small holders, poultry

keepers, horticulturalists, etc. Similar departments exist in Scotland, in Northern and Southern Ireland and in most of the British dominions. Among European countries many have separate Ministries of Agriculture, but the Italian reforms of 1923–27 placed agricultural affairs in a general "Ministry of National Economy" which is responsible for co-ordinating agricultural and industrial policy.

The Board of Education.—The Board of Education succeeded a committee of the privy council, formed in 1839 to administer parliamentary grants in aid of education which had then recently been introduced. The board consists of a president, the lord president of the council, the first lord of the treasury, the chancellor of the exchequer and the secretaries of State—the responsibility resting with the president Its jurisdiction extends to Wales, for which, however, there is a separate department in its office As at present constituted, after education in England and Wales was put on its present footing by the Education Act, 1902, this office is one of the largest of Government departments The board, through its headquarters staff and a large inspectorate, supervises the educational work carried on by local education authorities in counties and boroughs, and through parliamentary grants has considerable influence over the work of universities and other educational organizations which are not subject to direct governmental control In addition, the Board controls several (not all) of the national museums

In Scotland and Northern Ireland, there are separate education departments, as there are in Southern Ireland and the dominions overseas Indeed, education is one of the national services which is almost everywhere increasingly costly and considered to require governmental organization This is usually by a separate ministry, which may, however, be combined with "fine arts" as in France and Italy, or with "public worship" or some other subject as in some States of Germany The commissariat for education in Russia, in addition to educational duties of the usual type, manages a large publishing business, producing not merely text-books but some 40 scientific journals

The Ministry of Health.—The Ministry of Health was set up by statute in 1919, primarily to concentrate health services previously exercised by the Local Government Board, the National Health Insurance Commission, the privy council, the Home Office and the Board of Education The insurance commission had been responsible for collecting contributions to a national scheme of health insurance established in 1911, and for providing the benefits for which the insured population had paid, with certain ancillary functions in the way (especially) of research The Local Government Board had much wider scope Established by act of parliament in 1871, with the same purpose as the new ministry—that of concentrating services which previously had been divided—it was responsible for the central supervision of most services carried out by locally elected authorities, and for much besides In matters of health, these services covered the suppression of nuisances, closing of unhealthy dwellings, prevention of infectious disease and of the sale of contaminated food, maintenance of sewers and (increasingly under the legislation of the 20th century) the provision of clinics and public medical assistance, largely aided by parliamentary grants The board took over the central administration of the poor law from the Poor Law board in 1871 It supervised highways, the registration of electors, town planning, the provision of houses for the working classes, motor cars and local finance (sanctioning loans and auditing through district auditors the accounts of most local authorities). It confirmed by-laws on most subjects on which local authorities could make them It decided between the Crown and the subject on claims for old age pensions, between local authorities in various disputes, and between them and individuals on numerous matters affecting proprietary rights Of the subjects here enumerated, highways (in part) and motor cars have, by the Ministry of Transport Act, 1919, passed to the Ministry of Transport, and electoral registration has by order in council passed to the Home Office

The Ministry of Health Act gave power, by order in council, to transfer functions from or to the minister, and a few small changes, additional to those mentioned, have been made, but substantially the functions of the ministry remain as now enumerated (that is, as they were in 1919), with the addition of extensive new duties, affecting many matters besides health, under later legislation To a great extent, therefore, the Ministry of Health in England has functions assigned in most European countries to the Ministry of the Interior The minister's jurisdiction extends to Wales, where work in matters of "health" (not including "housing") is done through the Welsh Board of Health, but the "local government" work of the ministry direct from London In Scotland the Scottish Board of Health performs duties almost identical with those of the Ministry of Health in England. It is derived similarly from the Scottish Local Government Board and the Scottish Insurance Commission In Northern Ireland, most of the duties of a Ministry of Health are performed by the Ministry of Home Affairs So in the Free State, and in the dominions overseas, there is no separately organized Ministry of Health, but duties analogous to those of the English ministry are performed by other departments Except in France, where "health" and "labour" are combined, the same is true of European countries

The Ministry of Labour.—The Ministry of Labour was set up in 1916 and took over certain duties (mainly from the Board of Trade) in relation to problems of labour It does not deal with all such problems, in particular the inspection of factories and workshops remains under the Home Office, and that of mines falls to the mines department of the Board of Trade

The ministry is responsible for unemployment insurance and for the national system of employment exchanges It is also the authority for dealing with industrial disputes and the medium by which those capable of settlement in a judicial manner are brought before the industrial court or special tribunals of enquiry

Among European States, France, Germany and Russia have Ministries of Labour (the first named combining it with "health") and it will probably be found that the Italian "Ministry of Corporations" when fully constituted performs a great many of the same functions

The Ministry of Pensions.—The Ministry of Pensions was set up by act of parliament in Dec 1916, to deal with pensions arising out of services during the war, but the department does not deal with the "service pensions" of the army, navy and air force, which are left with the departments responsible for the general administration of those services That is, the business of the ministry is the assessment and payment of pensions to widows and dependents, and for disability—the latter involving maintenance of hospitals and a large staff of medical men

The Board of Trade.—The "committee of the privy council for trade" or, as it is usually called, the Board of Trade, dates in its present form from 1786, when (after the constitution and dissolution of several earlier bodies) a permanent committee was formed by an order in council, which with one or two small exceptions still regulates the legal constitution of the board Under it all the principal officers of State, including the first lords of the Treasury and Admiralty, the secretaries of State, and certain members of the privy council, among whom was the archbishop of Canterbury, obtained seats at the board *ex officio* The growth of commerce, however, necessarily threw new duties upon the Board of Trade, and its technical constitution has now merely an historical importance, the president acting alone as the responsible minister Described by Lord Haldane's committee on the machinery of Government in 1918, as "the department dealing with private enterprise as such," the Board of Trade has since lost some of its functions, to the Ministry of Transport and Ministry of Labour in particular It retains, however, the control of patents, weights and measures, and of foreshores belonging to the Crown, the administration of the law relating to wrecks, to copyright, to companies and bankruptcy, to gas undertakings and to merchant shipping, and it publishes statistical and other information on commercial subjects, relating to Great Britain and other countries A sub-department under a parliamentary secretary is charged with administration of the law relating to mines, and another organization of general interest was attached to the Board of Trade in 1925, when a food council was established, without executive

functions but intended to collect and publish information on food prices and supplies. The Board of Trade is one of the few departments which exercises jurisdiction in Scotland as well as England

Departments of trade, or commerce, or bearing similar titles, exist in Northern Ireland and the Irish Free State, and in all the self-governing dominions, with functions similar to the central functions of the Board of Trade in Great Britain In European countries the same is generally true, but in Italy the interests of industry and the supervision of mining, of insurance, of "intellectual property," and the preparation of statistics on all subjects, are among the duties of sub-departments of the Ministry of National Economy, which also embraces agriculture, fisheries and the exploitation of forests and national domains

The Ministry of Transport.—The Ministry of Transport was formed by statute in 1919, to take over from other Government departments their duties concerning transport by road and rail throughout Great Britain

In effecting the transfer of existing powers to the ministry, the problem already mentioned, of allocating governmental functions, arose and it was found expedient to leave some, *e g*, the sanctioning of loans for road works proposed by local authorities, and the approval of by-laws for the width of streets and for vehicles on the roads, with the Ministry of Health, as the department generally responsible for local government

In 1927 the Government announced an intention to abolish the Ministry of Transport as a separate entity, but this intention was abandoned, and the functions of the department continued as before These fall under three main headings railways, roads and road vehicles The minister orders public enquiry into railway accidents and confirms by-laws of the railway companies He sees to the enforcement of the regulative acts of parliament for railways, and himself makes orders, having statutory force, for trams and mechanically propelled road vehicles He also administers the road fund, a fund kept separate from the country's main revenues, fed by the proceeds of taxation on motor cars, and devoted to the upkeep of the roads The minister is also responsible to parliament for the work of the electricity commission, a sub-department charged with the duty (under the supervision of a central board created in 1927) of developing electrical supplies

Among European countries, Russia has a Ministry of Transport whose jurisdiction covers the whole U S S R In Germany a Ministry of Transport works the State railways and supervises others, as does the Ministry of Public Works in France, though many of the supervisory duties in regard to private enterprise appertain to the Ministry of the Interior In Italy, the State railways are worked by an autonomous department of the Ministry of Communications, which ministry also controls posts and telegraphs and the mercantile marine, while supervision over privately owned railways, trams and automobile services is exercised by the Ministry of Public Works The latter is also responsible, like the English Ministry of Transport, for the development of electric power, and, like that ministry and the French Ministry of Public Works, for the development of roads

Office of Works.—The Office of His Majesty's Works and Public Buildings is another department of the British Government which is under the control of a board this consists of the first commissioner and (nominally) all the secretaries of State and the president of the Board of Trade As with other boards already mentioned, the practical responsibility rests with the first commissioner The board's primary duty is the maintenance of the royal palaces and governmental buildings this includes palaces (like Hampton Court) and parks (like Hyde Park) which are open to the public Another duty of popular interest is the control of ancient monuments, the commissioners having power to purchase or to accept the guardianship of monuments They can also, upon its being represented to them that a monument is in danger of destruction or removal, make a preservation order, the effect of which is to prohibit demolition or removal

Other European countries necessarily maintain departments charged with the supervision of the buildings of Government, but it is not usual for the same department to be charged with responsibility for the preservation of ancient monuments Thus in France and Italy this power is entrusted to the Ministry of Public Instruction and Fine Art.

Among other departments of the British Government which need not be treated at length are the Charity Commission, which supervises the administration of charitable funds; the Civil Service Commission, which manages the examinations, and otherwise arranges, for recruitment to the Government services (including many branches of the armed forces); the Commissioners of Crown Lands, formerly the Commissioners of His Majesty's Woods, Forests and Land Revenues, who manage those hereditary estates of the Crown which have been surrendered in return for a fixed parliamentary revenue, the Development Commission, which dispenses parliamentary grants for various public improvements, the Exchequer and Audit Department, whose head, the comptroller and auditor-general, is responsible for the audit of all moneys under parliamentary control, the Forestry Commission, which is charged with the management of existing state-owned forest lands and reafforestation, the Friendly Societies Registry; the Royal Mint, the Department of Overseas Trade, formed jointly by the Foreign Office and the Board of Trade to foster foreign commerce, the Public Works Loan Board, which advances money for work of public utility; the Department of the Paymaster-General, who acts as a banker, by drafts on whom most governmental payments are made, the office of the privy council, which provides staff also for the cabinet and the committee of imperial defence, the Public Record Office, of which the titular head is the Master of the Rolls, and in which all governmental papers (except those destroyed under his authority) are destined to be stored for the information of posterity, the Department of Scientific and Industrial Research, which maintains laboratories and issues reports on a variety of scientific topics, especially those with a practical bearing, and His Majesty's Stationery Office, which not only supplies the paper and similar stores needed in Government offices but carries on a considerable publishing business

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UNITED STATES

The executive department of the United States began to function (1789) with only three Government departments (State, Treasury and War) and two offices (attorney general and postmaster general), but as the nation expanded and new functions were undertaken, new departments, bureaux, commissions and other agencies were created by Congress to carry on the administrative work As a result of this expansion, there existed in 1929 ten co-ordinate executive departments, each with numerous bureaux and divisions, and about a score of agencies and commissions which have been erected outside the great departments At first, excepting the Navy Department which was created in 1798, the new agencies were established within the existing departments without any special regard to the functions they were to perform As bureaux and agencies of a similar nature accumulated they were grouped into one organization and collectively transferred into a department and its administrative head became a member of the president's cabinet (*See* CABINET. *United States*) In this manner the Department of the Interior was created in 1849, the Department of Agriculture in 1862, the Department of Commerce and Labor in 1903, however, the latter department was divided in 1913 into two separate depart-

ments, that of Commerce and that of Labour, each with a separate head As is pointed out in the article CABINET, the heads of the Federal departments are appointed by the president (with the consent of the Senate) and serve at his pleasure rather than that of a majority of the legislative body; they do not hold seats in Congress, nor are they given the privilege of speaking from the floor. It must be observed, however, that the various departments and agencies are created by Congress and that it may impose or take away duties, or may prescribe such minute details as to amount to a practical direction of the officials The ten U S Government departments, their chief divisions and functions, are indicated below (X)

The Department of State.—The Department of State was created by two acts of the first Congress, July 27 and Sept 15, 1789 By the former act the department was designated as the Department of Foreign Affairs, but that designation was changed by the second act, Congress having decided not to carry out the project for a corresponding Department of Home Affairs The functions of the latter office were imposed upon the department already created and the name changed to be more descriptive Many of the functions now performed by other offices of the Government were first embraced within the Department of State, and there still remain vestiges of the earlier time Among these latter functions are the custody of the great seal and the original laws, and the duty of carrying on the correspondence with the State Governments with reference to amendments to the Constitution and the election each four years of electors for president and vice president But the Department of State is primarily the "foreign office" of the nation and under the supervision of the president, it exclusively directs the foreign relations of the United States The secretary of State is the ranking member of the president's cabinet Under him, in the department, there is an undersecretary of State, four assistant secretaries, a solicitor, who is actually an officer of the Department of Justice, though placed in the Department of State and serving under the immediate supervision of the secretary of State, the chiefs of various divisions, some of which are political and some administrative in function, and a total staff of about 650 officers and employees In size, the Department of State is the smallest of the executive departments of the U S Government, although its expansion in the last twelve years has been marked

The secretary of State is appointed directly by the president, by and with the consent of the Senate, as are also the undersecretary, the assistant secretaries and the solicitor The lower positions in the department are, for the most part, filled on the basis of examinations under the Civil Service Commission

Under the secretary of State is the Foreign Service, diplomatic and consular The United States maintains (1929) diplomatic establishments in 54 countries, there being 14 embassies and 40 legations There are consular representatives, consuls general, consuls, vice consuls and consular agents in 381 commercial centres throughout the world The total foreign service staff includes 3,785 persons, among whom 1,860 are clerks Ambassadors and ministers are appointed by the president, by and with the advice of the Senate, as well as all commissioned Foreign Service officers of lower rank, the latter are appointed after examination and are promoted on the basis of efficiency

The duties of the Department of State as a foreign office are for the most part those which the president, in his capacity as director of the foreign relations of the nation, may direct The function of the Department of State is to transact the foreign business of the United States Its methods are those of negotiation and discussion with a view to securing by peaceful means the preservation of American rights under the treaties and under international law Most of the functions are not defined by municipal law but by international law and the established usages of nations. The president has the power to negotiate a treaty but such a treaty becomes effective only with the advice and consent of the Senate. The practice is almost universal for the president first to negotiate and sign a treaty and then submit it to the Senate for its advice and consent to ratification However, it frequently occurs that the secretary of State confers with proper committees of the Senate before a treaty is made.

The Department of State has important functions as the agent or representative of other executive departments in the discharge of functions which are both domestic and foreign in character Thus the department, through its Foreign Service, has a share in the execution of the immigration, narcotic and quarantine laws, and it gathers much of the financial, agricultural and commercial information upon which the departments of the Treasury, Agriculture and Commerce depend Where representatives of other departments transact official business abroad they function under the supervision of, or in close co-operation with, the diplomatic and consular representatives of the United States (N T J)

The Treasury Department was established by the act of Congress of Sept 2, 1789 The secretary, who is a member of the cabinet, is also *ex-officio* chairman of the Federal Reserve Board and *ex-officio* chairman of the Federal Farm Loan Board He is assisted by an undersecretary and by three assistant secretaries. He is charged with the management of the national finances, superintends the collection of the revenue and is responsible for public debt operations, grants warrants for money drawn from the Treasury in pursuance of appropriations made by law, and for the payment of moneys into the Treasury, prepares plans for the improvement of the revenue laws and for the support of the public credit; and submits a report annually to Congress on the condition of the public finances

The receipts of the Government come chiefly from internal revenue collections and customs duties The Bureau of Internal Revenue of the Treasury Department, under the supervision of the commissioner of internal revenue, administers and enforces the internal revenue laws and collects all internal revenue taxes For administrative purposes, the duties of the bureau are assigned to five divisions or units There are 64 collection districts under supervision of collectors of internal revenue, and 37 field audit divisions under the immediate supervision of internal revenue agents in charge The principal function of the Customs Service is the collection of import duties; incident to this is the prevention of smuggling

Except where otherwise provided by law, all receipts of the U S Government are covered into the Treasury by warrant of the secretary, and expenditures therefrom are made only upon authorization of Congress The major part of the Government's expenditures are made by disbursing officers' checks from funds placed to their credit with the treasurer of the U S upon warrants of the secretary of the Treasury, countersigned by the controller general of the U S To some extent payments are made to public creditors upon Treasury warrants The U S treasurer is charged with the receipt and disbursement of all public moneys that may be deposited in the U S Treasury and in all other depositaries authorized by the secretary of the Treasury. He has also many other fiscal duties

The commissioner of accounts and deposits has administrative supervision over the Division of Bookkeeping and Warrants, which is by law the official book-keeping organization of the Government, in regard to the receipt, appropriation and expenditure of public moneys covering all departments and establishments of the Government, he also supervises the Division of Deposits, which is charged with the administration of matters pertaining to the designation of Government depositaries and the deposit of Government funds in such depositaries In addition he has control of the investment accounts of the Government and is responsible for the proper custody of investments and securities held by the treasurer and the Federal Reserve banks for which the secretary is responsible, other than those related to public debt operation The Public Debt Service is under the general supervision of the commissioner of the public debt, who is in charge of transactions in the public debt and the paper currency issues of the United States.

One of the important functions of the Treasury is to supply money which is the circulating medium of this country It maintains mints at Philadelphia, San Francisco and Denver for the coinage of money and the Bureau of Engraving and Printing

at Washington for the production of notes, bonds, securities and postage stamps. The controller of the currency is charged under the law with the organization and supervision of all solvent national banks and the administration, through a receiver, of those which have become insolvent He is also *ex-officio* member of the Federal Reserve Board. The Federal Farm Loan Board has supervision of the 12 Federal Land banks, the 12 Federal Intermediate Credit banks and the Joint Stock Land banks. It grants charters to and supervises National Farm Loan associations through which the loans of the Federal Land banks are made

The Bureau of Public Health Service is charged with the enforcement of national quarantine laws and conducts the medical examination of aliens entering the United States The service conducts scientific investigations concerning and enforces measures for promoting public health Through the Marine Hospital Service it provides hospital care and other treatment to American seamen The Coast Guard, one of the oldest organizations of the Government, was established in 1790 as a result of the need for the services of a coastal patrol for the enforcement of the customs laws and an organized armed force for the protection of the sea coast The duties of the Coast Guard include assistance to vessels in distress and saving life and property, destruction or removal of wrecks, and other floating dangers to navigation; extending medical aid to American vessels in deep sea fisheries; protection of the customs revenue and prevention of foreign smugglers from evading the National Prohibition law, the conduct of the international ice patrol in the North Atlantic ocean, patrol of the North Pacific ocean, Bering sea and south-eastern Alaska for the protection of the seal herds under international convention and the enforcement of the U S laws, operating as part of the navy in time of war, and many other duties

The Prohibition Bureau has supervision of the enforcement of the National Prohibition Act and also of the Harrison Narcotic Act The Secret Service Division is charged with suppression of counterfeiting, the protection of the president and his family and the president elect, the investigation of violations of the Farm Loan Act and such other matters relating to the Treasury Department as are directed by the secretary Other important subdivisions of the Treasury are the Division of Appointments and the Division of Supply, the chief clerk's office, the Government Actuary and the section of Financial and Economic Research

Still another subdivision of the Treasury is the supervising architect's office, which is responsible for the construction, enlargement, remodelling and repair of all public buildings and their mechanical equipment. In the plans which are being made for the erection of Government buildings and for the beautification of Washington, the responsibility for the purchase of sites and the design and erection of buildings has been placed by Congress on the secretary of the Treasury

The Bureau of the Budget was created by the act approved on June 10, 1921 It is in the Treasury Department but under the immediate direction of the president The bureau prepares for the president the annual budget and such supplemental or deficiency estimates as the president may recommend to Congress

(O L Mr)

The War Department.—The War Department dates from 1789, although there was a similar department during the period of the Confederation and Washington reappointed its head, Gen Henry Knox, secretary of the new department established under the Constitution The department has important non-military as well as military functions

In general, the secretary of War concerns himself with the major aspects of the defence problems and administrative functions of the department Under him in the department are two assistant secretaries. To one is delegated preparation of plans relative to the procurement of supplies and the war-time mobilization of industry He also represents the War Department in transactions with other departments of the Government relating to the procurement of supplies when they concern joint war programmes The other assistant secretary of War is charged with the carrying out of the provisions of the Air Corps Act of 1926

The chief of staff is the senior military adviser to the secretary of War. Subordinate to him, and assisting him, are the deputy chief of staff and five assistant chiefs of staff, who head the divisions of what is known as the War Department general staff, which acts in an advisory and planning capacity The routine activities of the War Department are cleared through the office of the adjutant general. The combatant branches or the line of the army comprise the infantry, cavalry, field artillery, coast artillery, air corps, corps of engineers and signal corps. Other branches are the judge advocate general's department, inspector general's department, quartermaster corps, finance department, the ordnance department, chemical warfare service, chaplains and the medical department, the latter including the medical corps, the dental corps, the veterinary corps, the medical administrative corps and the army nurse corps

Agencies for the transmission and co-ordination of War Department business include the war council and the advisory council on legislation. The former meets from time to time at the call of the secretary of War, to consider policies relating to the military and munitions problems of the department

The territorial administration of the army is conducted through nine corps areas—into which the United States, including Alaska and Porto Rico, are divided—and the Hawaiian department, Philippine department, Panama canal department and the U S forces in China Under the commanding general of each corps area is a chief of staff with general and administrative staffs

The military activities of the War Department include responsibility for the clothing, feeding, equipping, transportation and instruction of troops in the Regular Army, who garrison over 250 military posts in all parts of the United States, Porto Rico, Panama Canal Zone, Hawaii, Alaska, Philippine Islands and China Among the varied military installations administered by the War Department are proving grounds and arsenals; ordnance, quartermaster and engineer depots, hospitals and medical centres, remount stations, motor repair centres, flying fields, ferry and transport systems, railroads; and service schools The department is also charged with many non-military functions The most important civil task is the river and harbour work of the corps of engineers. This may be regarded as "maintenance of way" work for practically all the water-borne commerce of the United States. For the improvement of rivers and harbours the Federal Government has expended, through the War Department, over $1,250,000,000, including both first cost and maintenance. To the War Department is also delegated the supervision of projects for the control of floods on the Mississippi and Sacramento rivers The Inland Waterways Corporation is another important civil activity of the department The War Department, through the Inland Waterways Corporation, now operates three business organizations—the Mississippi-Warrior Service, the Warrior Terminal Company and the Upper River Division

Supervision of the governments of the Philippine Islands and Porto Rico, the two major U S insular territories, is also delegated to the War Department and administered through the Bureau of Insular Affairs The Dominican customs receivership is likewise administered by this bureau Other non-military War Department activities relate to such varied projects as national parks, national cemeteries, homes for disabled soldiers, roads, trails and bridges in Alaska, and cable, radio and telegraph systems

The secretary of War is the representative of the president directly charged with the general supervision of the government of the Panama Canal Zone and the administration of the Panama canal He is also chairman of numerous commissions and committees, the most important of which are the Federal Power Commission, National Forest Reservation Commission, Committee on Outdoor Recreation, committee appointed by the president to determine the future policy of the Government with respect to the merchant marine and American shipping in general, and is a member of the Federal Oil Conservation Board

(D F. D)

The Department of Justice.—The Department of Justice is that executive department of the U S. Government which is charged with the conduct of its legal business The head of the department is the attorney general, appointed by the president,

and confirmed by the Senate. As a member of the cabinet he ranks fourth in the line of succession to the Presidency in the event of a vacancy in the offices of president and vice president

The office of the attorney general was created by the Judiciary Act of 1789 Its growth, both in its functions and personnel, during the first 80 years of the existence of the Federal Government, was such that in 1870 Congress enacted the law entitled "An Act to establish the Department of Justice." This law provided that the attorney general should be the head of the Department of Justice, created the office of solicitor general, provided for assistant attorneys general, placed under the supervision of the attorney general the law officers of the other departments, and the supervision and control of U S district attorneys and all other counsel employed on behalf of the United States and vested him with supervisory powers over the accounts of district attorneys, marshals, clerks and other officers of the Federal courts.

As the head of the Department of Justice the attorney general is the chief law officer of the Government, representing it in all legal cases to which it may be a party, and appears in person in the U S Supreme Court in cases of exceptional gravity and importance; is the legal adviser of the president, to whom, and the heads of the executive departments, he is required by statute to give his advice and opinion on any questions of law arising in the conduct of administrative affairs The major activities of the department include the prosecutions of violations of the Federal laws, the approval of titles to lands or other property acquired by purchase or condemnation, the defence of claims against the United States in the court of claims, the management of the penal and reformatory institutions of the Federal Government. The department transacts the legal business of the Government under the general supervision of the attorney general and the immediate supervision of his assistants, exercising direction and control over the 92 district attorneys and marshals representing the U S judicial districts The solicitor general is responsible for the conduct of all cases before the U.S. Supreme Court, the assistant to the attorney general has special charge of all suits and other matters arising under the Federal anti-trust laws, and cases relating to acts to regulate commerce Seven assistant attorneys general are charged with the conduct of the work of the respective divisions of the department, as indicated (1) Tax-Prohibition Division, in charge of the general conduct of cases involving taxation, the National Prohibition Act and related acts and matters relating to Federal prisons and prisoners, and the probation law, (2) Court of Claims Division, in charge of the defence of claims against the United States in the court of claims and in the district courts and patent litigation; (3) Public Lands Division, in charge of cases involving the public lands and Indian litigation; (4) Criminal Division, in charge of criminal cases generally, and matters involving criminal practice and procedure; (5) Admiralty and Finance Division, in charge of matters relating to acquisition of land for the Government and matters of title, admiralty, finance, foreign relations, insular and territorial affairs, alien property matters and minor regulations of commerce; (6) Customs Division (New York city), in charge of protecting the interests of the Government in customs matters; (7) Administration Division, in charge of appointments, personnel, including field force, accounts and general administrative control of the department

The organization of the Department of Justice includes the Bureau of Investigation in charge of the director of the bureau, directing the investigation of alleged offences against certain laws of the United States, the pardon attorney having charge of all applications for executive clemency except those of the army and navy; the solicitors of the Treasury, Commerce, Labor and State, who are the chief law officers of their respective departments

(M W. W)

The Post Office Department.—The Post Office Department is the outgrowth of the office of postmaster general created in 1789 and attached to the Treasury Department as a bureau in 1791 To all intents and purposes the post office organization has been an independent department since 1825, when the term "post office department" was first used in the title of an act of Congress, and even more clearly from 1829, when President Jackson made the postmaster general a member of the cabinet. The Department was fully recognized by statute in 1874

The postal system, described as the "biggest single business in the world," handles nearly 27,000,000,000 pieces of mail yearly of which 15,000,000,000 are letters Nearly 370,000 employees are required to handle this mail Approximately 50,000 of them are city letter carriers, 46,000 rural carriers, nearly 70,000 clerks and 20,000 railway mail clerks. There are approximately 50,000 post offices with a postmaster presiding over each Every type of transportation suitable to local conditions is utilized This includes railroads, steamships, motor vehicles, aeroplanes, motor boats, wagons, horses, pneumatic tubes, belt conveyors, motor cycles, bicycles and the dog sled of Alaska. (*See* POST AND POSTAL SERVICE. *American Postal Service*)

The postal service is administered by a postmaster general and four assistant postmasters general. The executive head appoints all officers and employees of the department, except the four assistant postmasters general, the purchasing agent and the comptroller, who are presidential appointees With the exception of postmasters of the first, second and third classes, who are likewise presidential appointees, he appoints all postmasters and all other officers and employees of the service at large Subject to the approval of the president, he makes postal treaties with foreign Governments He awards and executes contracts and directs the management of the foreign mail service The first assistant postmaster general administers the organization and management of post offices of the first, second, third and fourth classes, the division of postmasters' appointments, post office quarters, the motor vehicle service and the division of dead letters and dead parcel post The second assistant postmaster general has charge of transportation facilities, including the air mail, the railway mail, and the foreign mail service, and supervises expenditures for mail transportation The third assistant postmaster general has charge of financial operations, including the collection of postal revenues, money orders, stamps, registered mails and postal savings, and controls the classification of mails The fourth assistant postmaster general administers the rural mail service and is charged with the custody and distribution of postal supplies and the manufacture of certain equipment (H S N)

The Navy Department.—Naval affairs were administered by the War Department until 1798, when a threatened war with France caused Congress to create a separate and independent Navy Department The president is, by the Constitution, the commander-in-chief of the navy. Through the secretary of the Navy he participates in naval activities, the secretary being in direct charge of every matter relating to the navy.

The Navy Department is subdivided into offices and bureaux, each charged with specific duties The heads of these subdivisions are the technical advisers of the secretary of the Navy and through them the secretary controls all naval work In the Navy Department in Washington, besides the offices of the secretary, the assistant secretary, the assistant secretary for aeronautics and the chief of Naval operations, there are eight chiefs of bureaux, viz, the chiefs of the bureaux of Navigation, Ordnance, Engineering, Aeronautics, Construction and Repair, Yards and Docks, Supplies and Accounts and Medicine and Surgery, and in addition the major general commandant of the marine corps and the judge advocate general of the Navy

During the temporary absence of the secretary and the assistant secretaries, the chief of naval operations acts as secretary of the Navy. The chief of naval operations is the senior officer of the navy while so serving and has the temporary rank of Admiral Under the direction of the secretary of the Navy he is charged with the operations of the fleet and of aircraft and with the preparation and readiness of plans for its use in war

The Bureau of Navigation is charged with the personnel of the navy. The Bureau of Ordnance has cognizance over the upkeep and operation of the gun factory, ordnance plants, torpedo stations, proving grounds, ammunition and mine depots and magazines on shore The Bureau of Engineering has charge of designing, building, fitting out and repairing machinery used for the

propulsion of naval ships. The duties of the Bureau of Aeronautics comprise all that relates to the design and procurement of aircraft and the maintenance of active aviation units and air stations. The Bureau of Construction and Repair is charged with designing, building, fitting and repairing the vessels of the navy, except the machinery. The Bureau of Yards and Docks is charged with the design and construction of public works and all buildings under the navy and marine corps The duties of the Bureau of Supplies and Accounts comprise all that relates to the purchase, reception, storage, care, custody, transfer, shipment, issue of and accountability for all supplies and property of the navy. The Bureau of Medicine and Surgery has charge of the upkeep and operation of all naval hospitals and the health of personnel

The major general commandant of the marine corps is responsible to the secretary of the Navy for the general efficiency and discipline of the corps He has charge of the operation of marine units and makes all assignments to vessels and shore stations The judge advocate general of the Navy has cognizance of all matters of law arising in the Navy Department.

(X)

The Department of the Interior.—The Department of the Interior, established on March 3, 1849, as the "Home Department," has charge of the administration of certain of the internal affairs of the nation This it does through seven main bureaux The General Land Office has control of the public lands, including their survey, handling applications for homesteads and Indian allotments, desert land and mining claims and mineral leases It has jurisdiction over granting railway and other rights of way and easements on public lands and adjusting State and railroad land grants The Bureau of Indian Affairs acts as the official guardian of the Indians; promotes their health and physical welfare, directs the education of Indian children; encourages their native arts and crafts, reclaims their lands and develops the natural resources in timber and minerals; supervises their funds, and handles all Indian affairs of the Government The Bureau of Pensions handles the pension claims and pays pensions for all the wars of the United States except the World War, and administers the Civil Service Retirement Act, handling and paying annuities to retired employees of the Government The Bureau of Education furthers education by the compilation and dissemination of data covering education in the United States and foreign countries; operates Government schools for the natives of Alaska, and has supervision of the development of the reindeer industry of the Territory The Geological Survey makes topographic and geological maps of the United States and Alaska; studies the surface and underground water resources, prepares and distributes reports on mineral deposits, and, through a conservation branch, classifies public lands and supervises engineering phases of mineral leasing The Bureau of Reclamation constructs and operates irrigation works; collects annual payments from water users for cost of irrigation; promotes knowledge of irrigation methods, suitability of crops, availability of markets and improvement of farm homes The national park service conserves national parks and monuments. It also protects the flora and fauna of the parks

There are also assigned to the Department of the Interior additional functions, including the construction, operation and maintenance of a Government owned railroad into the interior of Alaska, the exercise of certain powers and duties in the administration of the affairs of the Territories of Alaska and Hawaii; the maintenance of Saint Elizabeth's hospital, an institution for the treatment of mental diseases of the army, navy, public health service, and the insane of the District of Columbia; also the maintenance of The Freedmen's hospital, an institution providing medical and surgical treatment for the coloured race of the District of Columbia and residents of the several States Howard university, an institution for the education of the coloured youth in the liberal arts and sciences, supported partly by congressional appropriations, is also under the general supervision of the department, as is the Columbia Institution for the Deaf (*See* DEAF AND DUMB: *United States.*) The department is further charged with the administration of the act of June 8, 1906, for the preservation of American antiquities and the granting of archaeological permits. (H. WK)

Department of Agriculture.—The Department of Agriculture was established by the act of Congress of May 15, 1862, which provided that "there shall be at the seat of government a Department of Agriculture, the general design and duties of which shall be to acquire and diffuse among the people of the United States useful information on subjects concerned with agriculture, in the most general and comprehensive sense of the word . . ." By numerous subsequent legislative enactments the work of the department has been greatly extended

The head of the department, the secretary of Agriculture, is a member of the president's cabinet Additional general officers include an assistant secretary and five directors, respectively, of scientific work, regulatory work, extension work, personnel and business administration and information. The department operates through the following major units: office of the secretary, which includes the general administrative, business and legal offices, Weather Bureau, Bureau of Animal Industry, Bureau of Dairy Industry, Bureau of Plant Industry, Forest Service, Bureau of Chemistry and Soils, Bureau of Entomology, Bureau of Biological Survey, Bureau of Public Roads, Bureau of Agricultural Economics, Bureau of Home Economics, Plant Quarantine and Control Administration, Grain Futures Administration and the Food, Drug and Insecticide Administration; also the office of experiment stations, extension service, office of information and library, these four branches being grouped, for administrative purposes, under the office of the secretary The secretary and the assistant secretary are appointed by the president The secretary appoints the directors, chiefs of bureaux and offices, and other employees, and these are under the Federal Civil Service system. The personnel of the department numbers approximately 21,000, of whom about 16,000 are stationed outside of Washington

Under special laws the department co-operates with the agricultural college and experiment station in each of the 48 States in the promotion and co-ordination of research work and in maintaining the system of agricultural extension through which, by means of county agents and specialists, the results of research in agriculture and home economics are brought directly to the attention of farmers and other interested persons The department engages extensively in scientific research to aid in the production and marketing of crops and live stock and in specialized fields which include forestry, wood utilization, rural sociology, home economics, food chemistry and bacteriology, road building and maintenance, rural engineering, meteorology, aerology, conservation of birds and other wild life, etc Experiment stations and laboratories are maintained at many points in the United States and in Alaska, Hawaii, Porto Rico, Guam and the Virgin islands The department conducts extensive investigations in agricultural economics and promotes orderly production and marketing by disseminating economic information, such as crop estimates, daily market reports, etc Campaigns are carried on, independently and in co-operation with the States, to eradicate or control diseases and insect pests of crops and live stock The department administers and enforces some 40 regulatory laws, including the Meat Inspection Act, Food and Drugs Act, Milk Importation Act, Insecticide and Fungicide Act, Plant and Animal Quarantine Acts, Migratory Bird Treaty Act and numerous acts to establish grades and standards and regulate the marketing of cotton, grain and other commodities (W. M J)

The Department of Commerce.—The Department of Commerce succeeded the earlier Department of Commerce and Labor by the act of Congress approved on March 4, 1913, which also created a separate and independent Department of Labor The secretary of Commerce is a member of the president's cabinet, but is not in line of succession to the Presidency It is his duty to promote and develop the foreign and domestic commerce, the mining, manufacturing, shipping and fishery industries and the transportation facilities of the United States There are two assistant secretaries, one of whom has special jurisdiction over commercial aeronautics

The department is composed of 13 branches, as follows: the

office of the secretary, which supervises the work of the department as a whole; the aeronautics branch, for the maintenance of aids to navigation on civil airways, the inspection of commercial aircraft, the licensing of pilots and the enforcement of air traffic rules; the Radio Division, for the inspection of radio-communicating and broadcasting stations; the Bureau of the Census, for the publication of statistics relating to population, agriculture, manufactures, mining, etc ; the Bureau of Foreign and Domestic Commerce, charged with the collection and dissemination of trade information for the benefit of manufacturers and exporters, the Coast and Geodetic Survey, for surveying the coastal waters and the publication of nautical charts, the Bureau of Fisheries, for the conservation of the fishery resources and the regulation of the salmon and fur-seal fisheries of Alaska, the Lighthouse Service, for the maintenance of aids to marine navigation, the Bureau of Navigation, for the enforcement of the navigation laws; the Steamboat-Inspection service, for the inspection of steam vessels, and the licensing of their officers and crews; the Bureau of Standards, the custodian of the official prototype standards of measurement, which carries on industrial experimentation and research, the Bureau of Mines, for research and investigation in the fields of mining and metallurgy, with particular reference to the promotion of safety, and the Patent Office, through which the Government issues letters patent to inventors, and registers trade-marks, prints and labels. (X)

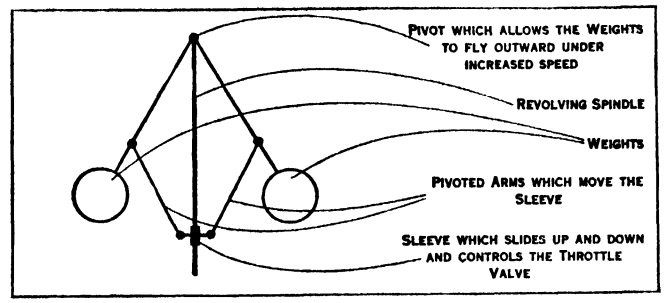
The Department of Labor.—The Department of Labor is the outgrowth of an agitation that began after the Civil War (1861–65), when recognition in the Federal Government for the great group of wage-earners of the country was first sought This resulted in the creation of the Bureau of Labor in the Department of the Interior in 1884 In 1888 the bureau was made an independent establishment of the Government, with its head reporting directly to the president In 1903, under the administration of President Roosevelt, the Department of Commerce and Labor was created, and the Bureau of Labor was transferred to it A continued and insistent demand that the wage-earners be accorded representation in the cabinet of the president resulted in the enactment of a law, approved by President Taft on March 4, 1913, creating the Department of Labor and transferring to it the Bureau of Labor (now the Bureau of Labor Statistics), the Children's Bureau and the bureaux of Immigration and Naturalization, which by the organic act was separated into two distinct bureaux The law also gave the secretary authority to conciliate industrial disputes submitted to him During the World War the activities of the department were widely extended, and many war-time bureaux were added to the organization, including the Women's Bureau and the U S Employment Service, which now remain as permanent services In 1928 these made up the Department of Labor.

Each of these bureaux pursues a clear-cut service in fostering the welfare of the wage-earner The Bureau of Immigration guards the gates of the nation, and under the laws passed by Congress protects the American workman from injurious competition from abroad The Bureau of Labor Statistics watches the labour demand and supply, compiles information that is vital to intelligent administration and keeps the wage-earner and the public informed as to employment, wage, working conditions and cost of living The Conciliation Service, under the supervision of the secretary of Labor, seeks to avert and settle industrial disputes, and to foster the spirit of co-operation in industry The Women's Bureau and the Children's Bureau work for the betterment of women and children in industry and in home life The Employment Service directs wage-earners to profitable employment (J. J D)

GOVERNOR, in general, one who governs or exercises authority, specifically, an official appointed to govern a district, province, town, etc In British colonies or dependencies the representative of the Crown is termed a governor Colonial governors are classed as governors-general, governors and lieutenant-governors, according to the status of the colony or group of colonies over which they preside In the United States the official head of every State Government is a governor. (*See* VICEROY)

GOVERNOR is an automatic device which regulates the speed of an engine or turbine, and keeps it within certain limits notwithstanding variations in the load or the pressure The centrifugal governor is the principal type It is made in numerous forms, all having two or more weights arranged so that they can freely move outwards upon increase of speed, or fall as speed falls Any change of speed is communicated to the governor, which automatically varies the intake of power

In steam engines the flow of steam is thus controlled, or expansion gear is actuated In gas engines the full charge is admitted, but the governor shuts it off at excess speed, this system being termed the hit-and-miss Or the volume of air and gas is varied, or the proportion of air to the gas, without, however, missing a charge Oil and Diesel engines (*q v*) are governed by varying the quantity of fuel injected into the cylinders as the speed varies and affects the governor Water turbines receive their governing from a curtailment of the supply by a movable sluice device or by a spear-head entering more or less deeply into an inlet cone Elaborate governors are fitted to some steam turbines, with a system of oil pressure to control the steam throttle-valve Governors for colliery winding engines control complex mechanism arranged so that if the cage travels too fast the governor shuts off steam and applies the brakes automatically In regard to the big engines which drive rolling-mills the governing arrangements operate, should the engine-man be incapacitated



DIAGRAMMATICAL SKETCH SHOWING THE PRINCIPLE OF THE GOVERNOR
To keep the speed of an engine or turbine within prescribed limits, under varying loads, centrifugal action of the balls affects the throttle, opening it wider as speed drops, or partially closing it if the speed is too high

A gas governor is used to regulate the pressure of gas supply, either at the works or on a small scale for gas cookers or gas fires In the latter type of governor, weights on a spindle are regulated to suit the desired adjustment (F H)

GOW, NIEL (1727–1807), Scottish musician of humble parentage, famous as a violinist and player of reels, but more so for the part he played in preserving the old melodies of Scotland His compositions, and those of his four sons, Nathaniel, the most famous (1763–1831), William (1751–1791), Andrew (1760–1803), and John (1764–1826), formed the "Gow Collection," comprising various volumes edited by Niel and his sons, a valuable repository of Scottish traditional airs The "Gow Collection" includes *A Collection of Strathspey Reels* (Dunkeld, 1784), *Second, Third, Fourth* and *Fifth Collections* (1788, 1792, 1800, 1809, 1822)

GOWER, JOHN (d 1408), English poet, died at an advanced age in 1408, so that he may be presumed to have been born about 1330 He belonged to a good Kentish family and owned the manors of Feltwell in Suffolk and Moulton in Norfolk In a document of 1382 he is called an "Esquier de Kent," and he was certainly not in holy orders That he was acquainted with Chaucer we know, first because Chaucer in leaving England for Italy in 1378 appointed Gower and another to represent him in his absence, secondly because Chaucer addressed his *Troilus and Criseide* to Gower and Strode (whom he addresses as "moral Gower" and "philosophical Strode") for criticism and correction, and thirdly because of the lines in the first edition of Gower's *Confessio amantis,* "And gret wel Chaucer whan ye mete," etc There is no sufficient ground for the suggestion, based partly on the subsequent omission of these lines and partly on the humorous reference of Chaucer to Gower's *Confessio amantis* in the introduction to the *Man of Law's Tale,* that the friendship was

broken by a quarrel From his Latin poem *Vox clamantis* we know that he was deeply and painfully interested in the peasants' rising of 1381; and by the alterations which the author made in successive revisions of this work we can trace a gradually increasing sense of disappointment in the youthful king, whom he at first acquits of all responsibility for the state of the kingdom on account of his tender age That he became personally known to the king we learn from his own statement in the first edition of the *Confessio amantis,* where he says that he met the king upon the river, was invited to enter the royal barge, and in the conversation which followed received the suggestion which led him to write his principal English poem At the same time we know, especially from the later revisions of the *Confessio amantis,* that he was an admirer of the king's brilliant cousin, Henry of Lancaster, afterwards Henry IV, whom he came eventually to regard as a possible saviour of society from the misgovernment of Richard II

The first edition of the *Confessio amantis* is dated 1390, and this contains, at least in some copies, a secondary dedication to the then earl of Derby The later form, in which Henry became the sole object of the dedication, is of the year 1393 Gower's political opinions are further embodied in the *Cronica tripartita*

In 1398 he was married to Agnes Groundolf, and from the special licence granted by the bishop of Winchester for the celebration of this marriage in John Gower's private oratory we gather that he was then living in lodgings assigned to him within the priory of St Mary Overy, and perhaps also that he was too infirm to be married in the parish church. It is probable that this was not his first marriage, for there are indications in his early French poem that he had a wife at the time when that was written. His will is dated Aug 15, 1408, and his death took place very soon after this. He had been blind for some years before his death. A magnificent tomb with a recumbent effigy was erected over his grave in the chapel of St John the Baptist within the church of the priory, now St. Saviour's, Southwark

The effigy on Gower's tomb rests its head upon a pile of three folio volumes entitled *Speculum meditantis, Vox clamantis* and *Confessio amantis* These are his three principal works. The first of these was long supposed to have perished, but a copy of it was discovered in the year 1895 under the title *Mirour de l'omme* It is a French poem of about 30,000 lines in 12-line stanzas, and under the form of an allegory of the human soul describes the seven deadly sins and their opposing virtues

Gower's next work was the *Vox clamantis* in Latin elegiac verse, in which the author takes occasion from the peasants' insurrection of 1381 to deal again with the faults of the various classes of society. In the earlier portion the insurrection itself is described in a rather vivid manner

Gower's chief claim, however, to reputation as a poet rests upon his English work, the *Confessio amantis,* in which he displays in his native language a real gift as a story-teller He is himself the lover of his poem, in spite of his advancing years, and he makes his confession to Genius, the priest of Venus, under the usual headings supplied by the seven deadly sins These with their several branches are successively described, and the nature of them illustrated by tales drawn from very various sources and often extremely well told The metre is the short couplet, and it is very smooth and regular The great fault of the *Confessio amantis* is the extent of its digressions

Gower also wrote in 1397 a short series of French ballades on the virtue of the married state (*Traitié pour essampler les amantz mariés*), and after the accession of Henry IV he produced the *Cronica tripartita,* a partisan account in Latin leonine hexameters of the events of the last 12 years of the reign of Richard II. About the same time he addressed an English poem in seven-line stanzas to Henry IV. (*In Praise of Peace*), and dedicated to the king a series of French ballades (*Cinkante Balades*), graceful and even poetical in expression. Several occasional Latin pieces also belong to the later years of his life.

On the whole Gower must be admitted to have had considerable literary powers; and though not a man of genius, and by no means to be compared with Chaucer, yet he did good service in helping to establish the standard literary language, which at the end of the 14th century took the place of the Middle English dialects The *Confessio amantis* was long regarded as a classic of the language, and Gower and Chaucer were often mentioned side by side as the fathers of English poetry

A complete edition of Gower's works in four volumes, edited by G C. Macaulay, was published in 1899–1902, the first volume containing the French works, the second and third the English, and the fourth the Latin, with a biography. Before this the *Confessio amantis* had been published in the following editions Caxton (1483); Berthelette (1532 and 1554), Chalmers, *British Poets* (1810), Reinhold Pauli (1857), H. Morley (1889, incomplete). The two series of French ballades and the *Praise of Peace* were printed for the Roxburghe Club in 1818, and the *Vox clamantis* and *Cronica tripartita* were edited by H O Coxe for the Roxburghe Club in 1850 The *Cronica tripartita,* the *Praise of Peace* and some of the minor Latin poems were printed in Wright's *Political Poems* (Rolls series, 14). The *Praise of Peace* appeared in the early folio editions of Chaucer, and has been edited also by Dr Skeat in his *Chaucerian and other Pieces* Reference may be made to H. J Todd, *Illustrations of the Lives and Writings of Gower and Chaucer* (1810), the article (by Sir H Nicolas) in the *Retrospective Review* for 1828, F J Child, "Memoirs on the Language of Chaucer and Gower," in *Early English Pronunciation* (1869 etc.), H Morley, *English Writers* (1887 etc.), vol iv, B ten Brink, *History of Early English Literature* (Eng trans, 1883, etc), vol. ii ; and W J Courthope, *History of English Poetry* (1895), vol i. (G. C. M)

GOWER, a Welsh seigniory and district in the county of Glamorganshire (*q v.*), lying between the rivers Tawe and Loughor and between Breconshire and the sea, its length from the Breconshire border to Worm's Head being 28 m, and its breadth about 8 m It corresponds to the ancient commote of Gower (in Welsh *Gwyr*) which in early Welsh times was grouped with two other commotes stretching westwards to the Towy and so formed part of the principality of Ystrad Tywi Its western associations were shown by its inclusion until the formation of the diocese of Swansea and Bacon (1923) within the diocese of St David What is meant by Gower in modern popular usage, however, is only the peninsular part or "English Gower," lying mainly to the south of a line drawn from Swansea to Loughor

The numerous limestone caves of the coast are noted for their animal remains, and finds of palaeolithic flints and a skeleton of palaeolithic date have been made (*see* W J Sollas, "Paviland Cave· An Aurignacian Station in Wales," *Journ. Roy Auth Inst,* 1913). The high ground of the centre of the peninsula has megaliths and tumuli The south coast has evidences of a Bronze Age culture, while hill-top camps seem to have been occupied by different groups up to the time of the Viking raids In the Arthurian romances Gower appears in the form of Goire, as the island home of the dead. It is also surmised by Sir John Rhys that Malory's *Brandegore* (*i e*, Brân of Gower) represents the Celtic god of the other world (Rhys, *Arthurian Legend,* 160, 329 *et seq*) Traces of the more or less temporary Scandinavian occupation are found in such place-names as Burry Holms, Worms Head and Swansea, and probably also in some cliff earthworks. About 1100 Gower was conquered by Henry de Newburgh, earl of Warwick His followers settled for the most part on the southern side of the peninsula, leaving the Welsh inhabitants of the northern half of Gower practically undisturbed. These invaders were probably reinforced later by Flemings from south Pembrokeshire Moated mounds, which in some cases developed into castles, were built for the protection of the various manors. The castles included those of Swansea, Loughor and Oystermouth. These were repeatedly attacked and burnt by the Welsh during the 12th and 13th centuries. A large section of Gower is still unenclosed common land

About 1189 the lordship passed from the Warwick family to the crown and then to the de Braoses, in whose family it remained practically continuously for over 120 years In 1208 the Welsh and English inhabitants received each a charter from King John. Later the king's officers of the newly organized county of Carmarthen repeatedly claimed jurisdiction over Gower. De Braose resisted the claim and organized the English part of his lordship on the lines of a county palatine. Troubles befell the de Braose family and the region passed to John de Mowbray.

It frequently changed hands between them and the Beauchamps, representatives of the original owners (earl of Warwick) The 4th duke of Norfolk (the Mowbrays) exchanged it in 1489, for lands in England, with William Herbert, earl of Pembroke It passed through Charles Somerset to the present owner, the duke of Beaufort Gower was included in 1535 in Glamorgan

The characteristically English part of Gower lies to the south and south-west of its central ridge of Cefn y Bryn The present line of demarcation between English and Welsh is one drawn from Swansea in a west-north-west direction to Llanrhidian on the north coast. The boundary very nearly coincides with the outcrop of the coal measures, the industrial population to the north being Welsh-speaking, the agriculturists to the south English.

See J D. Davies, *A History of West Gower* (4 vols, 1877–94); W Ll-Morgan, *An Antiquarian Survey of East Gower* (1899), an article (probably by Prof Freeman) entitled "Anglia Trans-Walliana" in the *Saturday Review* for May 20, 1876, G. T Clark, "The Signory of Gower" *Archaeologia Cambrensis* (1893–94); *The Surveys of Gower and Kilvey,* ed by Baker and Grant-Francis (1861–70).

GOWN, formerly the term for a loose outer garment worn by either sex but now generally for that worn by women It is also the name for the distinctive robes worn by holders of particular offices or by members of particular professions or universities, etc (*see* ROBES)

GOWRIE, JOHN RUTHVEN, THIRD EARL OF (*c* 1577–1600), Scottish conspirator, was the second son of William, 4th Lord Ruthven and first earl of Gowrie (?1541–1584), by his wife Dorothea, daughter of Henry Stewart, second Lord Methven The Ruthven family was of ancient Scottish descent, the earldom dated from 1581 The first earl of Gowrie and his father Patrick, third Lord Ruthven (*c* 1520–1566), had both been concerned in the murder of Rizzio in 1566, and both took an active part on the side of the Kirk in the constant intrigues of the period Gowrie had been custodian of Mary, queen of Scots, during her imprisonment in Loch Leven, and had also been the chief actor in the "raid of Ruthven" in 1582 when King James VI was seized while a guest and kept prisoner. Though pardoned, he continued to plot, and was executed for high treason in 1584

When, therefore, on the death of his elder brother the second earl in 1588 John Ruthven succeeded to the earldom, he inherited family traditions of treason and intrigue He received an excellent education at the grammar school of Perth and at the University of Edinburgh, after which he joined with Atholl and Montrose in offering to serve Queen Elizabeth, and had thus already been engaged in conspiracy when, in 1594, he went to study at Padua On his way home in 1599, moreover, it is probable that he communicated at Paris with the exiled Bothwell

In 1600 the earl and his brother, Alexander Ruthven, were murdered at Gowrie house in mysterious circumstances Three solutions of the mystery of this "Gowrie conspiracy" have been suggested first, that Gowrie and his brother had plotted to murder or to kidnap King James at Gowrie house, second, that James visited Gowrie house with the intention of murdering the two Ruthvens, third, that the tragedy sprang from a brawl

According to James the facts were as follows on Aug 5, 1600, James was asked while hunting near Falkland to go to Gowrie house to examine a prisoner with a quantity of foreign gold there When he arrived with a small retinue, he was taken alone into a small turret by Alexander Ruthven Here, instead of the prisoner with the foreign gold, he found an armed man His retainers, who had been told that the king had left, were setting out to overtake him when they saw him struggling at a window, and heard his cry for help They thereupon forced an entrance to the turret, and in the struggle Ruthven and Gowrie were killed

One of Gowrie's younger brothers, William, fled abroad, while the other, Patrick, was imprisoned in the Tower He was released in 1622, married Elizabeth Woodford, widow of the 1st Lord Gerrard; he died in poverty Their daughter Mary married the famous painter Van Dyck

See Andrew Lang, *James VI. and the Gowrie Mystery* (1902), and the authorities there cited; Robert Pitcairn, *Criminal Trials in Scotland* (3 vols., Edinburgh, 1833); David Moysie, *Memoirs of the Affairs of Scotland 1577–1603* (Edinburgh, 1830); Louis A Barbe, *The Tragedy of Gowrie House* (1887), Andrew Bisset, *Essays on Historical Truth* (1871), David Calderwood, *History of the Kirk of Scotland* (8 vols., Edinburgh, 1842–1849) W A Craigie has edited as *Skotlands Rimur,* some Icelandic ballads relating to the Gowrie conspiracy.

GOWRIE, a belt of fertile alluvial land (*Scotice,* "carse"), in Perthshire, Scotland Occupying the north shore of the Firth of Tay, the Carse of Gowrie extends east of Perth city to the confines of Dundee It measures 15 m in length, and is one of the richest tracts in Perthshire The district is noteworthy for the number of its castles and mansions, among which may be mentioned Kinfauns castle, Inchyra house, Pitfour castle, Errol park, Megginch castle, dating from 1575; Fingask castle, Kinnaird castle, erected in the 15th century and occupied by James VI in 1617; Rossie priory, the seat of Lord Kinnaird; and Huntly castle

GOYA, a town and port of the Province of Corrientes, Argentina, on the Paraná river, 618 m N of Buenos Aires and 147 m S of the town of Corrientes Pop (1925) 16,000 It is served by the Central, Entre Rios and North-eastern railways, and is 34 hours from Buenos Aires by rail Goya is a distributing centre for agricultural products and timber It dates from 1807

GOYANNA or **GOIANA,** a city of Brazil in the north-east angle of the State of Pernambuco, about 65 m N of the city of Pernambuco The population (including municipal district) in 1920 was 53,854 It is built on a fertile plain between the rivers Tracunhaem and Capibaribe-mirim, near their junction to form the Goyanna river, and is 15 m from the coast It is surrounded by, and is the commercial centre for, one of the richest agricultural districts of the State Goyanna is one of the oldest towns of the State, and was occupied by the Dutch from 1636 to 1654 It has several old-style churches

GOYATACAN, an independent linguistic stock of South American Indians, so called from the Goyatacas, one of its important tribes The Goyatacas (so named from the Brazilian state of Goyaz, in which, however, few of these Indians appear to have lived) occupied a large part of the state of Minas Geraeas and the southern edge of the state of Bahia, in the highlands of eastern Brazil In early times tribes of this stock probably occupied the Atlantic coast in this region, but at the time of arrival of the Portuguese, the coastal strip was in the hands of Tupian (*q v*) tribes The bow and throwing-club were their chief weapons

See Maximilian, Prince of Wied-Neuroeid, *Travels in Brazil in the Years 1815, 1816, 1817* (London, 1820), K von den Steinen, *Durch Zentral Beasilien* (Leipzig, 1886).

GOYA Y LUCIENTES, FRANCISCO (1746–1828), Spanish painter, was born on March 30, 1746, at Fuendetodos, near Saragossa He began his art studies in the studio of José Luzan Martinez at Saragossa, where he made the acquaintance of Francisco Bayeu, the future court painter, and of Zapater, his life-long friend and correspondent Goya was a true son of Aragon, he took part in street scuffles between the youths of rival parishes; after one of these fights, in which three combatants were killed, he was compelled, at the age of 19, to flee to Madrid

In consequence of his riotous and dissolute life he found it convenient to leave Madrid also, and he made his way to the coast as one of a travelling troupe of bull-fighters, and finally reached Rome, broken in health and destitute Here he continued his studies In 1771 he was awarded the second prize in a competition initiated by the academy of Parma He returned to Saragossa in the autumn of the same year There he painted frescoes in the famous cathedral El Pilar, and in the Carthusian church Aula Dei The influence of Tiepolo is evident He married Bayeu's sister and returned to Madrid in 1775

The Court Painter.—Raphael Mengs was at that time decorating the royal palace with classicist pictures of Olympian gods, and Bayeu, who was working under Mengs, may have put in a good word for his brother-in-law Goya was commissioned to paint cartoons for tapestries in the Pardo, the crown prince's residence He was free to choose his own subjects, and between 1776 and 1780 he supplied some 20 cartoons to the factory of Santa Barbara representing *genre* scenes from the life of the fields, the village and the street These cartoons opened a new chapter in the history of decorative art His originality was

recognized by Mengs; and royal favour naturally followed He was director of the Academy of Arts in 1785, and a court painter in 1786 His work now became intimately connected with the court life. He painted the portraits of four successive sovereigns of Spain and their families. The "Family of Charles IV.," the "Queen in a Mantilla," the "King in Uniform," and the great equestrian portraits of the king and queen are among his best work in the Prado. These portraits, with their searching and sometimes cruel analysis of character, reveal him as a cynical onlooker at a decadent court He disdained flattery, and his interpretation was lifelike, brilliant and strong

He viewed the world as a drama—almost as a farce; and he expressed now in grim satire, now in delightful simplicity, the contemporary life of Spain at the time of the French Revolution He was versatile and his facility was marvellous; it often took him but one or two hours to paint a portrait, and he left a gallery of the most famous men and women of his age and country The Duchess of Osuna favoured him with commissions. The splendid portrait of the Duchess of Alva, with the dedication "by her friend Goya," is dated 1795 The portrait of Guillemardet, then ambassador of the Directory and later one of Napoleon's prefects, belongs to the same time. "No portrait succeeded with me better," wrote Goya It is a triumph of realism Of a later date are his portraits of the duke of Wellington, one in the possession of the present duke, the other in the Havermeyer collection at New York The British Museum has a sketch of the duke in red chalk Among Goya's religious paintings are the "Crucifixion" for Francisco el Grande, and the decoration of the cupola of San Antonio de la Florida, painted in 1798

With the French invasion, Goya joined the Josefinos and worked for Joseph Bonaparte He had to hide for three months from the fury of the people, when the French fled from Madrid That his feelings were for his own people all the time is shown in his painfully realistic picture of the massacre of the "Dos de Mayo" (1808), and by his set of etchings, "Disasters of the War," a record of French atrocities, drawn while he was King Joseph's court painter, and, perhaps, not meant for publication. Of this time are the weird and terrifying paintings which decorated the walls of his home, and which are now in the Prado

Bordeaux.—With age, Goya's health began to fail; he became almost totally deaf. At 78 he crossed the Pyrenees alone and went to Bordeaux, where he was welcomed by the colony of Spanish refugees He set to work and painted his friends; he painted the "Water Carrier," the "Knife Grinder," and the "Milkmaid," working with colour and without line From Bordeaux he visited Paris, and in 1827 returned to Madrid for a short stay His portrait was then painted, by order of King Ferdinand, by Vincente Lopez (now in the Prado) Goya died at Bordeaux on April 16, 1828 His remains were transferred in 1919 to S Antonio de la Florida at Madrid

Most of Goya's paintings are in Spain, in the Prado, in the Academia de San Fernando and in private collections; until the Osuna sale of 1896, very few of his pictures were to be seen outside his own country The National Gallery, London, has two fine portraits. Goya was also an etcher and a lithographer The set of etchings known as "Los Caprichos" (*c.* 1797) exposed the vices of degraded society with savage satire; "Los Proverbios" (1805) were executed in the same vein Then followed the terrible "Los Desastres de la Guerra" (1810) mentioned above, and the "Tauromaquia" (1815) with scenes of the bull-fight. Of great interest are his etchings after pictures by Velasquez At Bordeaux, in 1825, he executed four lithographs Of the four sets of etchings only the first was issued in his life-time; the others were not published until the middle of the last century Although Goya founded no school and had no direct followers, his strongly personal and spontaneous art greatly influenced the development of modern painting. Delacroix and the French romanticists admired him He was studied by Manet, by Daumier, and more recently by Sargent and by Zuloaga.

The most important documents for the *Life* of Goya are contained in his correspondence with his friend, Martin Zapater. Of these letters 135 were published in 1868. Monographs on Goya were written by Ch. Yriarte (1867); Paul Lefort (1877), W. Rothenstein (1900), P. Lafond (1902); Val von Loja (1903), A. F. Calvert (1908); Hugh Stokes (1914); J Tild (1920); A. L Mayer (1923); R. Gomez de la Serina (1928) Three separate books on Goya, the portraitist, the painter, and the engraver were written by A de Beruete y Moret. The first of these was translated into English by S. Brinton. For Goya's centenary these three books were condensed into one volume by Sanchez Canton. *See* also Cruzado Villaarnil, *Los Tapices de Goya* (1870). (I. A. R.)

GOYAZ, inland State, Brazil, bounded by Maranhão on the N, by Matto Grosso and Pará on the W, Maranhão, Bahia, and Minas Geraes on the E, and by Minas Geraes and Matto Grosso on the south Population 1920, 511,919, including half-civilized Indians and half-breeds Area, 254,834 sq miles. The state lies wholly within the great Brazilian plateau region, but its surface is much broken towards the N by the deeply eroded valleys of the Araguaya and Upper Tocantins rivers and their tributaries The general slope of the plateau is toward the N, and the drainage of the State is chiefly through the above-named rivers—the principal tributaries of the Araguaya being the Grande and Vermelho, and of the Upper Tocantins, the Manoel Alves Grande, Somno, Paranan, and Maranhão A considerable part of southern Goyaz, however, slopes southward and the drainage is through numerous small streams flowing into the Paranahyba, a large tributary of the Paraná. The general elevation of the plateau is estimated to be about 2,700 ft, and the highest elevation to be the Serra dos Pyreneos (5,250 ft) Crossing the state NNE to SSW there is a well-defined chain of mountains, of which the Pyreneos, Santa Rita and Santa Martha ranges form parts, but their elevation above the plateau is not great The surface of the plateau is generally open campo and scrubby arboreal growth called *caatingas*, but the streams are generally bordered with forest, especially in the deeper valleys. Towards the N the forest becomes denser and of the character of the Amazon Valley The climate of the plateau is usually described as temperate, but it is essentially sub-tropical The valley regions are tropical, and malarial fevers are common

The cultivation of the soil is limited to local needs, except in the production of tobacco, which is exported to neighbouring States The open campos afford good pasturage, and live stock is largely exported Gold-mining has been carried on in a primitive manner for more than two centuries, but the output has never been large and no very rich mines have been discovered Diamonds have been found, but have been mined only to a limited extent There is a considerable export of quartz crystal, commercially known as "Brazilian pebbles," used in optical work Although the northern and southern extremities of Goyaz lie within two great river systems—the Tocantins and Paraná—the upper courses of which are navigable, both of them are obstructed by falls The only outlet for the State has been by means of mule trains to the railway terminals of São Paulo and Minas Geraes, pending the extension of railways from both of those States

The capital of the State is Goyaz or Villa-Boa de Goyaz, a mining town on the Rio Vermelho, a tributary of the Araguaya rising on the northern slopes of the Serra de Santa Rita. Population, including the municipal district (1920), 21,223 Gold was discovered here in 1682 by Bartholomeu Bueno, the first European explorer of this region, and the settlement founded by him was called Santa Anna, which is still the name of the parish The site of the town is a barren, rocky mountain valley, 1,900 ft. above sea-level, in which the heat is most oppressive at times and the nights are unpleasantly cold Goyaz is the see of a bishopric founded in 1826, and possesses a small cathedral and some churches

The State contains the area selected for the future Federal capitol on the plateau north and east of the city of Goyaz.

GOYEN, JAN JOSEPHSZOON VAN (1596–1656), Dutch painter, was born at Leyden on Jan. 13, 1596, learned painting under several masters at Leyden and Haarlem, married in 1618 and settled at The Hague about 1631 where he rose to the presidency of his guild in 1640. He was one of the first to emancipate himself from the traditions of minute painting of detail embodied in the works of Breughel and Savery. Though he preserved the dun scale of tone peculiar to those painters, he studied

atmospheric effects in black and white with considerable skill. He had much influence on Dutch art. He formed Solomon Ruysdael and Pieter Potter, forced attention from Rembrandt, and bequeathed some of his precepts to Pieter de Molyn, Coelenbier, Saftleven, van der Kabel and Berghem. A friend of van Dyck and Bartholomew van der Helst, he sat to both these artists for his likeness. His daughter Margaret married Jan Steen, and he had steady patrons in the stadtholder Frederick Henry, and the chiefs of the municipality of The Hague He died at The Hague on April 27, 1656

Between 1610 and 1616 van Goyen wandered from one school to the other. He was apprenticed to Isaak Swanenburgh, de Man, Klok and de Hoorn In 1616 he joined Esaias van der Velde, amongst his earlier pictures, some of 1621 (Berlin Museum) and 1623 (Brunswick Gallery) show the influence of Esaias very perceptibly The landscape is minute. Details of branching and foliage are given, and the landscape serves as a stage for genre scenes After 1625 these peculiarities gradually disappear Atmospheric effect in landscapes of cool tints is the principal object which van Goyen holds in view In buildings and water, with shipping near the banks, he sometimes has the strength if not the colour of Albert Cuyp

Van Goyen's work is seen to advantage at the Louvre, and in Berlin, Gotha, Vienna, Munich and Augsburg The National Gallery in London has seven of his works. Though he visited France once or twice, van Goyen chiefly confined himself to the scenery of Holland. One of his largest pieces is a view of The Hague, executed in 1651 for the municipality, and now in the town collection of that city. Most of his panels represent reaches of the Rhine, the Waal and the Maese. But he sometimes sketched the downs of Scheveningen, or the sea at the mouth of the Rhine and Scheldt, and he liked to depict the calm inshore, and rarely ventured upon seas stirred by more than a cooling breeze He painted winter scenes, with ice and skaters and sledges He produced little in partnership we can only instance the "Watering-place" in the gallery of Vienna, where the landscape is enlivened with horses and cattle by Philip Wouvermans More than 1,000 of van Goyen's pictures are catalogued by Hofstede de Groot As an etcher, van Goyen has bequeathed to us two rare plates

GOZO or **GOZZO,** an island of the Maltese group in the Mediterranean sea, second in size to Malta and similar in physique. It lies N W and 3¼ m from the nearest point of Malta, is of oval form, 8¾ m in length and 4½ m in extreme breadth, and has an area of nearly 25 sq m Its chief town, Victoria, formerly called Rabato (pop 1921, 5,219) stands near the middle of the island on one of a cluster of steep conical hills The prehistoric temple "Gigantia" is of the same type as Hagiar Kim in Malta but larger The estimated population in 1921 was 22,561

GOZZI, CARLO, Count (1720–1806), Italian dramatist, was born at Venice on Dec 13, 1720 At the age of sixteen he joined the army in Dalmatia; three years afterwards he returned to Venice, where he was reputed the wittiest member of the Granelleschi society, to which his satirical pieces had gained him admission This society aimed at preserving Tuscan literature pure and untainted by foreign influences Gozzi flouted the innovations of Pietro Chiari, but he also turned his wit against Goldoni and wagered that he could attract audiences by plays on the most puerile subjects His comedy, *Fiaba dell' amore delle tre melarancie,* was one of several slight and witty pieces based on fairy tales These pieces were praised by Goethe, Schlegel, Madame de Stael and Sismondi, and one of them, *Re Turandote,* was translated by Schiller and later made the subject of operas by Weber, Busoni and Puccini In his later years Gozzi wrote tragedies in which the comic element was introduced; he also copied Spanish models He died on April 4, 1806

His collected works were published under his own superintendence, at Venice, in 1792, in 10 volumes *See* Gozzi's own work, *Memorie inutili della vita di Carlo Gozzi* (3 vols, Venice, 1797, new ed, 2 vols, 1910), translated into French by Paul de Musset (1848), and into English by J. A Symonds (1889); and Magrini, *I tempi, la vita e gli scritti di Carlo Gozzi* (Benevento, 1883).

GOZZI, GASPARO, Count (1713–1786), brother of Carlo Gozzi, was born at Venice on Dec. 4, 1713. He married Luise Bergalli, who undertook the management of the theatre of Sant' Angelo, Venice, for which he provided the plays, chiefly adaptations from the French He published the *Gazzetta Veneta* and the *Osservatore Veneto* (1761, *seq*), modelled on Addison's *Spectator* and written in pure and graceful Italian His *Difesa di Dante* (1755), marked the beginning of the revival of the study of Dante. He died at Venice on Dec 26, 1786

Bibliography—Among his other works are· *Lettere famigliari* (1755), *Sermoni,* in blank verse His collected works were published at Venice, 1794–1798 *See* M A Vigho, *Gasparo Gozzi* (1916)

GOZZOLI, BENOZZO (more properly Benozzo di Lese di Sandro, called "Gozzoli" by Vasari) (1420–1497), Italian painter, born in Florence 1420, in the early part of his career assisted Fra Angelico, whom he followed to Rome and worked with at Orvieto In Rome he executed in Santa Maria in Aracoeli a fresco of "St Anthony and Two Angels" In 1449 he left Angelico, and went to Montefalco, near Foligno in Umbria In S Fortunato, near Montefalco, he painted a "Madonna and Child with Saints and Angels" and three other works One of these, the altarpiece, representing "St Thomas receiving the Girdle of the Virgin," is now in the Vatican gallery, and shows the affinity of Gozzoli's early style to Angelico's He next painted in the monastery of S Francesco, Montefalco, filling the choir with a triple course of subjects from the life of the saint, with various accessories, including heads of Dante, Petrarch and Giotto This work was completed in 1452, and is still marked by the style of Angelico, crossed here and there with a more distinctly Giottesque influence In the same church, in the chapel of St Jerome, is a fresco by Gozzoli of the Virgin and Saints, the Crucifixion and other subjects He remained at Montefalco (with an interval at Viterbo) probably till 1456, employing Mesastris as assistant Thence he went to Perugia, and painted in a church a "Virgin and Saints," now in the local academy, and soon afterwards to his native Florence, the headquarters of art By the end of 1459 he had nearly finished his important labour in the chapel of the Palazzo Riccardi, the "Journey of the Magi to Bethlehem," and, in the tribune of this chapel, a composition of "Angels in a Paradise" His picture in the National Gallery, London, a "Virgin and Child with Saints," 1461, belongs also to the period of his Florentine sojourn In 1464 Gozzoli left Florence for S Gimignano, where he executed some extensive works in the church of S Agostino, a composition of St Sebastian protecting the city from the plague of this same year, 1464, over the entire choir of the church, a triple course of scenes from the legends of St Augustine, from the time of his entering the school of Tagaste on to his burial, 17 chief subjects, with some accessories in the Pieve di S Gimignano, the "Martyrdom of Sebastian," and other subjects, and some further works in the city and its vicinity. Here he received undoubted co-operation from Giusto d'Andrea He stayed in this city till 1467, and from 1469 began, in the Campo Santo of Pisa, the vast series of mural paintings with which his name is specially identified He died in Pistoia on Oct 4, 1497, and was buried in San Domenico

The art of Gozzoli is pre-eminently attractive by its sense of what is rich, winning, lively and abundant; his colour is bright, vivacious and gay

See G Vasari, *Del Vite de' più eccellenti pittori,* Milanesi's edition, vol III (Florence, 1878–82); J Crowe and G B Cavalcaselle, *History of Painting,* vol III, B Berenson, *Florentine Drawings* (1903), Hugh Stokes, *B Gozzoli* (1906)

GRAAFF REINET, a town in the Cape Province of the Union of South Africa 32° 15′ S, 24° 32′ E Alt 2,463 ft Population (1921) 4,498 whites, 4,724 coloured It was founded by the Dutch in 1786, and named after the then governor of the Cape, C J van de Graaff, and his wife The town was built near the Sunday river, from which water is led to irrigate the gardens, and across which a large dam has been constructed just above the town to create a reservoir, capable of irrigating 17,000 ac of adjacent land The average annual rainfall is about 17 in The surrounding country is Karroo Veld, in the midst of which the town stands as an oasis. Most of the houses have their gardens, in which large quantities of fruit and vines and vegetables are grown. Water is

led along the streets in open furrows. The botanical gardens are well laid out. Graaff Reinet is lighted by electricity. The district produces considerable quantities of mohair and merino wool.

(R. U. S.)

GRABAU, AMADEUS WILLIAM (1870–), American palaeontologist, was born at Cedarburg, Wis., on Jan. 9, 1870, educated at the Massachusetts Institute of Technology (Sc.B., 1896) and Harvard (Sc.D., 1900). He served as assistant and instructor in palaeontology at the Massachusetts institute, 1892–97, was professor of geology at Rensselaer Polytechnic institute, Troy, N.Y., 1899–1901 and then entered the faculty of Columbia university as lecturer, 1901–02, adjunct professor, 1902–05 and professor, 1905–19, of palaeontology. In 1919 he became professor of palaeontology at the National university in Peking, China, and also chief palaeontologist of the Chinese geological survey. He accompanied the Third Asiatic Expedition of the American Museum of Natural History as research associate in palaeontology. The subjects of his special researches include *North American Index Fossils* (with H. W. Shimer, 1909–10), *Palaeozoic Corals of China* (1921); *Ordovician Fossils of North China* (1921); *Stratigraphy of China*, vol. I (1924–25); *Silurian Fossils of Yunnan* (1926).

GRABBE, CHRISTIAN DIETRICH (1801–1836), German dramatist, was born at Detmold on Dec. 11, 1801. He lived an extremely irregular life, and though both Tieck and Immermann tried to reform him, he died prematurely as a result of his excesses on Sept. 12, 1836. His tragic life provided the matter of a play by E. Johst, *Der Einsame* (1917) and a novel by P. Friedrich (1925). Many of Grabbe's dramas contain fine passages and a wealth of original ideas, though they are little suited to the requirements of the stage. The boldly conceived *Don Juan und Faust* (1829) and the historical dramas *Friedrich Barbarossa* (1829), *Heinrich VI.* (1830), and *Napoleon oder die Hundert Tage* (1831), the last of which places the battle of Waterloo upon the stage, are his best works.

Grabbe's works have been edited by O. Blumenthal (4 vols., 1875), E. Grisebach (4 vols., 1902) and by P. Zaunert (3 vols., 1910). *See* also K. Ziegler, *Grabbes Leben und Charakter* (1855), O. Blumenthal, *Beitrage zur Kenntniss Grabbes* (1875); C. A. Piper, *Grabbe* (1898).

GRACCHUS, in ancient Rome, the name of a plebeian family of the Sempronian *gens*. Its most distinguished representatives were the famous tribunes of the people, Tiberius and Gaius Sempronius Gracchus, mentioned below, usually called "the Gracchi."

GRACCHUS, GAIUS SEMPRONIUS (153–121 B.C.), younger brother of Tiberius, was a man of greater abilities, bolder and more passionate, although possessed of considerable powers of self-control, and a vigorous and impressive orator. When 20 years of age he was appointed one of the commissioners to carry out the distribution of land under the provisions of his brother's agrarian law. At the time of Tiberius's death, Gaius was serving under his brother-in-law Scipio in Spain, but probably returned to Rome in the following year (132). In 131 he supported the bill of G. Papirius Carbo, the object of which was to make it legal for a tribune to offer himself as candidate for the office in two consecutive years, and thus to remove one of the chief obstacles that had hampered Tiberius. The bill was then rejected, but appears to have subsequently passed in a modified form, as Gaius himself was re-elected without any disturbance. Possibly, however, his re-election was illegal, and he had only succeeded where his brother had failed. For the next few years nothing is heard of Gaius. Public opinion pointed him out as the man to avenge his brother's death and carry out his plans, and the aristocratic party, warned by the example of Tiberius, were anxious to keep him away from Rome. In 126 Gaius accompanied the consul L. Aurelius Orestes as quaestor to Sardinia, then in a state of revolt. Here he made himself so popular that the senate in alarm prolonged the command of Orestes, in order that Gaius might be obliged to remain there in his capacity of quaestor. But he returned to Rome without the permission of the senate, and, when called to account by the censors, defended himself so successfully that he was acquitted of having acted illegally. The disappointed aristocrats then brought him to trial on the charge of being implicated in the revolt of Fregellae, and in other ways unsuccessfully endeavoured to undermine his influence. Gaius then decided to act; against the wishes of his mother he became a candidate for the tribuneship, and was elected for the year 123.

Legislative Work.—The following is a summary of his legislation, apart from special measures aimed at his brother's opponents. He revived his brother's agrarian law, which, although it had not been repealed, had fallen into abeyance, and stabilised the price of corn in Rome. He founded the first over-sea colony at Iunonia, on the site of Carthage, with a citizen status. He also remodelled the voting system of the comitia centuriata in such a way as to reduce the influence of the aristocrats. A further group of laws aimed at strengthening the hands of the equites, to whom he gave the right to farm the taxes of Asia, and at the same time he provided that the members of the *quaestiones perpetuae*, which included the court that dealt with extortion in the provinces, should be drawn from the equites. These measures raised Gaius to the height of his popularity, and during the year of his first tribuneship he may be considered the absolute ruler of Rome. His legislation also involved him in an immense amount of administrative work, at which according to Plutarch he was very successful. Store-houses were built for the state-controlled corn (*Horrea Semproniana*), roads built and improved in the country districts to facilitate transport, and so on. He was chosen tribune for the second time for the year 122. To this period is probably to be assigned his proposal that the franchise should be given to all the Latin communities, and that the status of the Latins should be conferred upon the Italian allies. This proposal would have saved the Social War, but of course lost him favour with his own supporters, and the senate put up Livius Drusus to outbid him with proposals never meant to be carried out. On his return from superintending the organisation of his new colony he failed to secure the tribunate again, and the new consul, L. Opimius, at once proposed the abandonment of Iunonia. A riot during the voting resulted in Gaius being proclaimed a public enemy—the consuls were given plenary powers, and Gaius, who escaped over the Tiber, was found dead next day.

BIBLIOGRAPHY.—*See* Livy, *Epit.* 60; Appian, *Bell. Civ.* i. 21, Plutarch, *Gaius Gracchus;* Orosius v. 12, Aulus Gellius x. 3, xi. 10. For an account of the two tribunes *see* Mommsen, *Hist. of Rome* (Eng. trans.), bk. iv., chs. 2 and 3, C. Neumann, *Geschichte Roms während des Verfalles der Republik* (1881); A. H. J. Greenidge, *History of Rome* (1904), E. Meyer, *Untersuchungen zur Geschichte der Gracchen* (1894), G. E. Underhill, Plutarch's *Lives of the Gracchi* (1892), W. Warde Fowler in *English Historical Review* (1905), pp. 209 and 417, Long, *Decline of the Roman Republic*, chs. 10–13, 17–19, containing a careful examination of the ancient authorities; T. Lau, *Die Gracchen und ihre Zeit* (1854). There is a monograph by C. W. Nitzsch, *Die Gracchen und ihre nachsten Vorganger* (1847).

GRACCHUS, TIBERIUS SEMPRONIUS, consul in 238 B.C., defeated the Ligurians, and, at the conclusion of the Carthaginian mercenary war, was in command of the fleet which took possession of Sardinia.

GRACCHUS, TIBERIUS SEMPRONIUS, probably the son of the preceding. Consul in 215, during the second Punic War, he defeated the Capuans, and in 214 beat Hanno near Beneventum with the help of slave volunteers, fighting under promise of freedom. In 213 Gracchus was consul a second time and carried on the war in Lucania; in the following year, while advancing on Capua, he was betrayed by a Lucanian and trapped and killed by Mago.

GRACCHUS, TIBERIUS SEMPRONIUS (*c.* 210–151 B.C.), father of the tribunes, and husband of Cornelia. Although an opponent of the two Scipios (Asiaticus and Africanus), as tribune in 185 he was a member of the commission sent to Macedonia to investigate the complaints made by Eumenes II. of Pergamum against Philip V. of Macedon. In 181 he went as praetor to Hither Spain, where he was successful both as a soldier and administrator. Censor in 169, he was associated with the somewhat reactionary policy of his colleague Claudius Pulcher. They tried to curb the growing power of the capitalists (the equites), and restricted the political influence of the freedmen by confining them to the city tribes. He visited Asia as an ambassador in 165 and 161, and was consul again in 163.

GRACCHUS, TIBERIUS SEMPRONIUS (163–133 B C), son of the preceding, was the elder of the two great reformers He and his brother were brought up by their mother Cornelia, assisted by the rhetorician Diophanes of Mytilene and the Stoic Blossius of Cumae. In 147 he served under his brother-in-law the younger Scipio in Africa during the last Punic War, and was the first to mount the walls in the attack on Carthage Quaestor in 137, he served in the Numantine wars in Spain, and saved the army by concluding an agreement with the enemy, who consented to treat with him out of respect for his father's memory This agreement was repudiated by the senate

In 133 he was tribune, and championed the impoverished farmer class and the lower orders His proposals (*see* AGRARIAN LAWS) were, briefly, to recover all the State lands which had been acquired by prescription in excess of the amount allowed by the Licinian laws (500 jugera a head) and distribute them in inalienable allotments They met with violent opposition, and were not carried until he had, illegally and unconstitutionally, secured the deposition of his fellow-tribune, M Octavius, who had been persuaded by the *optimates* to veto them The senate put every obstacle in the way of the three commissioners appointed to carry out the provisions of the law, and Tiberius, in view of the bitter enmity he had aroused, saw that it was necessary to strengthen his hold on the popular favour The legacy to the Roman people of the kingdom and treasures of Attalus III of Pergamum gave him an opportunity He proposed that the money realized by the sale of the treasures should be divided, for the purchase of implements and stock, amongst those to whom assignments of land had been made under the new law

To strengthen his position further, Tiberius offered himself for re-election as tribune for the following year The senate declared that it was illegal to hold this office for two consecutive years, but Tiberius treated this objection with contempt To win the sympathy of the people, he appeared in mourning, and appealed for protection for his wife and children, and whenever he left his house he was accompanied by a bodyguard of 3,000 men, chiefly consisting of the city rabble The meeting of the tribes for the election of tribunes broke up in disorder on two successive days, without any result being attained, although on both occasions the first divisions voted in favour of Tiberius A rumour reached the senate that he was aiming at supreme power An appeal to the consul P Mucius Scaevola to order him to be put to death at once having failed, P Scipio Nasica exclaimed that Scaevola was acting treacherously towards the state, and called upon those who agreed with him to take up arms and follow him During the riot that followed, Tiberius was killed, and his body was thrown into the Tiber that night with 300 others A commission was appointed for the trial of his followers

See Livy, *Epit* 58; Appian, *Bell civ* i 9-17, Plutarch, *Tiberius Gracchus*, Vell Pat ii 2, 3.

GRACE, EDWARD MILLS (1841–1911), English cricketer, was born at Downend, near Bristol on Nov 28, 1841, and was an elder brother of William Gilbert Grace (*q v*) He was educated at Long Ashton, and studied medicine at the Bristol Medical School, and in Edinburgh In 1869 he settled at Thornbury, and practised there until his death on May 20, 1911

He was an enthusiastic cricketer, and was the first member of the family to become famous for his play He played first at Lord's in July 1861, for South Wales v. M C C, and by 1862 his reputation was established He played 12 times for the Gentlemen v Players from 1863 to 1869, and for the last time in 1886 From 1865 onwards, his two brothers W G and George Frederick (1850–80) became even more famous as cricketers, and in 1880 (Sept 6–8) the three brothers played together for England against Australia

GRACE, WILLIAM GILBERT (1848–1915), English cricketer, was born at Downend, Gloucestershire, on July 18, 1848. His father (Henry Mills Grace), his uncle (Alfred Pocock) and his elder brothers, Henry, Alfred and Edward Mills were enthusiastic cricketers; indeed, in E M Grace the family name first became famous A younger brother, George Frederick, also added to the cricket reputation of the family "W G" was endowed with a splendid physique as well as with powers of self-restraint and determination At the acme of his career he stood full 6 ft. 2 in., being powerfully proportioned, loose yet strong of limb He kept himself in condition all the year round, shooting, hunting or running with the beagles as soon as the cricket season was over. He was also a fine runner, 440 yd over 20 hurdles being his best distance; and it may be quoted as proof of his stamina that on July 30, 1866, he scored 224 not out for England *v* Surrey, and two days later won a race in the National and Olympian Association meeting at the Crystal Palace. The title of "champion" was well earned by one who for 36 years (1865–1900 inclusive) was actively engaged in first-class cricket In each of these years he was invited to represent the Gentlemen in their matches against the Players, and, when an Australian eleven visited England, to play for the mother country As late as 1899 he played in one of the five international contests; in 1900 he played against the Players at the Oval He held most "records" connected with the game, scoring over 100 runs on 121 occasions, and in seven seasons scoring over 1,000 runs and taking over 100 wickets Grace was one of the finest fieldsmen in England, and, at his best, a fine thrower, fast runner and safe "catch" By profession he was a medical man In later years he became secretary and manager of the London County Cricket club He was married in 1873 to Miss Agnes Day, and one of his sons played for two years in the Cambridge eleven He was the recipient of two national testimonials the first, amounting to £1,500, being presented to him in the form of a clock and a cheque at Lord's ground by Lord Charles Russell on July 22, 1879, the second, collected by the M C C, the county of Gloucestershire, the *Daily Telegraph* and the *Sportsman*, amounted to about £10,000, and was presented to him in 1896 He visited Australia in 1873–74 (captain), and in 1891–92 with Lord Sheffield's eleven (captain), the United States and Canada in 1872, with R A Fitzgerald's team He died at Eltham, Kent, on Oct 23, 1915

See F S A Cooper, *W G Grace, Cricketer* (1916), Lord Hawke and others, *The Memorial Biography of Dr. W. G Grace* (1919).

GRACE, a word of many shades of meaning, but in general connoting the idea of favour, whether that in which one stands to others or that which one shows to others The *New English Dictionary* groups the meanings of the words under three main heads (1) Pleasing quality, gracefulness, (2) favour, goodwill, (3) gratitude, thanks (Fr "grâce," Lat "gratia" from "gratus," beloved, pleasing, formed from the root "cra-," Gr χαρ-, *cf* χαίρω, χάρμα, χάρις).

In *religion* "grace" is a term describing an experience the basis of which is the sense of givenness in human life From one aspect this may be described as inspiration, from another as favour, from another as power, and from yet another as pity, but in all these cases the fundamental feature of the experience is man's perception that he is in touch with a wider Self from which there flow into him streams of rich, full energy Some of his greatest achievements seem to have come to him from outside himself, and he feels that, acting merely as a small self-dependent nucleus of consciousness, he could never have attained to them

Man has naturally tried to find a suitable word to describe this divine influx of energy Primitive peoples recognized its existence In Melanesia it is called *mana* (*q v*), and among some Indian tribes *manitou, orenda* and *wakonda* The Greeks called it sometimes ἀρετή, sometimes χάρις, and in the LXX and N T when pity is implied the word ἔλεος is used The Hebrews generally used חן as the equivalent of χάρις and חסד or "loving kindness" as the equivalent of ἔλεος

The distribution of this power has also to be explained The primitives regarded it as a quality or potency hovering between the personal and the impersonal, but more psychical than physical in character, permeating all things, but often concentrated in individual persons or things It is an indefinite reservoir of energy in the universe, on which man can draw for good or ill

All men, however, have not seemed to be equally under the influence of grace, and an explanation of this indisputable fact has had to be sought Some found it in the inscrutable character of the deity, who was held by them to bestow grace sportively or

capriciously, just like an oriental despot. But this conflicted with the gradually developing human conviction that any deity worthy of the name must be at least as good as the best human being; and so an explanation was found in the experience of the freedom of the will. All, it was held, were given sufficiency of grace, but only those who freely appropriated it showed its full effects.

Alongside of this conception of grace developed that of sin. This article is limited in scope by its title, but we are bound to consider the fact that in proportion as man's sense of guilt and failure increases (ἁμαρτία the N T word translated "sin"="missing of the mark") so there also increase his sense of helplessness and dire need of divine aid and his sense of his unworthiness and so of his inability to merit the loving self-outpourings of the Divine Being The conception of "grace" is therefore an inevitable concomitant of moral theism The positivist and determinist find with difficulty a place in their programme for grace and free will But the common-sense of the ordinary man revolts against the rigid conclusions of the determinist, and insists upon the reality of free will, and so upon the reality of grace.

In Christianity the conception of grace has developed proportionately to the richness of the experiences of Christian believers As the influence of the energising personality of God exercised on man, its definition has depended upon the nature of the beliefs held about God's personality and Character. Hence the wonderful richness and variety of the χαρισματα imparted to the Christian, believing himself, as he has always done, to be in touch with a deity whose character and influence are equivalent to those of the historical Jesus It must be admitted that the interpretation of Christian experience has been the subject of some controversy Thus it was debated whether after a single fall from grace a Christian could be reinstated (Novatianism, AD 251). It was also debated as to whether saving grace could be obtained outside the membership of the Church The largest single contribution to the answer of these questions was made by Augustine the Great (AD 354–430), Bishop of Hippo in Africa (*See* AUGUSTINE, SAINT) The experiences of his stormy youth and impressive conversion led him to lay tremendous stress on the irresistible power of God, and he therefore undervalued the importance of the co-operation of the free human will But he was led to do this by the sense of his own past wickedness, interpreted as evidence of the correctness of the meaning of the early chapters of the book of Genesis, *i e*, that the nature of every man is corrupted because of the original fall of Adam, so that man is not only of his own nature inclined to evil, but is now in such a condition that he cannot by his own natural strength and good works carry out the will of God. The dependence of the soul upon God seems to be a natural consequence of its origin, and the teaching of the Roman Catholic catechism is that we can do no good work of ourselves, but that we need the help of God's Grace This is also taught by the Church of England catechism

Pelagius, a native of Britain, a learned layman and a monk (a contemporary of Augustine), saw no safeguard for righteousness unless men recognised the complete freedom of the will and realised that they were accountable for their actions. Augustine in 417 secured the condemnation of Pelagius by means of an imperial decree, and this decision was afterwards confirmed in 431 at the Council of Ephesus The influence of Augustine, with his tendency to attribute arbitrary action to the deity, runs through the subsequent history of the Church In the 16th century Erasmus tended to take the side of Pelagius, Luther and to an even greater extent Calvin the side of Augustine Calvin in fact has seemed to insist that God predestines some to blessedness and some to damnation, and that man himself is so helpless and corrupt that all he can do is to take thankfully whatever grace and mercy may be dealt out to him. The so-called Arminian controversy was due to a reaction against this (A D. 1608) and an attempt was made to settle the dispute at the famous Synod of Dort 1618–19, the decrees of which decided that predestination only came in after the fall, and was not included in the eternal counsels of God.

Another difference of opinion arose as to the relation of grace to the sacraments. The Catholic view is that the sacraments are means by which grace is given, and its appropriation is held to depend on having the right disposition when receiving the sacraments. The Protestant view, aiming at the rejection of magic, has tended to regard the sacraments rather as symbols and pledges of grace already given, and the teaching and experience of Luther, that faith alone was needed in order to receive grace, was an immense simplification of life, though it was not carried to its logical conclusion by the earlier Protestants (except perhaps the Quakers) but was still linked up to the church system and its ordinances

In modern times the study of psychology has led to a clearer apprehension of the reality of grace, and of the lines along which the divine gift appears to operate. The notion that behind consciousness lies a large realm, to which various titles have been given, has suggested to some that grace is the inflow into consciousness (as it were through a mental sluice) of spiritual power which exists in the realm of the subconscious or super-conscious. The extension of Protestant principles has led many totally to discard sacraments, services and institutions as means of attaining grace, and to assert that the individual can find the power he needs ready to hand at all points in ordinary daily life On the other hand the last forty years have seen a considerable revival of Catholic sacramentalism, based often upon a pragmatic appeal

A final change in the conception of grace has resulted from the effect upon the belief in an original fall from righteousness produced by an independent study of the origin and development of the human species Those who totally discard the traditional belief are led sometimes to an exaggerated denial of the necessity of grace But the acceptance of its absolute necessity is independent of folk-lore The facts of past and present sin and corruption, and the humiliating spectacles of individual, national and racial deterioration, must prevent sober thinkers from indulging in the rash assumption that man is capable by himself, and without any aid from the Divine Spirit, either of developing or of regenerating his character.

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GRACES, THE, Greek goddesses of fertility The name (*cf.* Venus) refers to the "pleasing" or "charming" appearance of a fertile field or garden (Gr Χάριτες, Lat *Gratiae*) The number varies, sometimes only one Charis is mentioned, but usually they are three, Aglaia (brightness), Euphrosyne (joyfulness), Thalia (bloom)—daughters of Zeus and Hera (or Eurynome, daughter of Oceanus), or of Helios and Aegle. At Sparta there were two, Kleta and Phaenna; at Athens two, Auxo and Hegemone, associated with Agraulos in the ephetic oath Frequently they are taken as goddesses of charm or beauty in general, hence as associated with Aphrodite, Peitho, Hermes, the union of Hephaestus with Charis in the *Iliad* is probably a mere allegory (Craftsmanship weds Beauty). In works of art they were represented in early times draped, later as nude female figures In Latin the name was translated Gratiae (Graces)

See the articles in Roscher's *Lexikon der Mythologie*, and in Daremberg and Saglio's *Dictionnaire des antiquités* (with useful bibliography)

GRACIÁN Y MORALES, BALTASAR (1601–1658), Spanish prose writer and Jesuit. His principal works are *El Héroe* (1637); the *Arte de ingenio, tratado de Agudeza* (1642), a system of rhetoric in which the principles of *conceptismo* as opposed to *culteranismo* are inculcated; *El Discreto* (1646), a delineation of the typical courtier; *El Oráculo manual y arte de prudencia* (1647); and *El Criticón* (1651–53–57), an ingenious philosophical allegory of human existence

See Karl Borinski, *Baltasar Gracián und die Hoflitteratur in Deutschland* (Halle, 1894); Benedetto Croce, *I Trattatisti italiani del "concettismo" e Baltasar Gracian* (Napoli, 1899); A. Coster, "Baltasar Gracián, 1601–58," *Revue Hispanique*, xxix., pp. 347–752 (1913); A F. G Bell, *Baltasar Gracián* (1921).

GRACKLE, a word applied to certain birds of the family *Sturnidae* in the Old World and of the *Icteridae* in the New. The former include the mynas of India and adjacent countries, es-

pecially *Gracula religiosa,* which is some 10in long and has a black iridescent plumage, a white patch on the wing and yellow wattles behind the eyes, the bill is orange, the legs yellow, and the bird, which inhabits southern India, is frugivorous It can be taught to talk Allied species occupy Ceylon, Burma and Malay.

The American grackles belong to the genera *Euphagus, Megaquiscalus* and *Quiscalus.* The best known are the rusty blackbird or rusty grackle, *E carolinus,* found all over North America, and *Q. quiscula,* the purple grackle east of the Rocky mountains



BY COURTESY OF THE NATIONAL ASSOCIATION OF AUDUBON SOCIETIES

THE AMERICAN GRACKLE, COLOURED PURPLE AND BRONZE, WITH METALLIC TOUCHES OF GREEN AND BLUE

GRADO, an island of the province of Trieste, Italy, 4 m from Belvedere Pop. (1921) 5,219 The inhabitants of Aquileia took shelter there in 452 and 568 and the patriarchate of Grado began in 557–569 and continued till 1451 when it passed to Venice The cathedral was rebuilt in 571–586, it has a fine mosaic pavement.

GRADUAL, advancing or taking place by degrees or step by step; hence used of a slow progress or a gentle declivity or slope, opposed to steep or precipitous As a substantive, "gradual" is used of a service book of the Roman Catholic Church containing certain chants, called "graduals," sung at the service of the Mass after the reading or singing of the Epistle For the so-called Gradual Psalms, cxx–cxxxiv, the "songs of degrees," LXX, *ὠ δαὶ τῶν ἀναβαθμῶν*

GRADUATE (Med Lat *graduare,* to admit to an academical degree, *gradus*), in Great Britain a verb now only used in the academical sense intransitively, *i e*, "to take or proceed to a university degree," and figuratively of acquiring knowledge of, or proficiency in, anything The original transitive sense of "to confer or admit to a degree" is, however, still preserved in America, where the word is, moreover, not strictly confined to university degrees, but is used also of those successfully completing a course of study at any educational establishment As a substantive, a "graduate" (Med Lat *graduatus*) is one who has taken a degree in a university Those who have matriculated at a university, but not yet taken a degree, are known as "undergraduates" The word "student," used of undergraduates, *e g*, in Scottish universities, is never applied generally to those of the English and Irish universities At Oxford the only "students" are the "senior students" (*i e*, fellows) and "junior students" (*i e*, undergraduates on the foundation, or "scholars") of Christ Church The verb "to graduate" is also used of dividing anything into degrees or parts in accordance with a given scale For the scientific application *see* GRADUATION below It may also mean "to arrange in gradations" or "to adjust or apportion according to a given scale" Thus by "a graduated income-tax" is meant the system by which the percentage paid differs according to the amount of income on a pre-arranged scale

GRADUATION. There are few advances or refinements in the exact sciences which have not depended considerably on corresponding refinement in linear or angular measurement

Graduation, or "dividing," as it is usually called, is the art of dividing straight lines, circular arcs, or whole circumferences into any required number of equal parts It is the most important and difficult part of the work of the mathematical instrument maker

According to Shuckburgh, from the time of Hipparchus and Ptolemy to that of Copernicus in the beginning of the 16th century, few astronomical observations can be depended on to within less than 5 to 10 minutes of arc, those of Tycho Brahé (1546–1601) being reliable to within one minute The errors of Hevelius's 6-foot sextant (middle 17th century) might amount to 15 or 20 seconds of arc, Flamsteed's sextant to 10 or 12 seconds, and Graham's 8-foot mural quadrant, used by Bradley from 1742, to 7 or 8 seconds

There is still no such thing as a perfectly graduated circle in existence A fair indication of the present state of progress towards this ideal may be found in the fact that it is possible to produce circles of 12 inches diameter divided into very many nearly equal parts by divisions none of which is out of its true position by more than two seconds of arc Graduation may be considered under three heads, viz, original graduation, hand copying, and machine graduation performed by a dividing engine

Original Graduation.—The original graduation of a straight line may be performed either by continual bisection or by stepping In continual bisection the entire length of the line is first laid down Then, as nearly as possible, half that distance is taken in the beam-compass and marked off by faint arcs from each end of the line Should these marks coincide the exact middle of the line is obtained If not, as will almost always be the case, the distance between the marks is carefully bisected by hand with the aid of a magnifying glass The same process is again applied to the halves thus obtained, and so on in succession, till the desired divisions are reached In stepping, the smallest division required is first taken as accurately as possible by spring dividers, and that distance is then laid off by successive steps from one end of the line The division of circular arcs is essentially the same in principle as the graduation of straight lines

The foundation of the Royal Observatory at Greenwich, and the increasing demand for more accurate determination of the positions of the heavenly bodies, induced great advances in the art of graduation In England, outstanding amongst those who made definite contributions to these advances from the late 17th to the early 19th century, are Abraham Sharp (1651–1742), Thomas Tompion (1639–1713), George Graham (1673–1751), Jonathan Sisson (*c* 1690–1747), Jeremiah Sisson (*c* 1715–*c* 1780), John Bird (1709–1776), John Smeaton (1724–1792), Jesse Ramsden (1735–1800), John Troughton (*c* 1747–*c* 1790), Edward Troughton (1753–1835), Thomas Jones (*c* 1780–*c* 1840), and William Simms (1793–1860)

The first example in which the method of performing the graduation is described in detail is the 8-ft mural circle graduated by George Graham for Greenwich Observatory in 1725 In this two concentric arcs of radii 96 85 and 95 8 in respectively were first described by the beam-compass On the inner of these the arc of 90° was to be divided into degrees and 12th parts of a degree, while the same on the outer was to be divided into 96 equal parts and these again into 16th parts The reason for adopting the latter was that 96 and 16 being both powers of 2, the divisions could be obtained by continual bisection alone (which in Graham's opinion was the only accurate method), and would thus serve as a check upon the accuracy of the divisions of the inner arc With the same distance on the beam-compass as was used to describe the inner arc, laid off from 0°, the point 60° was determined With the points 0° and 60° as centres successively, and a distance on the beam-compass very nearly bisecting the arc 60°, two slight marks were made on the arc; the distance between these marks was divided by the hand aided by a lens, and this gave the point 30° The chord of 60° laid off from the point 30° gave the point 90°, and the quadrant was now divided into three equal parts Each of these parts was similarly bisected, and the resulting divisions again trisected, giving 18 parts of 5° each Each of these quinquesected gave degrees, the 12th parts of which were arrived at by bisecting and trisecting as before The outer arc was divided by continual bisection, and a table was constructed by which readings of the one could be converted into those of the other

After the dots indicating the required divisions were obtained small arcs were drawn through them by the beam-compass having its fixed point somewhere on the line which was tangent to the quadrantal arc at the point where a division was to be marked

The next important example of graduation was performed by Bird in 1767 His quadrant, which was also of 8-ft radius, was divided into degrees and 12th parts of a degree Bird computed the chords of certain arcs, so that when taken from an accurate scale of equal parts (previously constructed by him, employing continual bisection), and marked on the quadrant in their proper order, he obtained the point 85° 20′ = 1,024 × 5′. As 1,024 is equal to the tenth power of 2, he was able to obtain 5′ by continual bisection of this arc

The Duc de Chaulnes published in 1768 a method of dividing in which greater accuracy was obtainable by replacing the points of a pair of beam compasses by two micrometer microscopes. These microscopes, having cross wires in the foci of their eye-glasses were fixed to a frame, and several pieces of brass with divisions on them could be temporarily secured by wax as required, to the circle to be divided; these were used as trial divisions. The microscopes were first fixed as nearly as possible at opposite ends of a diameter of the circle to be divided, and a trial division placed under each, so that the intersection of the cross wires in each case was coincident with the middle of the division when viewed through the microscope. By repeatedly turning the circle half round, and by slight adjustment of the position of one microscope and one trial division, positions were obtained which were exactly diametrically opposite A cutting point was then placed over one division and a fixed microscope over the other, so that when any division was brought to bisect the cross wires in the microscope, the cutting point made one diametrically opposite. By a process of trial and adjustment with bisections and trisections, the circle was divided into spaces of 10°, then by obtaining the arc of 9°, by trial on the arc of 180°, the circle could be divided into spaces of 1°, or by similar means into smaller spaces

In the first stages of an original graduation, Ramsden used beam compasses as employed by Bird Micrometer microscopes were then used as in the method of the Duc de Chaulnes to measure the errors in the positions of the dots Corrections were made by pressing the dots backwards or forwards by hand, with a fine conical point This method, known as "coaxing," is capable of a great degree of accuracy, but is extremely tedious.

Ramsden's original graduation of the wheel of his dividing engine (described later) was as follows —It was divided with the greatest exactness of which he was capable, first into 5 parts, and each of these into 3, these parts were then bisected 4 times Supposing the whole circumference of the wheel to contain 2,160 teeth, this gave successively spaces corresponding to 432, 144, 72, 36, 18 and 9 teeth. To check the accuracy of these, he divided another circle (one-tenth of an inch within the first one), by continual bisections, giving 1,080, 540, 270, 135, 67½ and 33¾. Not finding any sensible differences as observed by means of a fixed radial thin silver wire and magnifying lens, he used the former set of divisions for reference in ratching the edge of the wheel

The method of original graduation adopted by Edward Troughton is fully described in the Philosophical Transactions for 1809, as employed by himself to divide a meridian circle of 4 ft diameter, made for Stephen Groombridge, and now preserved in the Science Museum. The circle was first accurately turned both on its face and its inner and outer edges A roller was next provided, of such diameter that it revolved 16 times on its own axis while made to roll once round the outer edge of the circle The roller, after having been properly adjusted as to size, was divided as accurately as possible into 16 equal parts by radial lines near the edge. While the frame carrying the roller was moved once round along the circle, the points of coincidence of the roller-divisions with the circle were accurately observed by two microscopes attached to the frame, one of which commanded the ring on the circle near its edge, which was to receive the divisions, and the other viewed the roller-divisions The points of contact thus ascertained were marked with faint dots, and the circle thereby divided into 256 very nearly equal parts.

From observations by means of two microscopes a table of errors in the positions of these dots was prepared The last part of Troughton's process was to employ them in cutting the final divisions of the circle, which were to be spaces of 5′ each The mean interval between any two dots is $360°/256 = 5' \times 16\frac{7}{8}$, and in the final division, this interval must be divided into $16\frac{7}{8}$ parts This was accomplished by means of an instrument called a sub-dividing sector

Troughton estimated (1809 paper) that 13 days of eight hours each would be well employed in dividing a 4-ft circle by his own method, and 52 days by Bird's method; whereas the method by adjustment supposing every dot to be tried, and that two-thirds of them wanted adjusting, would require approximately 150 days

Copying.—In copying a linear scale the pattern and scale to be divided are first fixed side by side, with their upper faces in the same plane. The dividing square, resembling an ordinary joiner's square, is then laid across both, and the point of the dividing knife dropped into the division of the pattern. The square is now moved up close to the point of the knife; and, while it is held firmly in this position by the left hand, the corresponding division on the work is made by drawing the knife along the edge of the square with the right hand

In copying circles use is made of the dividing plate This is a circular plate of brass, three feet or more in diameter, carefully graduated near its outer edge The work to be graduated is centred and clamped to the dividing plate, and by setting a radial straight-edge to any required division on the dividing plate, the corresponding division on the work is cut by drawing the dividing knife along the straight-edge.

Machine Graduation.—Henry Hindley of York, about 1739, constructed a small engine for cutting the teeth in clock wheels, and for dividing instruments. In this he used the roller method for the original division of the dividing plate, which was actuated by an endless screw

In 1766 Jesse Ramsden had made his first dividing engine, with a dividing plate 30 inches in diameter. Though this engine gave more accurate results than the ordinary dividing plate method, and was good enough for dividing the circle of the common surveying instruments, it was not sufficiently accurate for nautical instruments used in the determination of position In 1775 Ramsden had completed his second and very much better engine A sextant divided by it was examined by Bird, who reported favourably on it For his invention Ramsden received £615 from the Commissioners of Longitude on condition that he would divide sextants and octants for the trade at the rate of 6s per sextant and 3s per octant, also that he should instruct a certain number of persons (not exceeding ten) in the method of making and using the engine, during the period 28th October 1775 to 28th October 1777, the engine to become the property of the Commissioners.

Jesse Ramsden's engine consists of a horizontal wheel or plate 45 inches in diameter, which turns on a vertical axis, its outer edge is ratched or cut into 2,160 teeth, into which an endless screw gears The downward stroke of a treadle turns the screw through any portion of a revolution as fixed by the setting of suitable mechanism By means of a free wheel on the worm axis, the upward stroke of the treadle leaves the worm stationary The circle to be divided is centred and fixed securely to the horizontal plate of the engine, and after each downward stroke of the treadle a division is cut by hand, the cutting point being carried in a frame (invented by Hindley) which allows only a radial to-and-fro motion of the point One forward revolution of the screw advances the wheel through 10 minutes of arc A brass plate on the screw arbor is divided into 60 parts, so that one division of this corresponds to 10 seconds of arc on the wheel In cutting the teeth on the wheel, the first light marks were made for the whole circle by a series of 240 operations, in each of which the space corresponding to 9 teeth was dealt with by 9 turns of the endless screw, the divided circle being referred to at the commencement of each operation so as to eliminate any slight errors which may have occurred during the previous operation The whole series of operations was repeated three times round, to make the impression of the screw deeper The wheel was then ratched round continuously about 300 times, until the teeth were finished As the screw in ratching had continually hold of several teeth at the same time, and these continually changing, the inequalities of the teeth soon corrected themselves, and the teeth were reduced to what Ramsden described as "a perfect equality."

This engine was used continuously by Ramsden until his death in 1800 Since that time it has been in the possession of several dividers, and is now in the U S National Museum at Washington, together with his original machine by which the endless screw of the dividing engine was cut. Ramsden also constructed a linear

dividing engine on essentially the same principle, a straight rack taking the place of the notched rim of the circular plate

In 1778 John Troughton completed an engine which had occupied him three years. It was in general construction like that of Ramsden, but according to Edward Troughton it was thought to be superior in point of accuracy. Writing in 1830, he states. "The excellent engine of my late brother being fully four feet in diameter gave the operator, when at work near the centre, a position so painful, that it had done no good to either his health or my own, and has materially injured that of a worthy young man then my assistant, it was evident that, by making one of smaller dimensions, this evil would in a great measure be removed, and I foresaw that by employing my own method of original dividing from which to rack the plate, a considerable reduction might be effected without any sacrifice to accuracy I also perceived, that by contriving the parts with more simplicity than Ramsden had done, I could get through the work at less than two-thirds of the labour and expense. Such were my motives for making an engine and the work was accomplished in the year 1793" The description of the engine was published only in 1830 The engine was driven by a treadle and the divisions were cut by hand, as in Ramsden's engine The circle is 34 inches in diameter, the worm has 20 threads to the inch, and the edge of the plate is ratched into 2,160 teeth

In Troughton's dividing engine and those of Ramsden's construction the operator could cut about 24 divisions per minute and could continue at this rate for hours, allowing for slight interruptions In one minute as many as 30 divisions could be cut, but this rate could not be maintained

In 1826 William Simms went into partnership with Troughton, who retired from business in 1831 and died in 1835 In 1843 Simms had completed his own dividing engine, which he described before the Royal Astronomical Society in 1843 The plate was 46 inches in diameter and divided with extreme care on a ring of silver into 4,320 divisions, adopting Troughton's method with some modifications A single cutter, mounted in the endless screw frame, was used for ratching the edge of the plate, and as each of the 4,320 divisions in order was brought to coincide with the wires of a powerful microscope, the cutter was entered, and three circulations of the engine plate completed the work Mr Simms, in his paper, states —"I was not without hope that the teeth on the edge would by this means be cut as truly as the original divisions themselves, and this expectation has, I believe, been fully realised"

A new, important feature in this engine was the mechanism by which the engine became self-acting When first used, it was driven by means of a descending weight in an open court adjoining the room in which the engine was placed, later on, it was driven from an overhead shaft by a belt in the usual way

The original Troughton engine of 1793 with self-acting mechanism added by William Simms, appeared probably not long after Simms' larger engine had been made The wooden stand, the worm mechanism, and the large circle were made by Troughton in 1793 The casting seen on the left, with its wheelwork, the tracelet frame, and cam mechanism for moving the cutting knife up and down, and for regulating the length of cut, are due to Simms. This engine was in use almost continuously from 1793 until recent years, though it has been superseded for more accurate division by later and better engines constructed by Troughton and Simms During the latter part of its existence it has not been used for graduating instruments reading to a greater accuracy than one minute of arc

The re-graduation by hand of the two circles 30 and 24 inches in diameter of the Westbury altitude and azimuth circle made by Edward Troughton, which was performed by Simms in 1823, occupied nearly twelve weeks of six eight-hour days a week. By means of his automatic dividing engine (1843), after some five hours necessary for setting up the circles on the engine, the actual graduation would have been performed in about five hours

Modern Dividing Engines.—In fundamental design and principle of action the automatic dividing engine constructed by George W Watts in 1905 resembles the engine of William Simms. There are two sets of teeth on the edge of the wheel, one having 4,320 teeth and the other 2,160

After the circle to be graduated has been exactly centred and clamped upon the revolving wheel, the action of the engine is entirely automatic The main frame, in which the revolving table moves, is of cast iron; the revolving table and its spindle are of phosphor bronze, and weigh about 5 cwt, the whole engine weighing about 2 tons The original graduation into 4,320 equal divisions, which occupied five months, was made on three rings of silver inlaid on the top face near its outer edge The graduations, successively made on circular lines cut on these silver rings, were re-cut from tables of errors many times, until the maximum error of any one division did not exceed 0 6 of a second From the final graduations the teeth on the edge of the revolving table were cut one by one To avoid undue stress of the metal, and to maintain the keen edge of the V cutter, several cuts were taken, and the accuracy was checked by taking the mean of seven micrometer readings before each tooth was cut The whole process of cutting the teeth occupied five weeks, care being taken to keep the temperature constant and uniform throughout the specially constructed room in which the operations were carried out The machine is capable of graduating circles from 3 inches to 4 ft 6 in in diameter

Dividing engines of different designs for both circular and linear graduation are manufactured in considerable numbers at Geneva by the Société Genevoise d'Instruments de Physique The machines designed and made for laboratory use can engrave lines either *fine* grade, 0 05 to 0 15 mm (0 002″ to 0 006″) in thickness, or microscopic grade, 0 002 to 0 005 mm (0 0001″ to 0 0006″) in thickness to a guaranteed accuracy of 0 002 mm. (0 0001″) for linear machines and ±1 second of arc for circular machines The largest and most accurate of the circular dividing engines are 1 metre in diameter and the guaranteed accuracy is ±1 second of arc An automatic correcting device is provided to compensate the slight errors existing in the spacing of the teeth on the periphery of the dividing wheel In a larger machine, 2 metres in diameter, specially designed for use in gun factories, the accuracy is ±1·5 seconds

In the automatic machines for workshop use, lines may be ruled either of medium or coarse grade, 0 1 to 0 2 mm (0 004″ to 0 008″) in thickness to a guaranteed accuracy of ±0 010 mm (0 0004″) for linear machines, and ±1·5 to ±3·0 seconds of arc for circular machines, at a rate of 80 to 200 lines per minute

The high precision linear dividing engines are provided with a temperature compensation device which produces the same effect as if the pitch of the leading screw were varied by the small amount necessary to produce the correct compensation

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GRADUS, or GRADUS AD PARNASSUM (a step to Parnassus), a Latin (or Greek) dictionary, in which the quantities of the vowels of the words are marked Synonyms, epithets and poetical expressions and extracts are also included under the more important headings, the whole being intended as an aid for students in Greek and Latin verse composition. The first Latin gradus was compiled in 1702 by the Jesuit Paul Aler (1656–1727), a famous schoolmaster. There is a Latin gradus by C D. Yonge (1850), English-Latin by A C. Ainger and H. G Wintle (1890), Greek by J. Brasse (1828) and E. Maltby (1815), bishop of Durham

GRAECO-PERSIAN WARS, 546–466 B C The great Assyrian kingdom which had ruled and terrorized Asia for centuries came to an end with the fall of Nineveh in 612 B C Of it the Greeks knew little or nothing Only the Greeks of Cyprus had come into contact with it, and that only on one brief occasion It had never ruled within the peninsula of Asia Minor

For half a century after the fall of Nineveh the old dominions of Assyria were divided between two Powers, the Median and Babylonian kingdoms The Median monarchy conceived ambitions beyond the Taurus, so that a war arose between it and Lydia, which was brought to a practical, though not formal, conclusion by that strange incident on the Halys in 585, when the armies, prepared for battle, withdrew from the unfought fight in consequence of an eclipse of the sun Freed from danger from the east, Lydia turned her attention westwards, and in the next 40 years brought into subjection those Greek cities of the Asiatic coast of the Aegean on whose liberties the Lydian kings had been making desultory attacks for more than a century past

Rise of Cyrus.—The independent kingdom of Media had lasted little more than half a century when there came a change of dynasty within it, a change which seems, judging from the contemporary records of Nabonidus, king of Babylon, to have been little more than a domestic matter. The history of the next two centuries makes it almost certain that the Persians in the southwest of modern Persia were either a Median tribe or of a race near akin to the Medes In 532 Cyrus the Persian king of Anshan, a part of Elam, revolted and set himself up as ruler of the Median kingdom Lydia and Babylonia got alarmed at his vigour and success, and concluded an alliance which aimed at checking, or even suppressing, Cyrus Of that alliance he got wind, so about 546 he made an attack on Croesus of Lydia which ended in the capture of Sardes, the fall of the Lydian kingdom, and the passing of the continental Greeks of the Asiatic coast under Persian dominion

The fall of Lydia made a great impression on the Greek world, for it had loomed large as an oriental empire in contrast to the small and comparatively poor States of Greece

Of the relations between the Persians and the Greeks during the later part of the reign of Cyrus and during the reign of his successor Cambyses but little is known The islands of the eastern Aegean, with the exception of Samos, seem to have fallen early under Persian rule

A certain Polycrates ruled at Samos as tyrant for some years, and used the wealth he acquired in trade in carrying out some great architectural and engineering works But about 424 he fell into the hands of the Persians and was put to death In 516 a Persian force captured the island Thus Persian rule now extended to a line drawn north and south through the middle of the Aegean Cambyses had died in 522, and had been succeeded by a pretender who was slain by certain Persian nobles, of whom the leader, Darius, succeeded to the throne

Reign of Darius.—Everything that is known of him suggests that Darius was one of the greatest men that the ancient world produced, at least capable—perhaps great—as a commander in war, and in peace a ruler and organizer such as the world was never to see till the days of Augustus. The system of government which he established is all the more remarkable because it is in strong contrast with the crude and often barbarous methods of government which races ruling before him in the East had applied to the peoples which they had brought into subjection; for it was a system which recognized the wisdom, if not the justice, of respecting the rights of subjects of various races, and of allowing them as much local freedom as was consistent with the calls which the interests of the empire as a whole made upon them The Greek cities were left with considerable local autonomy under tyrants of their own race, who were indeed agents of Persia, but do not seem to have been harsh in their rule. Tribute had to be paid; but not even the Greeks themselves ever alleged that it was a crushing burden They had also in time of war to provide military and naval contingents for the Persian forces But, however lightly the hand of Persia lay upon them, the Greeks of Asia, being Greeks, resented any form of subjection which circumscribed their political freedom

Scythian Expedition.—Either before or after Darius' accession the Persians had acquired two *têtes-du-pont* in Europe, the Thracian Chersonese (Gallipoli peninsula), and Byzantium. This may have signified nothing more than a desire to control the narrow passages of the Hellespont and Bosporus But somewhere about 512 Darius took a step which has seemed to some writers, ancient and modern, to have signified a deliberate policy of extending the empire into Europe This is what is known as the Scythian expedition For this incident Herodotus is the chief authority among ancient writers, though Ctesias and Strabo contribute matter of importance. The outstanding element in the ancient tradition is that the expedition was directed against the Scyths Darius may have wished to teach that people the lesson that they must keep their hands off Asia and Asiatic kingdoms It was much easier to attack the Scyths through Thrace than through the twofold barrier of the Armenian mountains and the Caucasus

Misled, it would seem, by exaggerated reports of some disaster having overtaken the Persians in Scythia, the Greek cities of the Propontis region, which had submitted to Darius on his march northwards, revolted, so, when Darius himself returned to Asia, he left Megabazus in Europe to deal with those towns Herodotus represents him as having subdued all Thrace, a statement inconsistent with the story of some years later, nor is the story of Macedonia having given the earth and water of submission at this time quite free from suspicion The only element in the story of this aftermath of the Scythian expedition which lends colouring to the Greek conception of its having been preparatory to a future advance into Europe, that is to say, against Greece, is the tale of what happened at Myrcinus That leads to the next act in the Perso-Greek tragedy—the Ionian revolt

A certain Histiaeus, tyrant of Miletus, had been rewarded for his services in the Scythian expedition by the grant of Myrcinus, a town which commanded the narrow route along the north Aegean coast which was practically the only line of communication from the Hellespont region westwards When he proceeded to fortify this place the suspicions of Megabazus were aroused Representations made by him to Darius caused the latter to recall Histiaeus and to take him with him to Susa, where he would be out of mischief Histiaeus did not like detention at Susa, and was anxious to get back to his own people But, before he took any measures to bring about his return, certain other events of great significance in the relations between Persia and Greece took place

Political Movements at Athens.—In 510 the Athenians, aided by the Spartans, had expelled the tyrant Hippias, who had alienated the sympathies of Sparta by making an alliance with its sworn foe Argos The expulsion of the tyrant Hippias was followed by a struggle at Athens between the oligarchs, or, more probably, the conservative[1] element and the extreme democrats, in

[1]The term "conservative" in relation to Athenian politics will be used hereafter to denominate the moderate democrats at Athens together with the oligarchs, who voted with the moderates because the oligarchical vote was too small to carry any policy.

which Sparta intervened in a half-hearted and ineffective way on behalf of the former, a half-heartedness due to the fact that a strong party at Sparta was opposed to incurring obligations abroad which might keep Spartan troops away from home; and events at Athens had shown that an oligarchy could only be maintained by something like permanent military support from Sparta. But to the democrats it seemed as if they had to face political foes who were backed by the strongest military power in Greece, against which no alliance with any other Greek State would be of effective value Thus they turned to Persia for support, having no suspicion that Persia had any designs on the Greeks in Europe. An embassy was sent to Artaphernes, the satrap of Sardis, asking for an alliance. He demanded earth and water from the envoys, which they gave, evidently under the impression that it was part of the contract of alliance Artaphernes did not regard it in that light, but assumed that the Athenians had accepted subjection to the Great King Not till the time of Marathon were the Athenians undeceived on this point. The date of this embassy is not known, but it must have been about 507 Matters became complicated a year or two later when Artaphernes took up the cause of the exiled Hippias, and demanded of the Athenians that they should receive him back as tyrant The Athenian democrats who had expelled him had to swallow that bitter pill as the price of the continuance of the supposed alliance, for politics at Athens were finely balanced

The Ionian Revolt.—Such was the position when Histiaeus at Susa found means of intervening in the affairs of the Greek cities of the Asiatic coast His hope was that if Persia had trouble in those parts he might be sent down to settle it It is evident, however, from incidental references in Herodotus' account of the preliminaries to the Ionian revolt that, before Histiaeus moved, a conspiracy had been formed The prime mover in the matter was a certain Aristagoras, a cousin and son-in-law of Histiaeus, and his successor in the tyranny of Miletus Certain exiles from Naxos applied to him for help against political opponents The main difficulty of the conspirators would be the question of getting together at the outset of the revolt such a force as could cope successfully with the Persian fleet To the astute Aristagoras the affair of Naxos afforded such an opportunity, for, if Artaphernes could be induced to take up the matter, he would almost certainly mobilize an Ionian Greek fleet Artaphernes was quite ready to add Naxos to the empire of the Great King, and did mobilize the Greek fleet, whereon someone—almost certainly Aristagoras—warned the Naxians of what was impending and they, being prepared, beat off the attack Aristagoras came back with the fleet, apparently a disgraced man, but, in fact, a man who had got what he wanted Just about that time, says Herodotus, he received from Histiaeus at Susa a message tattooed on the head of a slave urging revolt The first act of Aristagoras and the conspirators was to seize certain tyrants who were on the fleet and to depose the rest This must have taken place in the autumn of 499 Then Aristagoras went off to Greece to get help Sparta refused assistance, but at Athens, where the conservatives were for the moment controlling affairs, he was offered help The story of the revolt, as told by Herodotus, shows that it was a brave venture bravely carried out; it took all the power of Persia six years to suppress the effort.

In the spring of 498 twenty ships from Athens and five from Eretria in Euboea arrived on the Asiatic coast The hoplites which they brought over seem to have taken part in a march on Sardes, which was partly taken. The danger to Sardes, so Plutarch says, forced Artaphernes to raise the siege of Miletus and come to the rescue of his capital The Greeks had to fall back to the sea, and were, according to Herodotus, badly defeated near Ephesus Subsequent events suggest that he exaggerated the disaster Be that as it may, the Athenian fleet sailed home shortly afterwards, recalled, it may be presumed, by the democrats who had once more got control of affairs So the year closed for the rebels They opened the next year 497 by sending their fleet to Byzantium and winning it and the cities of the Propontis over to their side The absence of the Persian fleet from Herodotus' story of the revolt up to this time is perhaps to be explained by a story preserved by Plutarch to the effect that the Ionians had defeated that fleet in a battle off the Pamphylian coast. This had probably taken place in the summer or autumn of 498, and it would account for the unimpeded action of the Ionian fleet in 497

The news of the revolt of Ionia had stirred the Cypriote Greeks to action The Greeks proceeded to attack Amathus, the stronghold of the Phoenician minority in the island Onesilus, the leader of the revolt, sent urgent messages to the Ionians for help. Before coming to the aid of the Cypriote Greeks the Ionian fleet brought about the revolt of Caria, a formidable addition to the resources of the rebels The Hellespontine and Carian ventures must have taken some time, so that it is not possible to put the arrival of the Ionian fleet at Cyprus earlier than the late summer of 497 In a sense it arrived too late, for a Phoenician fleet had shipped a Persian force over to the island, and, though the fleet gained another naval victory over the Phoenicians, treachery in the Greek land force led to disaster, and by the beginning of 496 the island was again in the hands of the Persians

After the recapture of Cyprus by the Persians the chronology of the revolt, always shadowy, vanishes for some years into thin air One thing seems certain—that the spread of the revolt in 497 must have called for great efforts on the part of Persia It was not till 496 that Persia was ready In the earlier half of that year Daurises seems to have subdued the Asiatic side of the Propontis The Greeks on the European side and the Thracians behind them seem to have thrown off whatever allegiance they had had to Persia at the time when north-west Asia Minor revolted Caria, with a population which had apparently for some centuries past made a living by fighting the battles of others, was a much more serious problem for Persia Three great battles took place there, the first on the Marsyas river, in which the Carians were defeated; the second shortly afterwards at Labraunda, in which they were again defeated, and a third near Pedasus, in which they inflicted a terrible defeat on the Persians These three battles took place, it would seem, in the campaigning season of 496 It was probably after the two defeats in Caria that Aristagoras proposed and carried out the plan of establishing, in case of the failure of the revolt, a refuge for the surviving rebels at that Myrcinus on the Strymon which had been granted to Histiaeus But there he and all his company perished in battle with the Thracians

Just about the time of Aristagoras' death Histiaeus arrived at Sardes His own plan had so far worked excellently, in that he had won his escape from Susa by persuading Darius to let him go down to the coast and settle the revolt; but on his arrival there he found that nobody trusted him At last the Mytilenians gave him eight ships with which he set himself up as a pirate in the Propontis in the rebel interests, making things unpleasant for the merchant ships of any city which showed a tendency to weaken in its enthusiasm for the continuation of the revolt These doings of Histiaeus form probably the sum of all that Herodotus has to tell of the events of the revolt in 495 In 494 the Persians began to besiege Miletus as being the true centre of the revolt Nothing further is told of the fate of Caria, save that after the fall of Miletus some of its cities submitted, while some were subdued by the Persians To aid in the attack on Miletus the Persians brought up a large fleet composed of Phoenician, Cilician, Cypriote and Egyptian contingents, numbering in all 600 vessels Against this the rebels put to sea with 353 ships, Miletus, Chios, Lesbos and Samos furnishing the largest contingents The fight took place at Ladé off Miletus The story of it as told by Herodotus is much distorted by anti-Ionian bias; but the battle ended in a great defeat of the Greeks This defeat was practically the end of the revolt Miletus fell late in 494 Histiaeus was finally caught and executed by Artaphernes After that the Persians spent part of 493 in extinguishing the dying embers of the rising

Even from Herodotus' account it is clear that the revolt was one of the most glorious incidents in the story of the Greek race It took the Persians six years to suppress it, and taxed severely the resources of the greatest empire of the time

Very little is known of the history of Athens during these years, but what is known suggests that a lively and varying struggle for supremacy was going on between the ultra-democrats and

the conservatives. The end of the revolt in 493 brought it indirectly to a climax. Phrynichus, in his play, *The Capture of Miletus,* attacked the democrats who five years before had withdrawn Athenian aid from the rebels, and was prosecuted and fined for so doing. Also Miltiades returned a fugitive from his tyranny in the Thracian Chersonese and was prosecuted by the democrats for tyranny, but acquitted. This acquittal was a conservative victory of such a decisive character that that party seems under the leadership of Miltiades to have controlled Athenian affairs up to the time of Marathon three years later

Mardonius in Thrace.—After sweeping up the mess in Asia in 493 the Persians proceeded in the next year to bring Thrace and Macedonia once more under their control, but the expedition of 492 was not confined to these limited aims It was commanded by Mardonius who had been appointed to supreme authority in the control of this extreme western part of the empire He seems also to have received at Susa orders for the settlement of affairs in the Asiatic Greek cities, a settlement showing a policy which aimed at the abolition of the recent discontents But when it comes to the expedition into Europe it is clear that its object was larger than the mere re-establishment of Persian authority in Thrace and Macedonia Herodotus says that it was aimed at Athens and Eretria in punishment for the aid they had sent to the Ionian rebels. That it was intended to advance beyond Macedonia is shown by the fact that the disaster which stopped its further progress took place after Macedonia had been pacified That it was an expedition of great magnitude and importance is shown by the employment of the fleet to co-operate with the land army The expedition of 492 seems to have aimed at a large, perhaps complete, conquest of Greece It was brought to an end by a great disaster to the fleet in a storm off Mt Athos.

But Darius did not forget Athens and Eretria They at least must be taught the lesson that it did not pay to interfere with Persian rule on the east side of the Aegean The year 491 passed without movement on the part of Persia, but in 490 came the famous Marathonian expedition.

The Marathon Expedition.—The story of Marathon soon became a legend, a legend in which the truth was both exaggerated and suppressed The most important suppression was the successful elimination from the tale of the part which the Athenian ultra-democrats had played in the matter On the side of exaggeration the magnitude of the Persian numbers was multiplied many times As far as numbers are concerned the only trustworthy element in the legend is that the army was transported across the Aegean in 600 ships That may be an overstatement; but it is not likely to be an understatement. It would imply that the land force cannot have been more than 60,000, and possibly not more than 40,000.

Since the return of Miltiades in 493 the Athenian ultra-democrats had been viewing with apprehension the possibility of an oligarchical reaction Now, if ever, was that alliance [*sic*] with Persia, which had been made with a view to provide against such a contingency, to bear fruit Therefore they regarded the expedition as in their interest, and were quite ready to co-operate with it. Even Herodotus cannot disguise the fact, though he tries to tone it down in the interests of the democracy of 30 or 40 years later. Pindar and Aristophanes, however, backed by the evidence of the 20 years preceding Marathon, make the situation clear.

In the course of its passage across the Aegean the expedition attacked Naxos and did damage there, but the inhabitants escaped to the hills Delos was treated with respect, for the Persians did not wish to arouse the whole Greek world against them Then, after visiting some other islands, they came to Eretria In answer to an appeal for help the Athenians ordered the 4,000 Athenian κληροῦχοι (allotment holders) who had been settled in Chalcis after its capture in 506 to go to the assistance of Eretria This they did not do, urging, so Herodotus relates, certain excuses which are not very credible The siege of Eretria only lasted six days The resistance was brave; but then the Persians got into the town—through treachery, so Herodotus says It was destroyed, and the inhabitants were carried away to be eventually settled at Ardericca near the mouth of the Euphrates After capturing the place the Persians took ship across the Euripus and landed on the plain of Marathon 24m. north-east of Athens.

There can be little doubt that the strategy of the Persians in the brief campaign which ensued in Attica was dictated by the assumption that they would receive considerable aid from their ultra-democratic sympathizers. The country party, the moderate democrats, from which the hoplite force was mainly drawn, seem to have been aware that the ultra-democrats were prepared to support the invaders. The latter were probably hampered by the presence of the hoplite force in Athens, and the suggestion of the landing at Marathon, at the extreme end of Attica, may have come from them. When the news of the landing reached Athens a council of war was held A message had already been sent to Sparta for assistance, a natural measure on the part of those conservatives who had looked for, and to a certain extent obtained aid from Sparta in the internal political struggles of the last 20 years.

The council of war was composed of the polemarch and the ten generals, the commanders of the regiments of the ten tribes. Herodotus reads into the Athenian army organization of 490 that of the time at which he wrote, some 30 or 40 years later. The application in 487 of the lot to the election of archons rendered it thenceforth impossible to entrust the supreme military command to the polemarch, and thereafter the direction of military and naval affairs passed to the board of ten generals, and the command on active service to one or more appointed for the expedition or campaign But at the time of Marathon the polemarch still had the supreme command in battle, though the strategy of a campaign was decided by a council of war in which the generals had each an equal vote with the polemarch It is evident from the story that the council was at first very nervous about leaving Athens for Marathon. But this nervousness seems to have vanished; and the army marched out. Moreover, no movement of the ultra-democrats took place, though their leaders, the Alcmaeonid family, did not renounce their connection with Persia.

Battle of Marathon.—Miltiades was not commander-in-chief of the Athenian forces, though the council of war adopted his advice and design He may have advised the march of the Athenians from Athens to Marathon He was almost certainly the conceiver of the strategy they adopted when they got there The council of war decided that it was safe for the hoplite force to leave Athens for Marathon, and thither it went The Persians, who did not as yet know the change of feeling among their quondam friends at Athens, regarded the Athenians as having fallen into the trap set for them—as having left Athens exposed to a surprise attack which would be supported by sympathizers within the city. It may be assumed that Miltiades' idea was that, as the Persian army had landed at Marathon, it could not, if the Athenians were there, either re-embark the army without exposing a covering force to attack and possible destruction, or advance on Athens without fighting its way through one or other of the narrow passages which led from the plain to Athens That is why, in accordance with his advice, the Athenian army remained inactive at Marathon until the Persians developed one of these two designs On arriving at Marathon the Athenians took up a position at the Heracleum, a sanctuary and precinct the remains of which have been discovered high up the valley now called the valley of Vrana, but called in old times the Aulon or Funnel Here they were amid rugged hills on the actual upper road to Athens, and within striking distance—about two miles—of any force which either tried to cover an embarkment or attempted to use the lower road. Either here or at Athens 1,000 Plataeans had joined them, assistance sent in gratitude for the protection which Athens had given to Plataea against Thebes for some 29 years past. Then ensued some days of inactivity, the Athenians waiting for the Persians to move, and for the arrival of the promised Spartan assistance, the Persians for a signal that their partisans in Athens were ready But the Persians moved before the signal came, anxious to decide the matter before the Spartans arrived The Persian plan was to re-embark a part of their army under the protection of a covering force, and, while the latter held the Athenians at Marathon, to land at Phalerum and make a dash on Athens So soon as the design developed its general nature must have become clear to the Athenian command;

also it was quite evident that the Athenian army must be back at Athens before the Persians landed at Phalerum.

That being so, the Athenians attacked the Persian covering force without delay. The remains of the mound which was raised over the Athenian dead after the battle show that the covering force was drawn up between the lower end of the Aulon and the sea with its back to the latter. Down the Aulon the Athenians advanced and took up battle formation at the mouth of the valley, probably about three quarters of a mile from the Persian front For the actual tactics in the battle the polemarch Callimachus, who took the unusual step of strengthening both wings and weakening the centre, with the idea, actually realized in the course of the battle, that the enemy's centre would force back the Athenian centre, follow it up, and so expose both its flanks to attack by the troops massed on the Athenian wings

As has been said, the battle developed as Callimachus had foreseen. The enemy drove in the Athenian centre with their own centre which, advancing in pursuit, was defeated and apparently wiped out by the Athenian wings The rest of the army fled to the ships, on which, after a struggle, most of them managed to escape. That the battle was not by any means a walk-over for the Athenians is clear from their own account of it. Later tradition represented the numbers of the Athenians as 10,000, which was probably the truth The number of the Persians was exaggerated at discretion The Persian losses are said to have amounted to 6,400, a loss which must have fallen mainly on the centre, and perhaps included nearly the whole of it If this number be accepted, and be taken as about one-third of the Persian troops in the battle, then their total number was about 20,000

From Marathon the Athenians marched with all speed to Athens in order to anticipate the arrival of the Persian fleet and the rest of the Persian army at Phalerum The latter did not attempt a landing The rapid movements of the Athenian army had rendered their plan hopeless, and so they sailed back to Asia The expected signal came late—probably after the battle was already engaged. After the Athenian army arrived in Athens the promised force from Sparta, 2,000 strong, arrived at the city The battle made an enormous, indeed an exaggerated, impression on the Greek mind This great Persia, which to the Greek stood for all that was great in the contemporary world, had been defeated in battle by a Greek State which was at the time hardly a first-class Power in contemporary Greece The Athenian State had suddenly emerged from a position of second-rate obscurity into a blaze of reputation Exaggerated or not, Marathon was a great victory, and in one sense epoch-making in the history of warfare It demonstrated the superiority of the Greek hoplite over any form of soldiery that Persia could put into the field Nevertheless, the glory of Marathon nearly proved the undoing of Greece, in that it made the Greek world incredulous as to the reality and the extent of the danger which threatened it from Persia ten years later, so that it was caught only half prepared to meet it

The Ten Years After Marathon.—Of the history of Greece in the decade following Marathon very little is known, and of that little less still has a bearing on the relations between the Greek and the Persian. Aegina, jealous of the growth of Athenian rivalry in trade, renews a war with Athens which the events of 490 had interrupted Miltiades comes to political ruin the year after Marathon; and a miscellaneous list of prominent Athenian politicians are ostracized in the years which follow The legislation of 487, to which reference has been made already, brings about a change in the Athenian military and naval organization Then comes the great increase of the Athenian fleet—of which more later That Darius intended to take vengeance for Marathon is undoubtedly the case He lost no time in beginning preparations with that end in view Their magnitude prolonged them, and Greece was saved by a revolt in Egypt which broke out in 486 It was not suppressed till 484, and Darius had died the previous year.

During these years there had been coming to the front in the ultra-democratic party a new leader not of the Alcmaeonid family. Themistocles had been archon in 493; but his name does not come into prominence until the second half of this decade, when he comes to the front as the advocate of the increase of the Athenian fleet. The silver mines at Laurium were bringing in a much larger income than aforetime to the State, an income which Themistocles proposed to use in the building of a great fleet instead of distributing it in doles among the citizens.

There were political circumstances which were probably the real efficient cause of the support given by democracy to his naval policy. If the democratic position had been an anxious one before Marathon, it was certainly still more anxious afterwards, even allowing for the fact that Miltiades had in 489 prejudiced conservative supremacy by his failure at Paros Sparta was still to all appearance ready to support the conservatives, and the democrats had lost the support of Persia There was nothing in Greece to substitute for it A great fleet would give security for the vital import of foreign corn, but it could also be used to cut off the supply. in other words the crews of the fleet would have the last say on the fate of Attica, and any oligarchy which might be set up there could be starved to death During those years, there came to Greece reports of great preparations being made in Asia for a repeated attack on the Greeks of Europe

Preparations of Xerxes.—Xerxes had inherited the policy of Darius, and from the time when in 484 the revolt of Egypt was suppressed, he began preparations for a grand attack on the Greeks of Europe By the autumn of 481 all was ready for an advance Athens had no delusions on the object of the expedition Corinth and Aegina with their trade connections with Asia would be in a position to ascertain the truth, and it was perhaps Corinth that convinced Sparta of it The Peloponnese, with the exception of Argos, took the patriotic side Boeotia, so Herodotus says medized outright, a statement which Plutarch (*De Herodoti Malignitate* 31) indignantly denies Phocis took the patriotic side because, so Herodotus says, the Thessalians took the other In Thessaly the feudal barons, led by the Aleuadae of Larissa medized; but the mass of the population took the other side Corcyra was inclined to be neutral The Sicilian cities had their hands full with a Carthaginian attack arranged by Persia

Meanwhile Xerxes had marched from Sardes to the Hellespont where he had caused two bridges to be constructed, a considerable engineering feat across a wide strait with a strong current also a canal had been cut across the peninsula of Mt Athos to avoid the stormy and ill-omened passage round the cape Its line is traceable at the present day

Greek Plans of Defence.—The Greek council of war now knew that no help was to be expected from outside Greece, so it planned the defence on that assumption As in the expedition of 492 the Persian strategy centred on the co-operation between army and fleet The plan's one drawback was that it limited the mobility of the fleet, since it had to keep in close touch with the army That the Greeks recognized this is apparent from their designs, even if they were not unanimous as to how and where they should be carried out That lack of unanimity came nigh to bringing the cause of the Greeks to ruin There was only one State north of the isthmus, Athens, which really counted in the defence The minor Peloponnesian States were therefore anxious to concentrate the defence at the isthmus, and there can be little doubt that Sparta and Corinth were in sympathy with them According to this design Athens was to sacrifice her territory for the time being, and her population was to take refuge in Peloponnese With this intent the Peloponnesians set about fortifying in feverish haste the four and a half miles breadth of isthmus It is plain that the Athenians refused to assent to a plan which involved at least the temporary sacrifice and devastation of their territory It is also plain that the Peloponnesians or, at any rate, the Spartans, knowing that the Athenian fleet was necessary even for a defence of the isthmus, made a show of falling in with the Athenian designs

The co-operation of fleet and army in the Persian attack rendered a similar co-operation necessary on the part of the defence But it is possible that the question arose whether the main effort of the Greeks should be on land or on sea Physiography decided the question The passage from the north frontier of Thessaly to the isthmus is, owing to the difficult nature of the country, a well-defined line which offers no alternatives save in Thessaly

itself. There it is possible, in passing from Larissa to Thermopylae to go either via Halos and Larissa Cremaste to Lamia, or to take a more inland route over the pass of Thaumacium South of Thermopylae the line is single, through Thermopylae and a low passage through the Oeta range near Abae; then by the narrow passage between the foot of Helicon and Lake Copais, and so by one of the passes of Mt Cithaeron—preferably the Dryoscephalae—into the Megarid and Attica. There were various defensible points on this route: at Tempe, where, however, the very narrow passage through that valley could be turned; at Thermopylae, where a turning movement involved great difficulty and danger; and at the narrow strip of traversable ground in Boeotia on the route between Coronea and Haliartus By sea, on the other hand, there was no place where the passage of the Persians could be blocked The Euripus could be turned by passing outside Euboea The Athenian plan of campaign assumed rightly that, if either arm of the invaders' force could be brought to a stand, the other would be brought to a stand also Physiography determined that this could only be done in the case of the army. At the same time the Greek fleet would have to cooperate with the Greek army to prevent the landing of troops in the rear of any position the latter might take up Had this design been carried out it is probable that the invaders would never have got south of Thermopylae That it was not carried out was due to the Peloponnesian dislike of any defence north of the isthmus, and to the further fact that, when forced into compliance with the Athenian designs, their compliance was at best half-hearted.

The first attempt at land defence was made at Tempe, where the Peneius river breaks through the mountains between Ossa and Olympus The available passage is very narrow indeed To this place they despatched 10,000 hoplites This must have been in the spring of 480 The Thessalian commons had begged them to come thither But, says Herodotus, the Greeks found that the pass could be turned by a route through Gonnos, and so gave up the idea of defending it, and so the Greek army and fleet went back to Attica and the isthmus

Battle of Thermopylae.—There must have been much controversy as to the next line of defence to be adopted; but the views of the Athenians again prevailed, and it was determined to send a force to Thermopylae, and the fleet to the north Euripus to cover the rear of the defenders of the pass The tale of this episode of the war as told by Herodotus, a Spartan version of a story of which there was much that the Spartan Government would be glad to conceal, is one of the strangest in literature. So far as it goes it is true Only 7,300 men, nearly all hoplites, were sent to defend the pass About 4,000 came from the Peloponnese, and the rest from Phocis and Boeotia No Athenians could be spared, for, now that the 200 vessels of the fleet were mobilized, all the Athenian hoplites would be serving as marines aboard the fleet. This land force was but a fraction of what the Peloponnesians could put into the field This force, says Herodotus, was represented by Leonidas, the Spartan king, as a sort of vanguard of a larger army, but no other troops were ever sent, not even when Leonidas sent an urgent message asking for reinforcements

Leonidas was, however, prepared to make a desperate defence of the pass, and it might have succeeded had not the Phocians who guarded the very narrow path of the Anopaea been taken unawares The Middle Gate of Thermopylae was at that day of such a nature that the front of an attacking force could only be a few men wide The light-armed Persian or the Persian bowmen could not make any impression on a Greek hoplite force in such a strong position The path of the Anopaea was a mere forest track on which a small force could have stopped an army The defence of Thermopylae showed the grandeur of the Spartan nature at its best, but for the Spartan Government it was fortunate that the circumstances of the battle made it possible for it to give its own version of a very embarrassing story. The Greek world all but accepted in full a tale which redounded to the glory of the Greek race as a whole; but there were those who, in moments of irritation and candour, were inclined to remind Sparta of the truth: "the Mede had time to come from the ends of the earth to Peloponnese ere any force of yours worthy of the name went out to meet him," said a speaker to the Spartans some 50 years later (Thuc. i. 69).

While these things had been going on at Thermopylae the Greek fleet in the north Euripus had successfully prevented the Persian fleet from landing troops behind the pass, and had, generally speaking, tried conclusions with the enemy. The Persian fleet had suffered greatly in a storm near Cape Sepias off the mouth of the Euripus, and in a later storm a Persian detachment of 200 vessels had been wrecked in the Hollows of Euboea. After the disaster at Thermopylae the Greek fleet withdrew southwards to the strait of Salamis on the Attic coast

Athenian Retirement to Salamis.—That the Athenians had expected the defence of the pass to be a real effort on the part of the land army is evident from the fact that they did not until after the disaster take any measures to secure the safety of their people Moreover, Herodotus says that, even after the disaster, they had expected a Greek army to oppose the Persians in Boeotia The miscalculation was such that, though some of the Attic population could be shipped over the Saronic gulf to Troezen, a large number could only, owing to lack of time, be transferred to the island of Salamis, less than a mile from the Attic coast. That was why the fleet went to the Salamis strait The refugees in the island had to be protected The fleet in the strait did not in any sense cover the fortifications at the isthmus 30 miles away. The Persian fleet might have ignored it, and sailed on to land troops south of the fortifications, in which case the Greek fleet would have been forced to give battle in open waters, which was what the Persians wished to force it to do, and exactly what the more intelligent of the commanders of the Greek fleet wished to avoid That the subsequent battle in the strait was brought about by Themistocles is doubtless a fact, but Eurybiades, the Spartan commander-in-chief of the Greeks, seems to have shared his views The enemy's fleet was not merely superior in numbers to that of the Greeks, but some of its contingents, especially the Phoenician, must have been superior to it in manoeuvring power The great Athenian contingent of 200 ships, more than half of the 366 triremes in the fleet, was manned by imperfectly trained crews. Even after the disasters at the Sepiad strand and in the Hollows of Euboea, the Persian probably outnumbered the Greek fleet by two to one With regard to the army, calculations of a more convincing kind may be made which reckon the total numbers at this period of the war at about 400,000 fighting men The passage of the Persian army from Thermopylae to Attica was marked by a raid on Delphi A considerable interval must have intervened between its departure from Artemisium and its arrival at the bay of Phalerum on the Attic coast, a few miles outside the eastern end of Salamis strait It put in there, not apparently with any intent of attacking the Greeks, but to afford supplies to the Persian army in Attica

Battle of Salamis.—The extant evidence as to what occurred at Salamis is contained in Herodotus and Diodorus together with a few but important details which may be gathered from the *Persae* of Aeschylus Diodorus' version is plagiarized from Ephorus, whose story, though not so dramatic as that of Herodotus, gives what is probably a more correct account of the course of events in and before the great fight The transhipment of the population to Troezen or Salamis seems to have been all but complete. A few, indeed, seem to have deliberately remained behind on the Acropolis The Greeks inside the strait of Salamis were in a very divided state of mind The Peloponnesian contingents in the fleet wanted naturally to sail to the isthmus, but any move thither without the Athenian contingent would have been suicidal As far as the Athenians were concerned it was plain that they could not desert the refugees on the island of Salamis At the same time if the fleet remained in the strait the Persians would be able to land troops behind the isthmus defence, which would have been a capital disaster to the Greek cause Strategically the position of the Greeks before the battle of Salamis was a very desperate one. There was only one way out, and Themistocles saw it—to induce the Persians to attack the Greek fleet in the

strait. The less experienced seamen had to make up for inferior skill by resorting to boarding tactics, which could only be really effective in narrow waters Moreover, the Persian superiority in numbers would be discounted if the battle were fought on a necessarily narrow front

In view of these considerations, Themistocles took what was the desperate measure of simulating treachery by sending a message to Xerxes saying that the Greek fleet was ready to betray the Greek cause. This message reached Xerxes in the late afternoon of the day preceding the battle. Unfortunately for the Persian he had had too many experiences of treachery within the ranks of Greek opponents to suspect the genuineness of the message, and so, early in the night, Xerxes moved the main part of his fleet from Phalerum bay to the eastern entrance of Salamis strait, to a line of which the small island of Psyttaleia formed more or less the centre To prevent any escape of the Greeks through the western strait of Salamis he sent the Egyptian squadron of 200 vessels to block its passage What actually took place on the day of battle may be deduced from the *Persae*. The Persian fleet had to advance into the strait Up to that time it had been hidden from the Greeks by the promontory of Cynosura; but the latter were aware that they were shut in, since Aristides had arrived at Salamis from Aegina during the night, and had informed them of the Persian movement

North of Psyttaleia the strait of Salamis turns at right angles from north to west, and thus the Persian fleet, advancing on both sides of Psyttaleia, had to execute a wheeling movement The strait after turning becomes somewhat narrower, a fact for which the Persians do not seem to have allowed, so that when they tried to advance into the inner strait with as broad a front as they had had when south of Psyttaleia a certain amount of confusion arose It was during this confusion that the Greeks, who had advanced eastwards down the inner strait, attacked Everything must have been in favour of the Greeks The two fleets must have become almost literally jammed in the strait to the north of Cynosura, and that would favour the boarding tactics of the Greeks who had on their vessels hoplites serving as marines Of the details of the fight a few are related by Herodotus, but they are rather picturesque stories than real contributions to its history. Before the day was done the Persians had been either driven, or forced to retire, from the strait.

The Greeks themselves seem not to have realized the extent of their victory until, shortly afterwards, the Persian fleet retired altogether from European waters and their army fell back northwards, part of it to winter in Thessaly with a view to further attack next year, part of it to Asia Though Salamis was not decisive of the war, for the attack of Mardonius in 479 was very formidable, yet it is one of the decisive battles of the world in that, had it turned out otherwise, Greece would have fallen under the dominion of Persia When the Greeks discovered that the Persian fleet had retreated they sailed as far as Andros Proposals were made to break down the Hellespont bridges, but these were overruled

In this same year Gelon of Syracuse inflicted on the Carthaginian invaders of Sicily such a defeat that, had he followed it up on the African coast, the career of Carthage might have come to an end Thus the great scheme of Persia had failed in both east and west When the year 479 opened, the Persian fleet seems to have been on the Ionian coast with a view to preventing any movement of revolt in the Ionian cities Mardonius was in Thessaly with an army which Greek authors reckoned at 400,000 men Half that number would probably be nearer the truth In the campaign of 480 Themistocles had held supreme command of the Athenian contingents, both naval and military; but in 479 he vanishes from the picture. No Greek author gives any explanation of his disappearance

Battle of Plataea.—In the spring the Persians seem to have made, through a certain Alexander of Macedon, an attempt to detach Athens from the Greek cause Sparta intervened, perhaps superfluously, and the attempt came to nothing. Then Mardonius started from Thessaly on his march south. It is evident that at the back of what follows is a resuscitation of the Peloponnesian design to concentrate the land defence at the isthmus. Sparta was reluctant to move northwards, but fearing that Athens might desert the Greek cause, the Spartans, whose army was mobilized, made a surprise march northwards at the very time that an Athenian embassy was at Sparta imploring them to act But meanwhile Mardonius had overrun Attica When, however, he heard that the Greek army was marching north he retreated to Boeotia with a base at Thebes. The Peloponnesian contingents of the Greek army now moved north from the isthmus, advancing to Eleusis, where the Athenian army met them Then the whole force marched through the Dryoscephalae pass into Boeotia, and took up a position low down on the north side of the pass Here the position was across a valley, the Greek centre being on low ground, and the wings on higher ground on either side The position was close to the little town of Erythrae The Persians were encamped on the Asopus river about three miles north of this point The Persian cavalry assailed the Megarians in the Greek centre but the Athenians went to their help, and the cavalry attack was driven off During the night the Greeks moved in a north-north-westerly direction to a hollow on the north side of which rose a ridge, the Asopus ridge The Persians got wind of the movement, and moved up the Asopus to a position fronting the Greeks About this time reinforcements were coming in which raised the numbers of the Greek army to a total of 108,200 The number of hoplites, the real fighting force, was about 39,000 The Persians numbered about 200,000 With them, however, were some Phocians and a large force of Thebans

A position of stalemate then supervened, neither side attempting anything for eight days Then, as the Greeks were some two miles from the passes which debouch on to the field, the Persians began to send cavalry round their flanks, which attacked and interfered with the Greek provision trains Then came a grand attack by the Persian cavalry which harassed the Greeks with long-range missiles, and destroyed the spring of Gargaphia on which the Greeks were dependent for water It lay in a hollow behind the Greek line The Greek position on the Asopus ridge became untenable, and a retreat was necessary The new position which was to be taken up was at the "island," which is a mound on a ridge at the foot of Cithaeron about a mile east of the town of Plataea, and almost surrounded by two branches of the Ōeroe river But, though the army generally was to make for this position, it is evident from what followed that the Spartans were to go in the first place to the relief of the Greek baggage trains in the passes. As the retreat was to be made at night there was every possibility of confusion The Greek centre started first, but missed the "island" and arrived at the town of Plataea The Spartans started later south-south-east towards the pass of Dryoscephalae The Athenians, who had waited for the Spartans to move, then started for the "island" Neither the Spartans nor the Athenians reached their objectives, for the Spartans, after they had gone a little more than a mile from the summit of the Asopus ridge, were assailed by the Persian cavalry and brought to a standstill at a point near a temple of Eleusinian Demeter, which stood on the ridge next east of the Asopus ridge Mardonius seems to have thought that the Greek retirement meant defeat, and to have determined to make the rout complete So long as the Persian cavalry employed missiles the Spartans suffered considerable loss Then the Persian infantry came up The battle was an unequal one, for the light-armed Persian had no chance against the hoplite In the mêlée Mardonius himself perished, and eventually the Persians were driven back in rout and tried to take refuge in their camp Meanwhile the Athenians on the Greek left had started for the "island" They had only reached the plain south-west of the Asopus ridge when they received a message from the Spartans asking for assistance, and seem to have started off in their direction But in the hollow south of the Asopus ridge they were assailed by the Greeks who were fighting on the Persian side They defeated the Thebans after an obstinate fight The Greek centre at Plataea had by this time received news of the two battles, and part of it seems to have hurried to aid the Spartans, while the other part went to help the Athenians The latter were badly cut up by the

Theban cavalry, and so never reached the Athenians, while the former may possibly have taken part in the last stages of the fight beneath the temple of Demeter. The last phase of the battle was a combined assault by the Greeks on the Persian camp and a general massacre of the enemy, 30,000 of whom are said to have perished. The Greeks celebrated their victory by dedicating to Delphi a tenth of the spoils and setting up the famous serpent column surmounted by a bowl, the remains of which still survive at Constantinople The leaders of the medizing party at Thebes they captured and executed. Plataea set the seal on Salamis The two battles saved Hellenism in Europe from becoming orientalized, and thus modified the history of the world.

Naval Operations in the Aegean: Mycalé.—While these things were taking place in European Greece, a Greek fleet was operating on the Asiatic coast of the Aegean The Ionians had appealed for help. The fleet was commanded by the Spartan Leutychides For some unknown reason the Phoenician contingent of the Persian fleet had been sent home, and therefore the weakened remnant dared not try conclusions with the Greeks on the open sea They sought refuge at Mycalé where was a strong land army which had been overawing the Greek cities As the Persians declined a naval battle, Leutychides disembarked his troops and attacked them on land. The result was an obstinate battle but a great Greek victory to which the Ionian contingent on the Persian sidé contributed by turning against their masters From that time forward the fate of the Greek cities of Asia became a factor in the relations between Persia and the European Greeks The year 478 was spent partly in the reconstitution of Attica and in that rebuilding of the walls of Athens which the Spartans would have prevented had they not been tricked by Themistocles.

The Delian Confederacy.—As far as the patriotic Greeks were concerned the action of the Ionians at Mycalé had practically committed them to the liberation of the Greek cities of Asia from Persian rule, and so the war had to be carried on in the form of an attack on the Persian hold on the Greek cities of the Aegean, the Propontis and Cyprus Pausanias the Spartan who had commanded at Plataea led in 478 what was probably a very miscellaneous fleet drawn from the Greek mainland and islands in an attack on the Persian possessions Under his command Cyprus and Byzantium were taken, the former a base for Persian attack on the Aegean, the latter the key to the corn route from the Euxine At Byzantium Pausanias developed certain strange habits which the Greek patriots interpreted as medism Sparta recalled him, and sent out a successor whom the Greeks refused to accept as commander; and so the leadership passed to Athens Sparta withdrew from the war, and it is probable that all the other States of the mainland save Athens withdrew at this time With the new league came the tribute from those States which paid Athens to furnish ships and crews on their behalf, an ever-increasing number as time went on How long it took to set free the Greek cities of the Asiatic coast is not known It is probable that one of the main motives of the campaigning was the complete restoration of the passage through the Hellespont and Bosporus to the Euxine corn region The restiveness of the allies culminating in the revolt of Naxos in 467, shows that there were many of them who thought that the danger from Persia was over by that time Whatever may have been the case before 466 the battle of the Eurymedon in that year put Persia completely out of action as far as the Aegean was concerned That great victory by land and sea was less dramatic and less decisive of the future than Salamis had been, but for 50 years after the battle Persia left Greece alone Still the experience of 50 years later was to show that those members of the league who supposed that the danger from Persia was over for ever were mistaken It was the continued existence of the great Athenian fleet which kept the Persians from interfering in Greek affairs Within a brief period after its destruction at Syracuse the interference began again, and within 30 years of that time Persia had become arbiter even in the internal politics of Greece

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GRAECO-TURKISH WAR, 1897. This war between Greece and Turkey (*see* GREECE: *Modern History*) involved two practically distinct campaigns, in Thessaly and in Epirus. Upon the Thessalian frontier the Turks, early in March, had concentrated six divisions (about 58,000 men), 1,500 cavalry and 156 guns, under Edhem Pasha A seventh division was rendered available a little later. The Greeks numbered about 45,000 infantry, 800 cavalry and 96 guns, under the crown prince. On both sides there was a considerable dispersion of forces along the frontier The Turkish navy, an important factor in the war of 1877–78, had became paralytic ten years later, and the Greek squadron held complete command of the sea Expeditionary forces directed against the Turkish line of communications might have influenced the course of the campaign; but for such work the Greeks were quite unprepared, and beyond bombarding one or two insignificant ports on the coast-line, and aiding the transport of troops from Athens to Volo, the navy accomplished nothing On April 9 and 10 Greek irregulars crossed the frontier, either with a view to provoke hostilities or in the hope of fomenting a rising in Macedonia. On the 16th and 17th some fighting occurred, in which Greek regulars took part; and on the 18th Edhem Pasha, whose headquarters had for some time been established at Elassona, ordered a general advance The Turkish plan was to turn the Greek left and to bring on a decisive action, but this was not carried out. In the centre the Turks occupied the Meluna pass on the 19th, and the way was practically open to Larissa The Turkish right wing, however, moving on Damani and the Reveni pass, encountered resistance, and the left wing was temporarily checked by the Greeks among the mountains near Nezeros At Mati, covering the road to Tyrnavo, the Greeks entrenched themselves Here sharp fighting occurred on the 21st and 22nd, during which the Greeks sought to turn the right flank of the superior Turkish central column By the 23rd the Turkish forces had drawn together, and the Greeks were threatened on both flanks In the evening a general retreat was ordered, and the loose discipline of the Greek army was at once manifested Rumours of disaster spread among the ranks, and wild panic supervened There was nothing to prevent an orderly retirement upon Larissa, which had been fortified and provisioned, and which offered a good defensive position The general *débâcle* could not, however, be arrested, and the mass of the Greek army fled southwards to Pharsala There was no pursuit, and the Turkish commander-in-chief did not reach Larissa till the 27th Thus ended the first phase of the war, in which the Greeks showed tenacity in defence, which proved fruitless by reason of initially bad strategic dispositions entailing far too great dispersion, and also because there was no plan of action beyond a general desire to avoid risking a defeat which might prevent the expected risings in Macedonia and elsewhere. The handling of the Turkish army showed little skill or enterprise.

Larissa being abandoned, Velestino, the junction of the Thessalian railways, where there was a strong position covering Volo, seemed to be the natural rallying point for the Greek army Here the support of the fleet would have been secured, and a Turkish advance across the Othrys range upon Athens could not have taken place until the flanking position had been captured Whether by direction or by natural impulse, however, the mass of the Greek troops made for Pharsala, where some order was re-established. The importance of Velestino was recognized by sending a brigade thither by railway from Pharsala, and the inferior Greek army was thus split into two portions, separated by nearly 40m A Turkish reconnaissance on Velestino was repulsed, but on May 5 the Greeks were driven from their positions in front of Pharsala by three divisions Further fighting followed on the 6th, and in the evening the Greek army retired in fair order upon

Domokos. It was intended to turn the Greek left with the first division under Hairi Pasha, but the flanking force did not arrive in time to bring about a decisive result The abandonment of Pharsala involved that of Velestino. Again delaying, Edhem Pasha did not attack Domokos till the 17th, giving the Greeks time to entrench their positions. The attack was delivered in three columns, of which the right was checked and the centre failed to take the Greek trenches and suffered much loss The left column, however, menaced the line of retreat, and the Greek army abandoned the whole position during the night No effective stand was made at the Furka pass, which was evacuated on the following night. Col Smolenski, who arrived on the 18th from Velestino, was directed to hold the pass of Thermopylae The Greek forces being much demoralized, the intervention of the tsar was invoked by telegraph, and the latter sent a personal appeal to the sultan, who directed a suspension of hostilities On the 20th an armistice was arranged

In Epirus at the outbreak of war about 15,000 Greeks under Col Manos occupied a line of defence from Arta to Peta The Turks, about 28,000 strong, under Achmet Hifsi Pasha, were distributed mainly at Iannina, Pentepagadia, and in front of Arta On April 18 the Turks commenced a three days' bombardment of Arta; but successive attempts to take the bridge were repulsed, and during the night of the 21st they retired on Philippiada, 26m distant, which was attacked and occupied by Col. Manos on the 23rd The Greeks then advanced to Pentepagadia, but the position held by their advanced force near Homopulos was attacked on the 28th and 29th, and no Greek reinforcements were forthcoming when needed The Evzones made a good defence, but were driven back by superior force, and a retreat was ordered, which quickly degenerated into panic-stricken flight to and across the Arta Reinforcements were sent to Arta from Athens, and on May 12 another incursion into Turkish territory began, the apparent object being to occupy a portion of the country in view of the breakdown in Thessaly and the probability that hostilities would shortly end The advance was made in three columns, while 2,500 Epirote volunteers were landed near the mouth of the Luro river with the idea of cutting off the Turkish garrison of Prevesa The centre column attacked the Turks near Strevina on the 13th, but although the Greeks fought well, they ultimately had to retreat The volunteers landed at the mouth of the Luro, were attacked and routed with heavy loss

The campaign in Epirus thus failed as completely as that in Thessaly Under the terms of the treaty of peace, signed on Sept 20, and arranged by the European Powers, Turkey obtained an indemnity of £T4,000,000 and a rectification of the Thessalian frontier, carrying with it some strategic advantage History records few more unjustifiable wars than that which Greece gratuitously provoked The Greek troops on several occasions showed tenacity and endurance, but discipline and cohesion were manifestly wanting Many of the officers were incapable, the campaign was gravely mismanaged; and politics, which led to the war, impeded its operations On the other hand, the fruits of the German tuition, which began in 1880, and received a powerful stimulus by the appointment of Gen von der Goltz in 1883, were shown in the Turkish army. The mobilization and concentration was on the whole smoothly carried out, the young school of German-trained officers displayed ability, and the artillery at Pharsala and Domokos was well handled. The superior leading was, however, not conspicuously successful, and while the rank and file again showed excellent military qualities, political conditions and the Oriental predilection for half-measures and for denying full responsibility and full powers to commanders in the field enfeebled the conduct of the campaign. (G S C.)

GRAEVIUS (properly GRAEVE or GREFFE), **JOHANN GEORG** (1632–1703), German classical scholar and critic, was born at Naumburg, Saxony, on Jan. 29, 1632. After holding other appointments, he became, in 1662, professor at Utrecht, where he died Jan 11, 1703. Graevius had a high reputation as a teacher. He was honoured with special recognition by Louis XIV., and was a particular favourite of William III. of England, who made him historiographer royal

His two most important works are the *Thesaurus antiquitatum Romanarum* (1694–99), and the *Thesaurus antiquitatum et historiarum Italiae* published after his death, and continued by the elder Burmann (1704–25) His editions of the classics, although they marked a distinct advance in scholarship, are now for the most part superseded.

GRAF, ARTURO (1848–1913), Italian poet, of German extraction, was born at Athens He was educated at Naples university and lectured on Italian literature in Rome, till in 1882 he was appointed professor at Turin His volumes of verse—*Medusa* (1880), *Poesie e novelle* (1874), *Dopo il tramonto versi* (1893), *Morgana* (1901), *Le Danaidi* (1897, enlarged ed 1905), *Rime della selva* (1906)—give him a high place among the lyrical poets of his century A good selection, *Poesie*, appeared in 1915 Of his numerous prose works may be mentioned *Roma nella memoria e nelle immaginazioni del medio evo* (2 vols, 1882–83) Graf was possessed by a pessimism deeper than that of Leopardi, on whom some of his best critical work was done in his *Foscolo, Manzoni, Leopardi* (1898) He died at Turin on May 29, 1913.

See Sartori Treves, *Arturo Graf, romanziere e poeta* (1904), M. Morandi, *Arturo Graf* (Rome, 1921), R Rizzo, *Pessimismo e spiritualismo nell' opera poetica di Arturo Graf* (Catania, 1921).

GRAF, KARL HEINRICH (1815–1869), German Old Testament scholar and orientalist, was born at Mulhausen in Alsace on Feb 28, 1815, and was educated at Strasbourg After holding various teaching posts, he was made instructor in French and Hebrew at the Landesschule of Meissen, and in 1852 professor. He died on July 16, 1869 Graf was one of the chief founders of Old Testament criticism.

See T K Cheyne, *Founders of Old Testament Criticism* (1893), and O. Pfleiderer, *Development of Theology* (1890)

GRAF or **GRAFF, URS** (*c* 1485–1527), Swiss draughtsman, engraver and goldsmith He was born at Solothurn, the son of the goldsmith Hugo Graf, and probably studied under his father and then at Basle His art is inspired by that of Durer and of Baldung Grun. After a period of travel he settled in Basle in 1509 In 1514 he executed a reliquary of St. Bernard for the monastery of St. Urban This, his chief work as a goldsmith, was sold by the city of Lucerne in 1850 and has since disappeared Graf is best known for his drawings, executed in sure and bold line work A hundred woodcuts for which he made the drawings, a number of engravings, etchings and niellos, and some 200 drawings by his hand are extant Most of his work is dated and signed by his monogram

GRÄFE, ALBRECHT VON (1828–1870), German oculist, was born on May 22, 1828 He studied medicine in Berlin, Vienna, Prague, Paris, London, Dublin and Edinburgh, specializing in ophthalmology, and soon became one of the greatest of eye surgeons After practising from 1850 in his private institution for the treatment of the eye, he was appointed teacher of ophthalmology in Berlin university in 1853 and professor in 1858 Von Grafe began in 1855 to issue the *Archiv fur Ophthalmologie*, which contains most of his important discoveries including his introduction of the operation of iridectomy in the treatment of iritis, iridochoroiditis and glaucoma (1855–62), his improvement of the treatment of cataract (1865–68) and his demonstration that often blindness and visual defects connected with cerebral disorders are traceable to optic neuritis (1860) Grafe was also an authority on diseases of the nerves and brain

See Alfred Grafe, *Ein Wort der Erinnerung an Albrecht von Grafe* (Halle, 1870), and E Michaelis, *Albrecht von Grafe* (1877).

GRÄFE, KARL FERDINAND VON (1787–1840), German surgeon, was born at Warsaw on Mar 8, 1787. He studied medicine at Halle and Leipzig, and in 1810 became professor of surgery at Berlin, and during the war with Napoleon, superintendent of the military hospitals. He died at Hanover on July 4, 1840 Grafe did much to reform army hospitals and improve the treatment of wounds, but he is chiefly noted as being the founder of modern plastic surgery

See E. Michaelis, *K. F. von Grafe* (1840)

GRAFFITO, plural *graffiti*, the Italian word meaning "scribbling" or "scratching" (*graffiare*, to scribble, Gr γράφειν), adopted by archaeologists as a general term for the casual writings, rude drawings and markings on ancient buildings, in distinction

from the deliberate writings known as "inscriptions." These "graffiti," either scratched on stone or plaster by a sharp instrument or, more rarely, written in red chalk or black charcoal, are found in great abundance, *e g*, on the monuments of ancient Egypt The best-known "graffiti" have been collected by R Garrucci (*Graffiti di Pompei,* Paris, 1856), and L. Correra ("Graffiti di Roma" in *Bolletino della commissione municipale archaeologica* Rome, 1893; *see* also *Corp Ins. Lat.* iv, Berlin, 1871). The subject matter of these scribblings includes scrawls by boys, street idlers and the casual "tripper," of rude caricatures, election addresses and lines of poetry Apparently private owners of property felt the nuisance of the defacement of their walls; at Rome near the *Porta Portuensis* was found an inscription begging people not to scribble (*scariphare*) on the walls

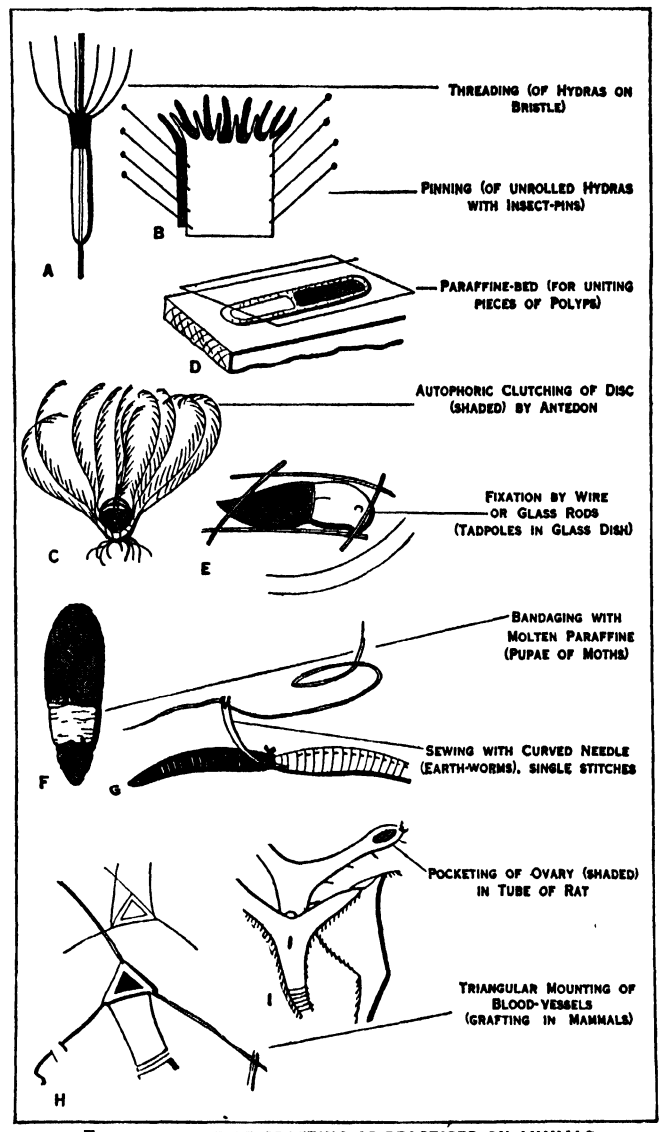
Graffiti are important to the palaeographer and the philologist as illustrating the forms and corruptions of the various alphabets and languages used by the people, and may guide the archaeologist to the date of the building, but they are chiefly valuable for the light they throw on the everyday life of the "man in the street" of the period, and for the intimate details of customs and institutions The graffiti dealing with the gladiatorial shows at Pompeii are in this respect particularly noteworthy (*see* Garrucci, *op cit*, Pls x–xiv ; A Mau, *Pompeii in Leben und Kunst,* 2nd ed, 1908, ch xxx) In 1866 in the Trastevere quarter of Rome was discovered the guard-house (*excubitorium*) of the seventh cohort of the city police (*vigiles*), the walls being covered by the scribblings of the guards (W Henzen, "L' Escubitorio della Settima coorte dei Vigili" in *Boll Inst*, 1867, and *Annali Inst*, 1874, *see* also R. Lanciani, *Ancient Rome in the Light of Recent Discoveries,* 230, and *Ruins and Excavations of Ancient Rome,* 1897, 548) The most famous graffito is that generally accepted as representing a caricature of Christ upon the cross, found on the walls of the Domus Gelotiana on the Palatine in 1857, and now preserved in the Kircherian Museum of the Collegio Romano (*See* Ferd Becker, *Das Spottcrucifix der romischen Kaiserpalaste,* Breslau, 1866; F X Kraus, *Das Spottcrucifix vom Palatin,* Freiburg in Breisgau, 1872, and Visconti and Lanciani, *Guida del Palatino*)

GRAFLY, CHARLES (1862–), American sculptor, was born at Philadelphia, Pa, on Dec 3, 1862 He was a pupil of the schools of the Pennsylvania Academy of the Fine Arts, Philadelphia, and of Henri M Chapu and Jean Dampt, and the École des Beaux-Arts, Paris. He received an honourable mention in the Paris salon of 1891 for his "Mauvais Présage," now at the Detroit Museum of Fine Arts, a gold medal at the Paris Exposition in 1900, and medals at Chicago (1893), Atlanta (1895) and Philadelphia (the gold medal of honour, Pennsylvania Academy of the Fine Arts) in 1899 In 1892 he became instructor in sculpture at the Pennsylvania Academy of the Fine Arts, also filling the same chair at the Drexel Institute, Philadelphia He was elected a full member of the National Academy of Design in 1905 He has received a number of gold medals at various exhibits His better-known works include. "General Reynolds," Fairmount park, Philadelphia, "Fountain of Man", "From Generation to Generation"; "Symbol of Life", "Vulture of War"; "England" and "France" for the New York custom house; "Pioneer Mother Monument," San Francisco, "Meade Memorial," Washington, D.C ; and many portrait busts

GRÄFRATH, a town in Rhenish Prussia, on the Itterbach, 14 m E. of Dusseldorf Pop (1925) 10,585 There was an abbey here from 1185 to 1803 The chief industries are iron and steel, and weaving is carried on.

GRAFT HYBRIDS: *see* CHIMAERA.

GRAFTING IN ANIMALS. Every gardener is well acquainted with grafting in plants. But it is less well-known that pieces of animals too may be joined in permanent union Grafting in animals is practised mainly for scientific purposes or for the restoration of weakened or lost parts Therefore graft and stock are not always taken from different species (*heteroplastic* transplantation) or races (*alleloplastic*), but may belong to samples of the same species and race (*homoplastic*) or even to one individual (*autoplastic*). It is as a rule easier to join pieces of the same species than pieces belonging to different species In the warm-blooded animals difficulties may arise even when two individuals of the same species are united by grafting, owing to blood incompatibility. With adult specimens of cold-blooded vertebrates this difficulty is less, and in their earlier stages and in invertebrate animals there seems to be little inconvenience from this source In some types it is possible to join species belonging to different



THE TECHNIQUE OF GRAFTING AS PRACTISED ON ANIMALS

classes (*dysplastic* transplantation), *e g*, amphibians and fish The degree to which grafting may be carried on depends, too, on the injury a given animal can endure Developed vertebrates will not stand the stoppage of their circulation and breathing inevitable with the removal of the head But in embryos of frogs, before the circulation of blood has started, the head-region may be grafted on to the body even of another species, and such compound monsters may even pass metamorphosis As insects do not need their heads for breathing, and circulation continues without the head being present, grafting of the head is possible even in the imaginal instar, but it is not yet clear whether function is restored There is no doubt that in lower organisms, such as worms, the head or other body-region can be grafted with functional success Lengthened individuals may be obtained in embryos of amphibians, tadpoles of abnormal length resulting Two warm-blooded animals may be joined by bridges of tissue containing blood-vessels and nerves. Side-to-side *"Parabiosis"* of this kind has been effected in rats, and reminds one of the "Siamese twins" Parabiotic grafts have also been effected in frogs, newts, butterfly pupae, earthworms and hydrae.

In certain cases the technique of grafting is even simpler in animals than in plants; when the opportunity is given for the stock to grip the graft by its own means, not even tying or gluing is required (autophoric method). Thus the sea-lily *Antedon*, a relative of the starfish, bears a central disc easily detached If another disc taken, let us say, from a specimen of different colour, be inserted into the groove left after the removal of the central disc, it will be clutched and kept in place by the tentacles surrounding this spot. There is nothing mysterious about this reaction as the tentacles also fold over the disc in the normal animal In the case of the vertebrate eye an implanted eye-ball will keep in place by friction and the closing of the eyelids To prevent these from opening prematurely, a fine pin or a silk stitch can be applied. Eyes can also be grafted in forms (*e g*, fish and tadpoles), which have no eyelids and have no means of pawing at the replanted eyes Replantation of eyes has been successfully achieved in several species of fresh-water fish, newts, salamanders, frogs, toads, rats and in a rabbit. But only in very rare cases does sight return Endeavours to apply grafting of eyes to restore vision to domestic animals have hitherto been unsuccessful The lens alone may be grafted autophorically The lens is extracted as in the operation for cataract. In fish, with cataract, the damaged lens, easily recognized by its opacity, is removed and a transparent lens from the eye of a healthy fish is slipped through the slit made by the operator's knife and is retained by the cornea Transplantation of the lens in warm-blooded animals has not yet been recorded Grafting of limbs, arm or leg, may be done in young tailed amphibians by inserting freshly detached limbs between the muscles of the shoulder pit or inguinal region, the contraction of the muscles holding them in place In warm-blooded animals, however, this method is not practicable and one has to resort to uniting every blood-vessel and nerve-trunk by stitching with catgut or silk A special technique has been devised for this purpose The suturing of nerves, however, in transplanting mammals' limbs has not proved satisfactory, no return of motility being secured In cold-blooded animals sewing is widely used. Chrysalids of butterflies and moths have been united by girdles of paraffin after cutting on ice Small sea or fresh-water animals can be fixed in grooves of wax and covered by slips of glass or metal (silver, lead) so that the two cut ends touch each other; they then become united by the pressure In this manner tadpoles, planarians and hydras may be dealt with. A convenient method of joining two or more pieces of hydra has been found by threading them on fine bristle When the thread is taken out of the water, a drop of water remains on the grafts and draws them together by surface-tension

Influence of Host.—Diverse scientific problems may be attacked by animal grafting One (which has also occupied the minds of many laymen), is the question as to the influence of a foster-mother on the characteristics of her nurslings Ovaries of one female mammal may be grafted into another previously spayed female, and their eggs then fertilized by a chosen male Then one can decide if the young show the characteristics one would predict from the crossing of this male with the female that has provided the ovary, or whether traits of the foster mother also appear. These experiments have furnished no sure evidence of the latter ever taking place In some series apparent exceptions to this law have been observed, but it could be shown that in these cases either the races employed were not pure, or that regeneration of ovarian tissue had occurred in the foster-mother, the eggs fertilized by the male being derived from this source This latter error is avoided by grafting ovaries inside the uterine horn and closing its end by a stitch Thus eggs of the regenerating ovaries are prevented from passing into the tube Much the same problem confronts us when parts of the body of an animal are grafted on to individuals of another race or species. Can the specific characters in the graft be changed by the influence of the host? Such an influence has been observed in a few special cases, but it is only colour that has spread from the stock into the graft, *e g.*, from a black axolotl to a pink eye grafted into its back from an albino of the same species. Here merely chemicals have diffused without altering the faculty of the graft to produce colour But no sign has ever been observed of the host being able to change the tissues of the graft so as to assume a new specificity The inability of the stock to change inherent differences applies also to merely individual characters Newts or frogs of the same species differ in the rate of heart-beat If the heart be extracted from one individual and grafted into the intestine of another, it retains its original rhythm of beating When different stages of animals undergoing metamorphosis are used as stock and graft, an interesting point occurs the eye of a caterpillar grafted on to the abdomen of the same species will develop at metamorphosis into the eye of the butterfly, the eye of a newt or salamander larva, grafted to the back of its neck, will metamorphosize into the eye of the adult form This happens not only when stock and graft have been taken from individuals of equal size, stage and age, but also from those differing in these aspects to a wide degree The explanation in amphibians is that metamorphosis is produced by the internal secretion of a gland, the thyroid, this secretion passes not only to the host but also to the graft Metamorphosis sets in, not because the stage of the grafted eye has been suited to the stage of the host, but because the graft receives the same agency as the host at the same time. In insects some similar but as yet unknown agency is presumably at work.

Functioning of Grafts.—As the host may in this manner modify the graft, so, too, the graft can by internal secretion modify the host In recent years numerous experiments have been performed in grafting ovaries or testes into castrated vertebrates, females or males the engrafted individuals displayed more or less distinctly the characters of the sex from which they had received the germinal glands by transplantation (*see* SEX). By joining embryos of amphibians the sex of one partner, usually the female, is changed An analogous case is found, when the posterior half of a male Hydra with functional testes is grafted on to the anterior half of a female. In all these cases the function of the graft is presumably established by diffusion of hormones It

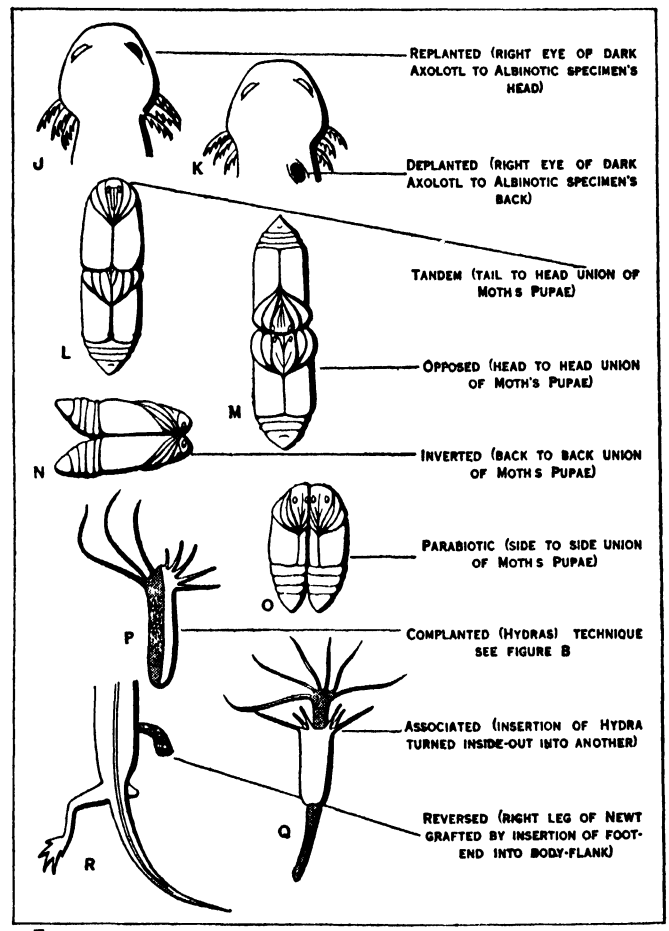


FIG 2.—THE POSITIONS AND ORIENTATION OF GRAFTS IN ANIMALS

is the same with grafts of other glands of internal secretion If, on the contrary, such parts of the body as require nervous connection for their normal function, are to be used in grafting, their function will only be completely restored, if the nerves of graft and stock unite When the head of one earthworm, for instance, has been joined to the body of another, the movements of this compound will at first be irregular, the ingestion of food impossible But later co-ordinate movements reappear, and food is taken in Microscopical examination then reveals continuity of nerve-cord between the grafted head and the stock. In amphibian larvae limbs grafted by the autophoric method may regain motility Curiously enough, it seems as if the connection of one nerve-trunk of the host's limb with the graft is enough for restoring all kinds of motility to the transplanted limb, although several nerve-trunks normally run to different parts of the limb As with motility, the return of sensation also depends on the regeneration of nerves Special tests must be applied to prove return of eyesight after replantation of the eye described above In fish and newts return of vision can be demonstrated by holding a wriggling worm behind the glass aquarium If the animal can see, it will strike at the glass trying to catch the prey; a blind one will take no notice In rats, jumping tests may be resorted to, as blind ones will not jump from a height This evidence of return of vision has been corroborated by microscopical examination of the retina and optic nerve in the grafted eyes.

Antagonism of Graft and Re-growth.—Although a certain amount of regenerative capacity must reside in the tissues of stock and graft, if they are to unite, the possibility of grafting in a given species or stage is by no means parallel to its regenerative potentialities Forms with a high regenerative capacity are often very difficult to unite permanently by grafting because a bud of regenerating tissue may appear on the host's cut surface, before the graft has become firmly attached This often happens when two headless Hydrae are grafted together Each forms a new head at the line of union and the animals separate again as two complete beings It is not necessary for permanent union, that the stock should be able to regenerate the organ which the graft represents As examples of this we may take the eyes of frogs or rats, which cannot of course be regenerated by these animals On the other hand structures may be difficult to graft, although easily regenerated in the same species the legs of the crayfish furnish an instance of this kind Neither is the regenerative capacity of the graft essential for its permanent fixation Pieces of young stages transplanted on older animals of the same kind will be resorbed, whilst the same part taken from an older stage will keep permanently attached, although its regenerative faculty is less It has, indeed, recently been established that a graft will usually hold better on a weakened stock. Probably the latter cannot resorb or destroy the intruder as quickly as a vigorous host, thus giving the graft a better chance to "take" The different regions of a developing embryo or animal body exert an influence on such parts as have not yet reached the same stage of differentiation (*See* DEDIFFERENTIATION, EXPERIMENTAL EMBRYOLOGY) If a hydra is deprived of its tentacular ring and inserted with this cut surface into the side of another hydra, nearly all the trunk of the former can be removed, without preventing the inserted head region from drawing material from the side of the larger component, the head "dominating" the flank. In planarians, newts and tadpoles, regeneration-buds in a sufficiently early stage will develop into any structure, in place of which they have been grafted. Such a regenerating "blastema" derived from the tail of a newt will develop into a limb if grafted on the cut stump of the latter. But in the lizard the regenerating tail blastema is not changed, even if grafted in place of a fore-leg (*see* HETEROMORPHOSIS and REGENERATION IN ANIMALS).

As soon as differentiation sets in, the regenerating tissues will no longer be influenced by the site on which they are grafted. They then conform to the general rule, that the form of a body-region or organ will not be changed by transplantation. Eyes may not only be grafted into eyesockets, but also to the neck or back of salamanders; the main difference being, that in the case of "replantation" function may be restored, whereas "deplantation" to an abnormal situation makes restoration of sight impossible. The orientation in which the components meet is only of consequence for function, not for morphology. When the posterior half of a tadpole is joined to the anterior of another in normal orientation, all parts will be able to function. If, on the contrary, two posterior halves are joined with their anterior cut surfaces together, the compound will not be able to take in food, as a mouth is lacking and will not be formed. If anterior halves are joined by their posterior cut surface, the two heads will pull in opposite directions and often tear asunder. The orientation of the grafted parts towards each other need not only be "normal" or "opposite," as in our last mentioned examples Two animals, grafted on to each other with their backs or bellies united, are termed "inverted" grafts If a limb be cut off and, after removal of its distal tip, grafted with the latter end directed towards the body, we have an instance of "reversed" transplantation In hydras other possibilities of grafting have been invented: if the body be slit lengthwise, the animal can be unrolled completely By putting one unrolled hydra on the other with their interior sides towards each other, and pinning the edges together for a short time, the two hydras will be united lengthwise by this "conplantation" By turning one hydra inside out and inserting it into the body-channel of a second polyp an "association" is effected Finally by pressing hydras through a cloth and mixing the dissociated parts complex hydras of "mosaic" character were obtained

When two different kinds or species of fresh-water polyp have been grafted, the behaviour of the compound as regards asexual reproduction by budding can be studied Although both kinds used may enter into a bud, in time the specific tissues will separate and no permanent "chimera" can be created Such experiments are especially striking when the two species differ in colour

In higher animals without asexual reproduction, buds of chimerical character may be obtained by grafting regenerating tissue, for instance from the member of a black axolotl on to the regenerating member of a white specimen If in this way half of the regenerating bud has been changed, the leg will show a "sectorial chimera" When the bud of one type is overgrown by the skin of the host, a "periclinal chimera" results In any case each cell only produces cells with the character of the species or race it has been taken from, as in "mosaic chimeras" with irregular mixture

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GRAFTON, DUKES OF. The English dukes of Grafton are descended from HENRY FITZROY (1663–1690), the natural son of Charles II by Barbara Villiers (countess of Castlemaine and duchess of Cleveland) In 1672 Henry was married to the daughter and heiress of the earl of Arlington and created earl of Euston; in 1675 he was created duke of Grafton. At James II.'s coronation he was lord high constable. In the Monmouth rebellion he commanded the royal troops in Somersetshire; but in 1688, with Churchill (duke of Marlborough), he seceded to William of Orange He died of a wound received at the storming of Cork

AUGUSTUS HENRY FITZROY, 3rd duke of Grafton (1735–1811), grandson of the preceding, was educated at Westminster and Cambridge. In 1765 he was secretary of State under the marquis of Rockingham; but he retired next year, and Pitt (becoming earl of Chatham) formed a ministry in which Grafton was first lord of the treasury (1766) but only nominally prime minister, until Chatham's illness at the end of 1767. Political differences and the attacks of "Junius" led to his resignation in Jan. 1770. He was lord privy seal in Lord North's ministry (1771), but resigned in 1775, being in favour of conciliatory action towards the American colonists. In the Rockingham ministry of 1782 he was again lord privy seal. In later years he was a prominent Unitarian.

BIBLIOGRAPHY.—The 3rd duke left in manuscript a *Memoir* of his public career, of which extracts have been printed in P H Stanhope, 5th Earl, *History of England* (1836–54), H Walpole, *Memoirs of*

George III. (Appendix, vol. iv., 1845); J. Campbell, *Lives of the Chancellors* (1845–69).

GRAFTON, RICHARD (d. 1572), English printer and chronicler, was born probably about 1513. He received the freedom of the Grocers' Company in 1534. In 1537 Grafton undertook, in conjunction with Edward Whitchurch, to produce a modified version of Coverdale's bible, generally known as Matthew's Bible (Antwerp, 1537). He went to Paris to reprint Coverdale's revised edition (1538) There Whitchurch and he began to print the folio known as the Great Bible by special licence obtained by Henry VIII from the French Government. Suddenly, however, the work was officially stopped and the presses seized. Grafton fled, but Thomas Cromwell eventually bought the presses and type, and the printing was completed in England. The Great Bible was reprinted several times under his direction, the last occasion being 1553. In 1544 Grafton and Whitchurch secured the exclusive right of printing church service books, and on the accession of Edward VI., he was appointed king's printer. In this capacity he produced *The Booke of the Common Prayer and Administracion of the Sacramentes, and other Rites and Ceremonies of the Churche: after the Use of the Churche of Englande* (1549 *seq*), and *Actes of Parliament* (1552 and 1553). In 1553 he printed Lady Jane Grey's proclamation and signed himself the queen's printer. For this he was imprisoned for a short time, and he seems thereafter to have retired from active business. His historical works include a continuation (1543) of Hardyng's *Chronicle* from the beginning of the reign of Edward IV. down to Grafton's own times. He seems to have taken liberties with the original After he retired from the printing business he published *An Abridgement of the Chronicles of England* (1562), *Manuell of the Chronicles of England* (1565), *Chronicle at large and meere Historye of the Affayres of England* (1568) In 1553–54 and 1556–57 he represented the City in parliament, and in 1562–63 he sat for Coventry.

See J. A. Kingdon, *Richard Grafton, Citizen and Grocer of London*, etc. (1901), in continuation of *Incidents in the Lives of T. Poyntz and R. Grafton* (1895)

GRAFTON, a city of Clarence county, New South Wales, lying on the Clarence river, at a distance of 45 m. from its mouth, 342 m. N.E. of Sydney. Pop. (1925) 6,220 The city became a municipality in 1850 The river is navigable from the sea to the town for ships of moderate burden, and for small vessels to a point 35 m. beyond it. The entrance to the river has been artificially improved Grafton is the seat of the Anglican joint-bishopric of Grafton and Armidale, and of a Roman Catholic bishopric created in 1888, both of which have cathedrals Dairy-farming and sugar-growing are important industries, and there are several sugar-mills in the neighbourhood Tobacco, cereals and fruits are also grown. There is rail-connection with Brisbane, etc.

GRAFTON, a town of Worcester county, Massachusetts, U.S.A., 8m. S.E. of Worcester, served by the Boston and Albany and the New York, New Haven and Hartford railways. The population (about 30% foreign-born white) was 6,973 in 1925. The several villages are residential suburbs of Worcester, and there are cotton and woollen mills, a shoe factory and other manufacturing industries. Within the present limits of the town was an Indian village where John Eliot soon after 1651 organized the third of his bands of "praying Indians" The Massachusetts general court granted to the Indians (1654) 4 sq. m. for their exclusive use In 1718 they sold a small farm to the first white settler, and in 1728 a large tract to a group of colonists The town was incorporated in 1735 and named after the second duke of Grafton The last of the pure-blooded Indians died about 1825.

GRAFTON, a city of northern West Virginia, U.S.A., 85m. S. of Pittsburgh, on the Tygart river, at an altitude of 1,000ft.; the county seat of Taylor county. It is on Federal highway 50 and is served by the Baltimore and Ohio railroad. The population was 8,517 in 1920 (95% native white) and was estimated locally at 10,000 in 1928 It is in a coal-mining and lumbering region, and has large railroad shops, flour mills, sawmills, glass and pottery works and other factories There is a national cemetery here, with 1,322 graves. The West Virginia Reform school is 4m. west. Grafton was settled about 1852, incorporated in 1856 and chartered as a city in 1899

GRAHAM, SIR GERALD (1831–1899), British general, was born on June 27, 1831, at Acton, Middlesex, and educated at Dresden and Woolwich academy. He entered the Royal Engineers in 1850, and served through the Russian War of 1854, being awarded the V.C. He fought in the China War of 1860, and was promoted brevet lieutenant-colonel and given the C.B. for his part in the storming of the Taku forts and the entry into Peking. He was promoted major-general in 1881, and commanded the advanced force in Egypt in 1882 In 1884 he commanded the expedition to the eastern Sudan. In 1885 he commanded the Suakin expedition, advancing the railway from Suakin to Otao, when the expedition was withdrawn. He three times received the thanks of parliament, and was given the G.C.M.G. and the G.C.B. He died on Dec. 17, 1899. He published a translation of Goetze's *Operations of the German Engineers in 1870–71* (1875) and *Last Words with Gordon* (1887).

GRAHAM, SIR JAMES ROBERT GEORGE, Bart. (1792–1861), British statesman, son of Sir James Graham and Lady Catherine Stewart, daughter of John, 7th earl of Galloway, was born on June 1, 1792 at Naworth, Cumberland. He was educated at Dalston, Westminster school and Christ Church, Oxford (1810–12) He sat in parliament from 1818 to 1820, but made no serious mark in politics until 1826, when his pamphlet *Corn and Currency* foreshadowed his career as an advanced liberal. He was returned in 1826 as Liberal M.P. for Carlisle, a seat which he exchanged in 1827 for the county of Cumberland. In 1830 he moved for the reduction of official salaries. In Earl Grey's administration of Nov. 1830, he was made first lord of the Admiralty, with a seat in the cabinet, and introduced many financial reforms in his department Graham served on the Committee of four which prepared the first Reform Bill. From 1832–37 he sat again for the county of Cumberland.

In 1834 dissensions on the Irish church question led to his withdrawal, with Lord Stanley, from the ministry. He was again returned for Cumberland in 1835, but in 1837 lost his seat on account of his growing sympathy with the Conservatives. In 1838 he was elected for Pembroke, and in 1841 for Dorchester. He held office as home secretary under Peel (1841–46), but his character hardly fitted him for a post requiring tact and an equable temperament His treatment of the representatives from Scotland was partly responsible for the dissatisfaction which resulted in the secession of the Free Kirk. During his term of office he became increasingly unpopular, and failed to carry through several reforms which he attempted In 1844 the detention and opening of letters at the post-office on his warrant raised a storm of public indignation against Graham, though this action was taken at the request of Lord Aberdeen, then foreign secretary An unsuccessful attempt was made to abolish the home secretary's power in this respect In 1846 famine threatened Ireland as the result of a potato disease, and Graham's agreement with Peel that the duty on imported corn could not be maintained alienated the Tories. Graham was out of office from Peel's resignation in 1846 to 1852, and on Peel's death in 1850 he became prominent among the Peelites In 1852 Graham again represented Carlisle, and was again given his post at the admiralty in Lord Aberdeen's coalition Government Graham took office again under Lord Palmerston, but resigned when he found that there was a cabinet majority in favour of the establishment of a committee of inquiry, to which he was opposed in principle in time of war. Graham successfully resisted an attempt to oppose his election in 1857, but took little active part in politics from that time until his retirement in 1861 He died on Oct. 25, 1861

See W. MacCullagh Torrens, *Life and Times of Sir James Graham* (1863), H. Lonsdale, *Worthies of Cumberland* (6 vols., 1867–75), C. S. Parker, *Life of Sir James Graham* (1907)

GRAHAM, afterwards **CUNNINGHAME-GRAHAM, ROBERT** (d. 1797?), Scottish poet, was the son of Nicholas Graham of Gartmore and Lady Margaret Cunninghame. He started life as a planter in Jamaica, where he was for a time receiver-general. In 1784 he was elected rector of Glasgow uni-

versity, and from 1794 to 1796 he was M P. for Stirlingshire. Politically he is remembered as the mover of a Bill of Rights, in which the Reform bill of 1832 was foreshadowed, and as an ardent advocate of the ideals of the French Revolution; but it is for his lyrics, the best known of which is "If Doughty Deeds My Lady Please," that he has remained famous

GRAHAM, THOMAS (1805–1869), British chemist, born at Glasgow, was educated at Glasgow University He was professor of chemistry in the Anderson Institution, Edinburgh (1830–37), then at University College, London (1837–55), and master of the Mint (1855–69) He was F R S (1836), and one of the founders of the London Chemical and the Cavendish Societies

His first paper, published in 1826, dealt with the absorption of gases by liquids, and the first of his important memoirs on gaseous diffusion appeared in 1829 By measuring the rate at which gases diffuse through a plug of plaster of Paris, Graham developed the law, known by his name, "that the diffusion rate of gases is inversely as the square root of their density" (*See* DIFFUSION) He further studied the flow of gases through fine tubes, and by effusion through a minute hole in a platinum disc, he found that the relative rates of effusion of gases are, like their rates of diffusion, inversely proportional to the square roots of the densities

His early work led him to examine the diffusion of one liquid into another, and as a result of the experiments he divided bodies into two classes—crystalloids, such as common salt, and colloids, of which gum arabic is a type—the former having high and the latter low diffusibility; this division has since been modified. Graham observed that in the passage through a parchment membrane these differences still held, and so was led to devise a method —"dialysis"—for the separation of colloids from crystalloids He also proved that the process of liquid diffusion causes partial decomposition of certain chemical compounds, the potassium sulphate, for instance, being separated from the aluminium sulphate in alum by the higher diffusibility of the former salt

In 1833 Graham studied the three forms of phosphoric acid (ortho, pyro and meta), the differences between them were attributed to the fact that they contained different amounts of basic water, replaceable by metallic oxides, united with a given quantity of phosphoric anhydride From this work the important concept of polybasic acids developed (*see* ACID). In 1835 he published the results of an examination of the properties of water of crystallization as a constituent of salts; definite compounds of salts and alcohol, analogous to hydrates, can be obtained, and these were called "alcoholates."

BIBLIOGRAPHY —Graham's *Elements of Chemistry*, first published in 1833, went through several editions, and also appeared in German, remodelled under J Otto's direction His *Chemical and Physical Researches* were collected by Dr James Young and Dr Angus Smith and printed "for presentation only" at Edinburgh in 1876, Dr Smith contributing a valuable preface and analysis of its contents *See* also T. E. Thorpe, *Essays in Historical Chemistry* (1902)

GRAHAME-WHITE, CLAUDE (1879– ·), English aviator and engineer, was born on Aug 21, 1879 He was educated at Bedford and studied engineering He owned one of the first petrol-driven motor cars in England, and worked at a motor engineering business in London until he became interested in aeronautics in 1909 In that year he gained an aviator's certificate of proficiency, being the first Englishman to do so, and in the following year he entered for many flying races both in Europe and in America, where he won the Gordon Bennett Cup He founded the first British flying school at Pau, in France, in 1909, and in the following year joined a company to run the Hendon aerodrome of London At the outbreak of war in 1914 he resigned from his position of flight commander, and superintended the construction of Government aeroplanes He wrote many treatises on aircraft, dealing with its history, its technical development, and its use in warfare Among the most important are: *The Aeroplane; Past, Present and Future* (1911); *The Aeroplane in War* (1912); *Our First Airways, their Organization, Equipment and Finance* (1918).

GRAHAMSTOWN, a town in South Africa, 33° 19′ S , 26° 31′ E.; alt. 1,769 White pop (1926), 7,648; coloured, 7,860. It is 106 m. from Port Elizabeth and is reached by a branch line from Alice Dale, on the main Port Elizabeth-Pretoria line The first settlement, established here in 1812, near the headwater of the Kowie river, and on the slopes of the Zuurberg, was a military post, founded by Col John Graham, to hold in check the Kafir tribes, who were pushing south-westward. The town is named after its founder After the arrival of the 1820 settlers, the site was chosen as a central rallying-point in case of need Since that time, in spite of its present somewhat isolated position, Grahamstown has retained its importance. It is the capital of the Eastern Province of Cape Colony, and here the Eastern Province law courts are placed. It is also the seat of Anglican and Roman Catholic bishops. The town is pleasantly laid out with broad, straight streets, often lined with trees It is often regarded as the most English town in Cape Colony The slopes of the neighbouring ridge are planted with trees, and from the top a magnificent view of the surrounding country can be obtained, a view of much geological interest. The town is also an important educational centre It has several good schools, and a training college. The Rhodes university college, a constituent college of the University of South Africa, stands in its own grounds, and is equipped with fine hostels, college buildings and playing fields Among the public buildings mention may be made of St George's cathedral (Anglican), built from designs by Sir Gilbert Scott, St Patrick's cathedral (R C), and the commemoration chapel (Wesleyan), erected in 1845 by the British 1820 settlers The Albany museum ranks high in South Africa for its examples of South African fauna and its collection representing early African cultures

(R U. S)

GRAIL, THE HOLY, the famous talisman of Arthurian romance, the object of quest on the part of the knights of the Round Table It is mainly, if not wholly, known to English readers through the medium of Malory's translation of the French *Quête del Saint Graal,* where it is the cup or chalice of the Last Supper, in which the blood which flowed from the wounds of the crucified Saviour has been miraculously preserved Students of the original romances are aware that there is in these texts an extraordinary diversity of statement as to the origin and nature of the Grail, and that it is extremely difficult to determine the precise value of the differing versions

The word *grail* undoubtedly originally signified *dish;* we read in an early French text of "boars' heads on grails of silver," and Robert de Borron, the author of the first Christian Grail romance, represents it as the dish on which, at the Last Supper, the Paschal Lamb was served Helinandus describes it as a "wide and somewhat shallow dish" This is certainly the primary sense of the word, which later on became attached to the varying manifestations of this mysterious object Thus it may be a direct food-providing talisman, as in the version attributed to the Welshman, Bleheris (probably identical with the Bledhericus to whom Giraldus Cambrensis refers as *"famosus ille fabulator"*). Here the king and his guests are fed by the "rich" Grail, which acts automatically, *"sans serjant et sans seneschal,"* the butlers providing the wine. Or it may be indirectly such a talisman, as in the *Perceval* romances and the Galahad *Queste,* where its appearance synchronizes with the feast provided, but we are not told that it is, as in the first case, the actual source of the food It may be a crystal vase, filled with blood, from which the Fisher king drinks, through a golden reed (*Diu Crône,* first visit) or a reliquary containing the Host (*ibid* , second visit) It may be a cup or dish, accompanied by a lance, which bleeds into it (Bleheris and *Perlesvaus*), the dish of the Last Supper (Borron's *Joseph*), or the cup (*Queste*) It may be a stone, as in the *Parzival;* or its place in procession may be taken, as in the Welsh *Peredur,* by a bleeding head on a dish. The task of the critic is to discover a solution which shall admit of all these diverse objects being one and the same, all equally "the Grail" Modern criticism is gradually arriving at the conclusion that there is only one solution which will meet these apparently contradictory demands· that which lies in the direction of what is now termed the "ritual" origin, rather than in that of purely Christian legend or modified folk-tale. The theory of a Christian origin, once very

generally accepted, has now been practically abandoned in face of the fact that no story of Joseph of Arimathea and the Grail exists in any legendary; it makes its first appearance in the romance of *Joseph of Arimathea* by Robert de Borron, composed in the closing years of the 12th century, and by no means the earliest Grail romance The connection of Joseph with Glastonbury, still credited in some circles, is even later, and is obviously imitated from the much earlier "Saint Sang" legend of Fescamp, of which Nicodemus is the protagonist Glastonbury and Fescamp were alike Benedictine foundations, both enjoyed royal patronage, and their abbots were closely connected by family ties both with each other and with the royal family of England The *Joseph-Glastonbury* story, which in its earliest form knows nothing of the Grail, is thus easily to be accounted for The folk-tale theory has more in its favour, as there are undoubted folklore features in some of the romances, such as, *e g*, the food-providing powers of the Grail, but we have no popular tale, even fragmentary, which provides us with the requisite *mise-en-scène*.

On the other hand, it is now very generally recognized that the machinery of the earlier romances—the Fisher king, sick, wounded or in extreme old age, whose incapacity entails disastrous consequences upon his land and folk, both alike ceasing to be fruitful, the quester, whose task is to heal the king, and restore fruitfulness to the land—bear a striking resemblance to the cults associated with such deities as Tammuz, Adonis and Attis, the object of which was the renewal of vegetation and the preservation of life Further, we now know that a certain early Christian sect, the Naassenes, identified the Logos of the Christian worship with these earlier deities, practised a triple initiation into the sources of life, physical and spiritual, and boldly proclaimed themselves to be "alone the true Christians, accomplishing the mystery at the Third Gate" The evidence for the connection between Christianity and the Attis cult in particular is clear, and has been commented upon by A B Cook in the second volume of his monumental work on *Zeus* Scholarly opinion is steadily coming round to the view that the only interpretation of the obscurities and apparent contradictions of the Grail story is to regard it as the confused record of a form of worship, semi-Christian, semi-Pagan, at one time practised in these islands, the central object of which was initiation into the sources of life, physical and spiritual This, and this alone, will account for the diverse forms assumed by the Grail, the symbol of that source Thus is may be the dish from which the worshippers partook of the communal feast; it may be the cup in juxtaposition with the lance, symbols of the male and female energies, source of physical life, and well known phallic emblems It may be the "Holy" Grail, source of spiritual life, the form of which is not defined, and which is wrought of no material substance—"'twas not of wood, nor of any manner of metal, nor was it in any wise of stone, nor of horn, nor of bone"; it is a spiritual object, to be spiritually discerned, but always, and under any form, a source of life Thus Wolfram's stone, the mere sight of which preserves all inhabitants of the Grail castle, not only in life, but in youth, is what is popularly known as "the philosopher's stone," that stone of the alchemist which was the source of all life Even the bleeding head of *Peredur* may be interpreted on the same lines A passage in the York Breviary, for the Feast of the Beheading of St John the Baptist, states *"Caput Johannis in disco signat Corpus Christi quo pascimur in sancto altari"* When the Grail had once been elevated to the purely Christian orthodox plane, as was done by Borron, and became the source, no longer of physical, but of spiritual life, such a substitution, by one familiar with the York Breviary, was possible, even as the author of Wolfram's source, or one before him, had introduced the alchemical stone As the record of the perennial, too often unsuccessful, quest for the source of life, all the puzzling features of the Grail story are capable of satisfactory explanation. There is no other clue to the maze

The versions of the Grail Quest which have come down to us are (*a*) those of which Gawain is the hero: the version by Bleheris, incorporated in the first continuation of Chrétien de Troyes' *Perceval,* and *Diu Crône,* a long and rambling series of *Gawain* adventures, the source of which is unknown. (*b*) The important group of which Perceval is the central figure: the *Conte del Graal* or *Perceval* of Chrétien, with its three continuations, respectively due to Wauchier de Denain, Gerbert (probably Gerbert de Montreuil, author of *Le Roman de la Violette*), and Manessier, the *Perceval* of Robert de Borron; *Perlesvaus,* by an unknown writer, and *Parzival,* by Wolfram von Eschenbach, the finest romance of the cycle Of the three continuations of Chrétien's poem that of Gerbert is the most interesting, as it witnesses to the existence of a tradition connecting the Swan Knight with the Grail hero, a tradition known also to Wolfram and to the author of *Sone de Nansai,* and familiar to the present generation through the medium of Wagner's *Lohengrin* (*c*) The latest of the Grail romances is the *Queste,* or *Quête del Saint Graal,* a section of the prose *Lancelot,* known to English readers through the medium of Malory's translation. Thus we have two romances of which Gawain is the hero, seven, if we include the three continuations of Chrétien, connected with Perceval, one only which knows Galahad, with Perceval as a good second To treat Galahad as Grail hero *par excellence,* as is too often done, is a grave mistake.

BIBLIOGRAPHY —The great bulk of the Grail literature still awaits adequate editing. The *Conte del Graal* or *Perceval* of Chrétien is still only available in Potvin's edition (6 vols 1866–71) This is not a critical edition, and the ms. selected, that of Mons, is unfortunately the least reliable of the extant texts The Gerbert continuation, which exists in only two mss, has been edited by Dr. Mary Williams for *Les Classiques Français du Moyen Âge* So far only two of the three volumes announced have appeared The same series includes an edition of *La Quête del Saint Graal* (Galahad Quest) by A Pauphilet, and an edition of Borron's *Joseph* by W A Nitze A critical edition of the *Perlesvaus,* under the direction of W. A. Nitze, is about to be published by the Carnegie trustees The text of the Modena ms of Borron's *Perceval* (a superior text to the Didot) was published by J L Weston, in vol II. of *The Legend of Sir Perceval* (1909). *Diu Crône* is still only available in Scholl's edition (Stuttgart, 1852). Three of the *Gawain* Grail visits (Bleheris, prose *Lancelot,* and *Diu Crône* second visit) have been translated by J. L Weston, in vol. VI. of *Arthurian Romances* The *Parzival* is that one of the Grail texts which has been most thoroughly studied The most available version for popular use is that by Bartsch (*Deutsche Classiker des Mittelalters*), which has recently been revised, other editions are by Lachmann (1891) and E Martin (1903) There is an English translation by J L. Weston, *Parzival, a Knightly Epic* (1894). The *Perlesvaus,* has been translated by Dr Sebastian Evans, *The High History of the Holy Grail* (1898) A translation of the Galahad *Queste* will be found in Malory (Books XIII–XVIII) For general treatment of the subject *see* J L Weston, *From Ritual to Romance* (1920), J D Bruce, *The Evolution of Arthurian Romance* (1923), J Armitage Robinson, *Two Glastonbury Legends* (1926), R S. Loomis, *Celtic Myth and Arthurian Romance* (Columbia University Press, 1927). (J L W.)

GRAIN, the seed, or "fruit," of cereals, and hence cereal plants generally (from Lat *granum,* seed) (*See* GRAIN PRODUCTION) The word is also used of the malt refuse of brewing and distilling, and of many hard rounded small particles, such as "grains" of sand, salt, gold, gunpowder, etc A "grain" is also the smallest unit of weight, both in Great Britain and the United States of America Its origin is supposed to be the weight of a grain of wheat The troy grain $=\frac{1}{5760}$ of a lb, the avoirdupois grain $=\frac{1}{7,000}$ of a lb In diamond weighing the grain $=\frac{1}{4}$ of the carat $=$ 7925 of the troy grain The word "grains" was early used of the small seed-like insects supposed formerly to be the berries of trees, from which a scarlet dye was extracted (*see* COCHINEAL and KERMES) The imitating in paint of the grain of wood is known as "graining" (*see* PAINTER-WORK)

GRAIN ELEVATORS: *see* GRANARIES

GRAINGER, PERCY ALDRIDGE (1882–), Australian pianist and composer, was born at Brighton, Melbourne, on July 8, 1882 He studied with Louis Pabst in Melbourne, with Kwast at Dr Hoch's conservatorium, Frankfurt, and later with Busoni From 1900 to 1915 he lived in London, during which period he made extensive concert tours and also collected the folk-tunes of which his very effective arrangements are widely known In 1915 he settled in the United States His compositions include: *Molly on the Shore* for orch, small orch, strings; *Shepherd's Hey* for orch, also for 12 voices, *Mock Morris,* sm. orch, strings; *Irish Tune from County Derry,* strings and horns, strings only; Clog Dance *Handel in the Strand,* piano and

strings, paraphrase on the "Flower Waltz" from *Cassenoisette*, Tschaikovsky, for piano; choruses with instruments; *Brigg Fair*, tenor solo and mixed chorus

GRAINING: *see* PAINTER-WORK.

GRAIN PRODUCTION AND TRADE. No one can study the international trade in grain without noticing the great changes that have occurred in modern times and that are still occurring. Since the closing years of the last century there have been developments which may affect the dietary and economic conditions of the various races of mankind; these later developments will be discussed and illustrated in subsequent sections of this article. If we take a longer survey of the position, we find that one of the most striking features is the gradual displacement of rye by wheat in the dietary of the European races The displacement is still only partial, but it is progressing steadily, and it would seem as if wheat would become the staple bread-stuff of the Caucasian peoples and perhaps of some at least of the races of the Orient In a somewhat similar way maize appears to be taking the place of oats and barley as a cattle-food, but here too the displacement is only partial Development in the growing of grain is certainly not standing still, but the rate of development will have to be rapid and continuous if it is to keep pace with the ever increasing demand Plant breeders the world over are aiming to provide growers with better yielding seed and hardier species of grain, but their work is necessarily slow We may be sure, however, that the last word in the breeding of new plants has not yet been said, and it would be venturesome to say it is outside the bounds of possibility for some new plant to be evolved which may even displace wheat as the chief bread-grain of civilised man In another direction too there have been developments; synthetic commodities are being manufactured on a large scale The French chemist Berthelot held the opinion that synthetic wheat and flour are within the bounds of possibility and put his belief on record in the following words —"The day is perhaps near when the progress of chemistry will make it possible to manufacture foodstuffs economically When that day arrives the cultivation of wheat and the raising of cattle will meet with the fate that we have seen fall upon the cultivation of madder There will be immense shifting of interests, but the masses will profit by the change."

The World's Wheat.—Wheat can be truly described as the most important of all crops, for it provides the staff of life for all the more advanced and progressive people of the world It has certainly been known to man for 5,000 years and has always accompanied him in his forward march. The crop responds readily to generous and careful treatment and herein lies a great hope of increasing supplies If the enormous areas now producing eight to twelve bushels per acre could be so cultivated that they produced twenty or even thirty bushels per acre, the world would certainly be relieved for many decades of all anxiety about the supply of bread As an instance of what can be produced on good land under favourable conditions, there is on record the sworn statement of a Canadian farmer of the Peace River district, that in 1927 he harvested 85 bushels per acre from twenty acres of summer fallow land On the other hand, without man's care and cultivation wheat dies out completely.

The statistics of wheat production are of deep interest.

Wheat Crops of the World
(in thousands of quarters of 480lb)

	1890	1900	1913	1926	1927
Europe (without Russia)	137,400	138,870	153,700	150,140	157,800
North America	56,700	80,500	124,300	156,100	164,500
South America	6,400	9,100	18,000	31,100	34,200
Australasia	4,900	6,900	13,600	21,400	14,600
India and Japan	30,000	33,800	48,300	45,460	45,400
Africa	6,200	7,860	13,400	12,520	13,300
Total (without Russia)	241,600	277,930	371,300	416,720	429,800
Russia	*28,000	**53,000	†122,000	‡101,200	‡95,000
Grand total	269,600	330.030	493,300	517,920	524,800

*60 governments, **71 governments, †73 governments; ‡records of Soviet Russia.

In addition to the crops given in the table, there are others concerning which no reliable statistics are available. These include those of Mexico (about 2,000,000qrs.), Turkey (about 5,000,000qrs.), Manchuria (about 2,500,000qrs.), China (80,000,000qrs.), Persia (2,000,000qrs.). The figures given in brackets are unauthoritative estimates of outturn which have been issued from time to time. There are also crops such as those of Kenya, Brazil and Peru, which may increase, but are at present quite unimportant

Adjustment of Supply to Demand.—It was said of old that while the earth remained seed time and harvest should not cease, and the experience of mankind proves how well the promise has been fulfilled. At each season's end, the world's reserves of foodstuffs are found to be just sufficient to provide for any brief seasonal interval This fact is not a little curious in the case of a plant like wheat, seeing that in one country, or in one season, it will yield ten bushels per acre and in another twenty bushels. Yet no instance can be adduced where the world's crop of one season has been found to be anything like double the size of the next preceding or next subsequent crop; though on the other hand there are many instances where the crop of one country in one year, compared with another year, may be startlingly deficient or excessive.

It can be stated as a fact, that the average world's production of a ten years' period is found to be equal to the average world's requirements of the same period The consumption of any importing country can be ascertained approximately by adding the imports to the home crop; in the case of exporting countries, the home consumption is found by deducting the exports from the quantity grown

The World's Maize.—We pass to the statistics of the crops of maize or Indian corn, commonly called "corn" in America.

The Maize Crop of the World
(in thousands of quarters of 480lb)

	1890	1900	1913	1926	1927
Europe (including Russia)	39,000	54,300	79,400	91,700	73,500
United States	172,000	255,000	285,000	308,600	325,000
Argentina	5,500	7,000	25,700	32,600	*37,400
Africa	4,700	5,000	11,300	13,600	18,000
British India	8,000	6,700	9,500	9,000	10,000
Total	229,200	328,000	410,900	455,500	463,900

*This official estimate probably not high enough—subsequent shipments indicate a crop of about 42,000,000qrs

This cereal is also grown in a number of countries which do not publish regular information about production, or for which it is not possible to obtain comparable statistics The most important are Dutch East Indies about 8,000,000qrs, Philippine Islands about 2,000,000qrs, Mexico 11,000,000qrs Australia grows a small crop and other small crops are those of Peru, Brazil, New Zealand and Uruguay.

Maize is usually considered a secondary or coarse grain and rated as feeding-stuff, but it is used as human food by many millions of people in tropical climates and in the southeast of Europe; it is also much used for food in Italy and the United States Dari or Kaffirkorn is used with maize in tropical climates and largely grown in countries which do not compile statistics of production, such as the Sudan, Syria and Persia, but there are crops, such as those of South Africa and the United States, of which the outturns are definitely known Maize is not a bread grain and therefore cannot rank with wheat as human food but it is a crop of the greatest importance to the human race Like wheat, it emerged with man from unrecorded history and depends on man's care for its continued existence There is no known wild maize, although it was reported that a kind of grass with large seeds was discovered in America some time ago, which might have been the parent of maize.

The yield of maize in America is 25 bushels per acre compared with 14¼ bushels of wheat and 20½ of barley; in Argentine 26 bushels per acre against 12 of wheat, while good European crops

will give 32 bushels of maize against 20 of wheat from adjoining lands. (All comparisons are made in bushels of 60lb. weight.) It is safe to predict that maize will continue to be grown as long as meat, milk and eggs are popular articles of diet.

The World's Barley.—The available statistics of barley production are as follow:

Barley Crops of the World
(in thousands of quarters of 400lb.)

	1890	1900	1913	1926	1927
Europe (without Russia)	48,700	62,600	70,000	82,770	80,700
North America	10,700	9,600	27,200	35,610	42,700
North Africa	8,500	9,000	12,400	7,840	9,700
India, Japan and Korea	25,300	24,500	33,500	30,720	27,600
Southern Hemisphere . .	1,100	1,200	2,400	3,900	3,000
Total (without Russia)	94,300	106,900	145,500	160,840	163,700
Russia	*21,200	†28,300	**69,000	‡31,000	‡28,000
Grand Total	115,500	135,200	185,500	191,840	191,700

*60 governments; †71 governments, **73 governments, ‡Soviet Russia

This table does not give a full list of the world's barley crops, the two chief omissions being those of Asia Minor and Iraq, both of which are important in the international trade, especially the latter which, together with Persia, in 1927 furnished more feeding barley to Great Britain than any other country Asia Minor grows moderate quantities of fine malting barley. Palestine and Syria also grow barley on a small scale.

Barley is of ancient lineage, probably the equal of wheat in this respect; it is of the greatest importance to agriculture and cattle raising There has been curtailment of cultivation in Russia, but the crop is holding its own in other lands and tending to increase The experience of 1927 however proved that supplies are not fully equal to requirements and the scarcity is likely to become more evident as time goes on. This remark applies both to malting and feeding sorts, the supply of the former having been reduced by the unseasonable weather of the European summer of 1927.

Barley is a dual purpose grain; it is used for malting and distilling and also for animal food, being especially valuable for fattening pigs. The best qualities are bought for malting purposes, the lower ones go to the distillers, and the poorest sorts are ground up for meal The average barley yield in Great Britain, expressed in bushels of 60lb is 27; in the United States 20½, in Germany 23

The World's Oats.—The following table gives the available figures for oats.

The Oat Crops of the World
(in thousands of quarters of 320lb.)

	1890	1900	1913	1926	1927
Europe (without Russia)	128,500	134,600	191,600	191,000	184,200
North America	59,400	93,000	155,000	163,700	164,000
Southern Hemisphere	2,200	4,200	9,800	10,700	7,100
Total (without Russia)	190,100	231,800	356,500	365,400	355,300
Russia	*70,000	†90,000	§125,500	‡90,000	‡90,000
Grand total	260,100	321,800	481,900	455,400	445,300

*60 governments, †71 governments, §73 governments, ‡Soviet Russia

In addition to the crops included in the above table there are a few others but they are unimportant

The oats crop can be described as the friend of the poor man and the good servant of his richer neighbour. It grows and flourishes where sunshine is scanty and the land not very fertile, but at the same time it well repays the care of the good farmer and brings forth heavier yields on the better soils Speaking generally, the best oats grow towards the north, or south of the equator towards the south

English farmers obtained in 1927 over 10/- per 112lb for good samples and expressed themselves as satisfied with the price It can perhaps be said there has been no general or serious reduction in oats growing in recent years and no such reduction appears likely if this cereal will fetch as much money as wheat.

Expressed in units of 60lb, oats do not always yield so well as wheat, the figures for Great Britain being 25 of oats against 31 of wheat. In France the yields are 20½ units of 60lb. for both wheat and oats, but in the United States oats make a much better relative showing with 17 units against 14¼ units of wheat

The World's Rye.—The statistics of rye production here follow

Rye Crops of the World
(in thousands of quarters of 480lb.)

	1890	1900	1913	1926	1927
Europe (without Russia)	64,600	74,700	95,600	83,880	92,600
North America	3,300	3,300	5,100	6,270	9,100
Argentina		100	400	390	860
Total (without Russia)	67,900	78,100	101,100	90,540	102,560
Russia	*87,500	†117,000	§116,000	‡105,000	‡100,000
Grand total	155,400	195,100	217,100	195,540	202,560

*60 governments, †70 governments, §73 governments, ‡Soviet Russia

Rye is a very valuable bread grain, but its cultivation is not increasing The figures given in the crop table seem to contradict this statement, for fair aggregate increases are shown since 1900, apart from Russia. It is quite true that larger crops are being grown in North America, and Argentina has made a small extension of her rye acreage, but Europe is not growing more rye, or if there is any increase it is not important The European crop, exclusive of Russia, shows a bigger total than in the former years, but previous to 1914 Poland and the small Baltic States (Estonia, Lithuania, Latvia) were all included in Russia It cannot be doubted that rye will continue to be cultivated in northerly regions, for at present there is nothing to replace it as a bread grain

Rye is not a heavy yielding grain, the outturn in Germany averaging 21 bushels per acre compared with 26 bushels of wheat; in the United States the yield is 12 bushels compared with 14¼ bushels of wheat; the comparisons are made in bushels of 60 lb

THE GRAIN MARKET

Developments in grain trading since war control was removed in Great Britain have resulted in a reduced volume of trade on the London market, which was formerly pre-eminent in this business by reason of the large surplus supplies which the United Kingdom imported, the financial facilities available in London, together with well-placed ports of call in the South of England and Ireland to which laden ships could be sent to await orders Among the causes of reduction are the larger imports made by Continental countries and the efforts of exporters to sell direct to the importers; the formation of farmers' pools in Canada and Australia which seek to obtain higher prices for growers by cutting out merchants and brokers—where possible the pools sell full cargoes direct to millers; the formation of millers' combines with the object of buying large quantities direct from shippers, both brokers and merchants being ignored in these operations

Movements of Wheat.—The statistics in the table on the next page show the world's commerce in wheat

Exports of wheat have nearly doubled since 1900–01 The new competitors for a share of the international trade have not only supplied all the additional exports, but also made good the loss of most of the European supply There is plenty of additional land in Canada, Argentina and Australia to enable shippers to sell still larger quantities, and there are millions of potential buyers and consumers in Asia and Africa, but they have yet to acquire a taste for wheaten bread and sufficient money to pay for it Altera-

Net Exports of Wheat & Flour (Reckoned as Wheat)
(in thousands of quarters of 480lb.)

Area	1900–1	Average 1909–14	Average 1919–22	1923–4	1924–5	1926–7
Russia	9,600	19,200	100	2,900	300	6,200
Danubian countries	5,000	7,500	700	2,100	1,800	2,700
Canada	2,900	11,800	18,700	43,100	24,300	36,800
United States	28,100	13,400	33,000	15,700	31,700	24,800
Argentina	5,600	10,300	16,700	21,500	15,300	17,400
Australia	2,300	6,600	11,000	10,500	15,200	13,000
India	600	6,200	200	3,300	6,500	1,000
Total all exporting countries (including other minor countries not mentioned above)	56,000	76,000	83,000	100,000	96,000	105,000

Net Imports of Wheat & Flour (Reckoned as Wheat)
(in thousands of quarters of 480lb.)

	1900–1	Average 1909–14	Average 1919–22	1923–4	1924 5	1926–7
Importing countries of Europe	48,000	65,000	72,000	70,000	81,000	87,000
Non-European countries	6,000	10,000	11,000	30,000	15,000	18,000
Total Imports	54,000	75,000	83,000	100,000	96,000	105,000
British Isles	23,300	27,000	25,900	31,100	28,500	29,600
France	1,500	5,800	7,300	8,000	5,900	10,000
Italy	4,700	6,600	11,300	8,800	11,000	10,800
Belgium	4,900	6,100	4,100	5,000	4,900	4,900
Holland	2,000	2,800	2,400	3,300	3,400	3,500
Germany	6,200	8,500	6,800	3,700	10,100	11,500
Czechoslovakia			1,800	2,600	2,700	2,500
Greece	800	900	1,400	2,300	2,600	2,300
Egypt	300	1,000	1,100	1,000	1,100	1,100
Japan	300	500	1,300	3,800	2,000	2,200

The figures for the war years are necessarily incomplete for some countries

tions in the sources of supply have been many and varied within the memory of the oldest traders Baltic ports were once important shippers, but they were pushed out of the trade by South Russia and the Eastern states of America, then came California and India, and finally the great inland States of America, the vast prairies of Canada, the fertile plains of Argentina and the vast spaces of Australia, measured in millions of square miles

London Corn Trade Association.—The usages and terms of the London market are matters within the competence of the London Corn Trade Association, a corporate body including members of all grain trade firms of consequence in Great Britain, on the Continent of Europe, and among exporters of North and South America, of India, Australia and Africa Brokers and traders in all the principal ports of Britain find it advantageous to belong to this Association Most of those not strictly connected with London are members of their own local associations, of which the Liverpool Corn Trade Association is the most important, followed by those of Hull, Bristol, Leith, Antwerp, Hamburg, Genoa, etc The main object of these associations is the protection of the common interests, by defining terms of contract, by providing for arbitration in cases of dispute, and by taking measures to uphold the rights of traders against infringement.

The predominance of North America in the grain markets of the world is an outstanding fact, and it is not too much to say that the wheat quotations of Chicago and Winnipeg are those most regarded as deciding the course of the world's grain trade from day to day; but it must be said that the importance of Buenos Aires quotations is steadily increasing as Argentina crops become greater and trade in River Plate produce steadily expands. In some seasons the Chicago price is all-important; in others it shares supremacy with Winnipeg The qualities quoted are so well known that it is needful only to mention No 2 Hard Winter, and No 1, No. 2 and No. 3 Manitoba to afford a definite basis of transactions. In this respect the business in North American grain is done on terms differing from those adopted by other exporting countries.

United States and Canadian Trading.—In the United States and in Canada the system of government inspection of grain for settling grades is very efficient, and the certificate of the government inspector is accepted as final. By far the greater part of the grain business in the United States is in connection with produce intended for national consumption or manufacture, and the terms agreeable to American buyers have therefore to be accepted by importers In Canada the relative size of overseas trade is much greater, but the system of inspection and grading is even more precise than in the United States and is frankly accepted by importers In dealing with Argentina, whence the tropical passage may cause the grain to deteriorate on the voyage, the contract's basis throws this risk on the shoulders of the exporter and wheat is sold with a guarantee of natural weight and good condition to be verified at discharge of the grain. Wheat from Australia is sold as average at time of shipment about equal to the official standard, and somewhat similar stipulations are made in the special contract form for Indian wheat, with a guarantee in case of damage by weevil, or deterioration by the excessive mixture of barley or any other extraneous matter. Russian wheat is now sold on sample

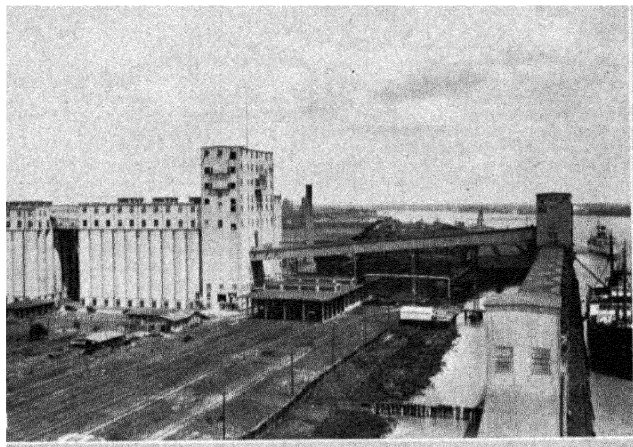
The practice of grading wheat and other grain has spread from North America to other countries, but lacking the complete elevator systems, these cannot deal with all their crops on the basis of grades

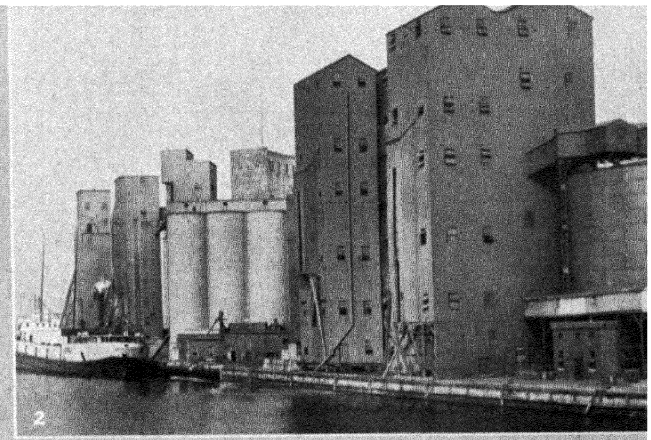
Millers' Purchases.—By far the larger portion of the world's wheat crop finds its way to the flour mill although some considerable quantity is used for cattle or poultry food The miller is in most cases the original buyer of grain for British ports, to be discharged direct from the ship into his warehouse communicating with the mill, by grain elevators and conveyors In the British grain trade today there is very little scope for the merchant who formerly purchased a wheat cargo for apportionment in suitable quantities amongst the smaller mills

Futures.—Apart from direct sales of overseas wheat to millers, considerable business is done by traders who buy wheat for shipment and, either immediately or later, sell a similar quantity for delivery at a future period This future delivery trading, known also as *marché à terme* or *mercado á término*, originated in the United States and has been established at Liverpool for over half a century. It was adopted at Buenos Aires in 1908 and is now carried on at Winnipeg There are future delivery exchanges, including grain contracts at several other American markets, also at Paris, Berlin, Rotterdam, Genoa, Milan, etc At Chicago futures trading is established for wheat, maize, oats, barley and rye, at Winnipeg for wheat, oats, barley and rye, at Buenos Aires for wheat, maize and oats, in Liverpool wheat absorbs the chief attention and this is also the case in other big markets It may be considered as essential that, to avoid cornering, a future delivery exchange should have an ample available supply of such qualities of wheat as are in favour with millers, in other words, the exchange should be located on a main route of transit between the grower and the consumer Unless this condition is fulfilled the business organization seldom succeeds

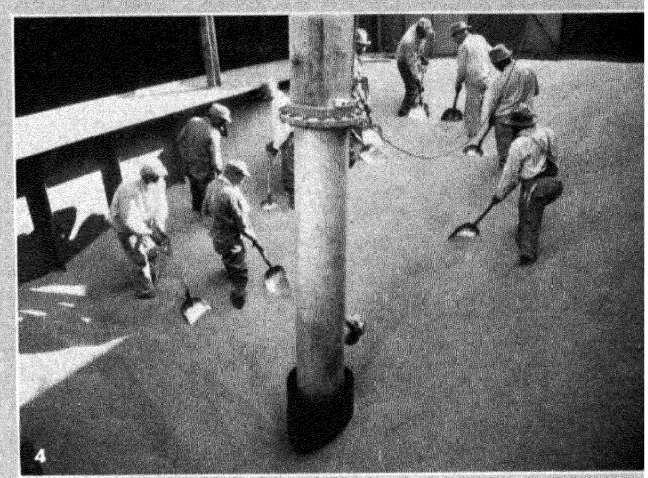
By means of one or other of these exchanges the farmer can, if he chooses to do so, sell his crop of wheat whenever the price suits him, months before it is ready for the reaper, and thus practically eliminate any risk of falling prices The miller who has purchased a cargo of wheat can sell an equal quantity in the form of contracts for future delivery Naturally he will not find this course desirable unless there is an apparent profit between the price paid for his cargo, and that obtainable for future delivery of wheat. The miller has to buy wheat for his mill, and if he makes contracts for future delivery his next enterprise is to sell the flour to be manufactured later, and, as he achieves this, to buy in his wheat contracts He thus makes four transactions in place of the simple purchase of wheat abroad and the sale of flour at home

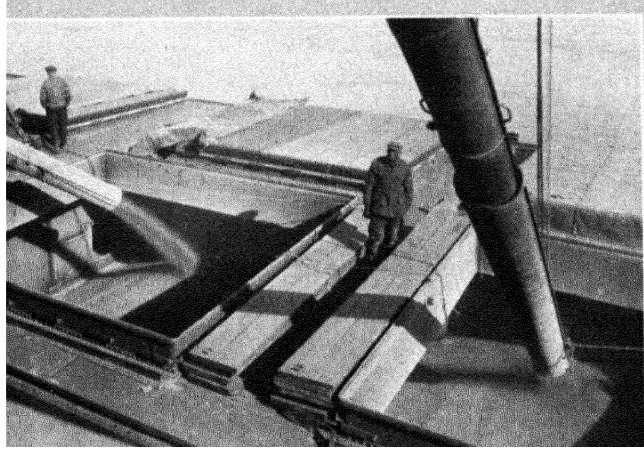
GRAIN PRODUCTION AND TRADE

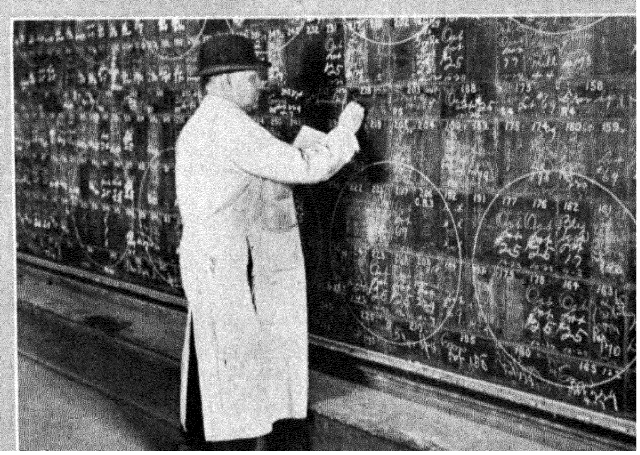












PHOTOGRAPHS, EWING GALLOWAY

LARGE SCALE METHODS OF STORING AND SHIPPING GRAIN IN THE UNITED STATES

1. Modern grain elevator built by the State of Louisiana at New Orleans. Its storage capacity is over 2,500,000 bushels, and its sacking capacity 7,200 bu. per hour. Elevator (left) consists of tubular concrete bins, open at the top and filled through chutes (fig. 3). Grain is unloaded from barges or railroad cars by suction tubes, stored in elevator, then loaded into ocean steamers for shipment to foreign markets
2. Grain elevator along the Lake Erie waterfront at Buffalo, to which wheat is shipped by steamer from Duluth and other Great Lake ports, for transport by the barge canal to Atlantic ports. The illustration shows (centre) concrete bins and (right) covered elevators
3. Interior of upper structure of the elevator in fig. 1, showing chutes which distribute grain into the round bins. The chutes are jointed and can be turned to reach several bins in their radius
4. Suction unloader removing grain from a steel barge for storage in waterfront elevator. A barge can be emptied in a few minutes by this method
5. Filling a barge with wheat in St. Louis, for shipment via the Mississippi river to New Orleans. Covered bins, fitted with weather-proof hatches, keep the wheat in prime condition during shipment
6. Blackboard located on the scale floor of a large grain elevator in Jersey City, showing complete record of the bin number, kind of grain and date of storage. Circle indicates the bins, contents of which may be weighed on one scale

Settlement of Price Differences.—Future trading involves, in effect, a daily settlement by seller and buyer alike of the difference in price arising from market fluctuations, and a payment by both parties at the time of making the contracts of a cash margin according to the regulations which form part of the contract stipulations. The penalty for non-payment of difference at the appointed time is the immediate sale or purchase, as the case may be, of all contracts standing in the name of the defaulting member in the clearing house registry.

The latest futures market to be established is at Johannesburg in South Africa, where trading is done in maize only.

The wheats tenderable against the Liverpool future delivery (Graded Wheat) contract are Canadian Spring Wheat; American Red Wheat and Spring Wheat; Soft Winter Wheat and Hard Winter Wheat, Argentine Wheat (northern type and southern type) and Australian wheat, but no wheat in tenderable which is unsuitable for general milling purposes.

Movements of Maize.—There have been great changes in the sources of supply of this cereal, but on the whole the trade has flourished.

Exports of Maize
(in thousands of quarters of 480lb)

	1900–1	1910–11	Average 1916 to 1920	1923–4	1925–6	1926–7
Argentina	4,000	9,500	10,300	14,900	18,700	33,200
Balkan countries	5,500	7,100		9,900	7,400	9,100
United States	19,600	6,900	4,100	2,500	2,800	2,000
Russia	700	5,300		900	900	1,100
South Africa		800	700	2,500	4,000	100
Other countries	100	2,100	700	1,300	2,300	1,300
Total	29,900	31,700	15,800	27,000	36,100	46,800

Imports of Maize
(in thousands of quarters of 480lb)

	1900–1	1910–11	Average 1916 to 1920	1923–4	1925–6	1926–7
United Kingdom and Ireland	13,200	10,400	6,200	9,200	9,000	10,100
Germany	6,400	3,500		800	2,500	7,400
Holland	1,600	2,300	1,600	3,600	4,600	5,600
France	1,400	2,600	1,400	3,000	3,000	3,500
Belgium	1,700	2,400	400	2,000	2,600	3,200
Denmark	500	1,200	1,300	600	1,800	3,200
Italy	1,100	2,500	800	1,000	1,900	1,800
Czechoslovakia				500	1,700	1,500
Scandinavia	100	100	500	600	1,000	1,100

Maize growers have grumbled at the prices obtained but they have continued to ship In the case of Argentina the quantities exported have steadily grown until the trade is now on a vast scale, and moreover it appears likely to increase The British Empire does not figure prominently as a maize exporter The African supplies are uncertain, the Canadian climate is not suitable, and Australia finds the international price too low India can consume all the home crop in a normal year. As maize contains a larger percentage of moisture than wheat, it is more likely to spoil if shipped soon after harvest, or during the germinating season

The units for maize sales on the international market are a quarter of 480lb or a metric ton of 1,000 kilos (2,204·6lb). American maize is sold on grade, the certificate of the U S. grader being final. Argentine maize is sold as fair average quality and shippers guarantee the outturn weight of the bags on arrival at this side, and of course the quality and condition must be right to conform to the description "fair average." South African and Kenya maize are also graded by the Government and sales are made on the basis of the official inspection certificate. The unit for "futures" (forward deliveries) and spot sales in Liverpool is 100lb , in America the bushel of 56lb. is the legal unit. In South Africa and East Africa the bag of 200lb is always employed for statistics and sales

Barley Movements.—The statistics of the commerce in barley are of great interest to those acquainted with the trade since 1900.

Exports of Barley
(in thousands of quarters of 400lb)

	1900–1	1910–11	Average 1916–20	1923–4	1925–6	1926–7
Russia	4,900	23,900		2,400	4,400	3,500
Poland				300	900	500
Balkan countries	2,000	3,400	600	2,700	1,600	4,500
North America	900	1,300	3,900	2,400	7,300	6,800
North Africa	900	1,000	1,500	2,800	900	400
Argentina			200	1,200	800	1,700
Czechoslovakia	1,400	1,000		1,000	600	600
Hungary					300	300
Other countries	1,700	1,600	1,900	3,300	1,800	2,400
Total	11,800	32,200	8,100	16,100	18,600	20,700

Imports of Barley by Chief Receiving Countries
(in thousands of quarters of 400lb)

	1900–1	1910–11	Average 1916–20	1923–4	1925–6	1926–7
Germany	4,400	19,300		2,700	6,800	11,600
United Kingdom and Ireland	5,100	4,400	3,300	5,400	4,500	3,600
Holland	300	200	50	1,900	1,900	2,100
Belgium	1,100	300	100	1,500	1,600	1,400
France	600	3,200	1,200	700	300	300

The moderate exports in 1900–01 were below the average of that period, for Russia and Balkan countries alone were then averaging shipments of about 10,000,000qrs. yearly By 1910–11 the Russian trade had reached its highest point and a very active shipping business was being done The great bulk of the Russian barley went to Germany, to feed the herds of pigs on which the Germans relied to provide the fats and meats which formed such a large part of their dietary. But the war cut off the Russian supply almost as completely as if it did not exist, and the blank shown for the period 1916–20 testifies to a complete stagnation of the trade even in the years immediately subsequent to the war. The war being followed by revolution in Russia, when trading was subsequently resumed it was soon found that the former supplies were not forthcoming; to add to the scarcity the Soviet government advised the peasants to grow wheat instead of feeding grain, probably for financial reasons, because the sale of a cargo of wheat around 50/– per 480lb brings much more money into the treasury than the sale of a cargo of feeding barley around 30/–. The malting barley supply is furnished by other and widely separated lands, of which the chief are California and Chili, but smaller quantities are obtained from Asia Minor and Australia, and lower qualities from India, Canada and North Africa

On the British markets the supplies of home grown and foreign barley used to be about equal in quantity, so that brewers and maltsters could select the desired quality from either source, but times have changed and in 1927 foreign descriptions were much less than the home crops, to the great advantage of the British grower The suitability of barley for malting is one of the technical studies of the grain trade and a really accurate judgment on a particular sample is not an easy matter Of the feeding barley trade in Great Britain, Bristol is the chief centre Sales are always made per 400lb and the contracts expressly stipulate that imported barley shall not contain more than a fixed percentage of foreign matter, *e g*, 3% or 5% It was found necessary many years ago to fix definitely the amount of foreign matter tolerated, because at one time it seemed the Russian peasant was trying to ship the family acres to importing countries and charge them as barley

The higher qualities of malting and distilling barleys are mostly sold per 448lb the lower qualities per 400lb but this rule is not adhered to strictly, for so-called Chilian Forage is sold per 448lb and on the other hand some good Asia Minor sorts are sold per 400lb

Movements of Oats.—The world's commerce in oats is shown in the following tables

Exports of Oats
(in thousands of quarters of 320lb.)

	1900–1	1910–11	Average 1916–20	1923–4	1925–6	1926–7
Argentina		3,100	3,300	3,800	3,500	4,000
North America	5,600	900	9,500	3,800	6,200	1,600
Russia	9,200	10,800		900	100	100
Poland					700	800
Balkan countries	200	1,200		400	300	
Other countries	2,000	1,500	1,000	2,500	1,600	1,000
Total	17,000	17,500	13,900	11,400	12,400	7,500

Imports of Oats by Chief Receiving Countries
(in thousands of quarters of 320lb)

	1900–1	1910–11	Average 1916–20	1923–4	1925–6	1926–7
United Kingdom and Ireland	8,200	5,700	3,400	3,900	3,100	1,700
Germany	2,900	2,500			2,100	1,100
Holland	900	500	200	600	700	700
Belgium	400	800	200	600	1,000	600
France	2,300	4,000	4,000	200	1,300	100
Italy	200	1,100	2,100	600	800	800

The international trade in oats has decreased in recent years and the figures of exports and imports in the table show that the quantities exchanged on the world market are only one half of those handled formerly

The contract terms for the sale of Argentine and North American oats are the same as for other grain

Sales on the international market are now all made per quarter of 320lb, or metric tons of 2,204 6lb, previous to the war the size of the quarter varied, some qualities being always sold at 304lb. and some at 320lb. British oats are sold per cwt of 112lb or per quarter of 3cwt, the former being the only legal unit The unit in North America is a bushel of 32lb, so that 10 bushels make one quarter of 320lb

The British trade in oats is chiefly in home grown grain; of the country's ordinary requirements over 80% is produced in the British Isles, and a very large proportion is used locally for dairying or other cattle food and horse provender

Movements of Rye.—Next follow the figures for the world's commerce in rye

Exports of Rye
(in thousands of quarters of 480lb)

	1900–1	1910–11	Average 1916–20	1923–4	1925–6	1926–7
North America	400		3,100	2,800	2,000	3,200
Russia	6,100	4,800		6,200	800	1,900
Poland				300	1,500	400
Balkan States	400	700	100	100	100	300
Argentina				400	300	700
Hungary		1,400		400	700	1,100
Other countries		200		100	600	
Total	6,900	7,100	3,200	10,300	6,000	7,600

Imports of Rye by Chief Receiving Countries
(in thousands of quarters of 480lb)

	1900–1	1910–11	Average 1915–20	1923–4	1925–6	1926–7
Germany	4,100	*		2,800	*	2,200
Holland	1,000	1,400	100	1,200	700	300
Scandinavia	1,300	1,100	600	1,500	1,100	900
Denmark	400	800	200	1,200	1,000	800
Finland			100	1,100	700	600
France		600	300	200	100	400
Czechoslovakia				700	800	500

*Small exports in these years

The international trade was never greatly interested in the rye business. In pre-war time Russia was the chief source of supply and Germany the chief buyer, but when the latter had a good harvest her exports exceeded her imports. A good deal of the rye was exported across Russia's land frontiers and the bulk of the trade was done direct between shippers in Russian ports and trading centres and German importing houses. The United States is now the chief exporter of rye and seems likely to hold that position although Canada and Argentina are competing. But the trade does not expand nor is there any expectation that it will grow in the coming years It may perhaps remain as at present, on the other hand there is no indication of any appreciable use of rye as a bread grain amongst people who hitherto have used other food It is fairly common for France, Italy and some other countries to decree the admixture of a percentage of rye flour with wheaten flour, but this is increase by compulsion, for the millers stop the practice immediately they are free to do so. Czechoslovakia, Austria, Holland, Denmark and Scandinavia all import fair quantities.

Rye is sold on British markets per quarter of 480lb and on the Continent the units are the quintal (220 46lb) and the metric ton of ten quintals In North America rye is graded officially in the same way as other grain and is there sold per bushel of 56lb

British Sources of Grain Supply.—In the following tabular statements are shown the countries which furnished the grain and flour imported by Great Britain and Ireland in 1901–02 and 1926–27, with the quantities received from each source of supply It will be noted that whereas British imports of flour, maize, barley and oats had fallen in the latter year, imports of wheat had risen

Imports from Various Countries into Great Britain and Ireland 1901-02

	Wheat (qrs 480lb)	Flour (sacks 280lb)	Maize (qrs 480lb)	Barley (qrs 400lb)	Oats (qrs 320lb)
Atlantic America	* 7,169,600	* 6,173,200	1,015,800	78,800	299,900
Pacific America	2,677,000	95,400		739,900	
Russian Empire	691,200	28,900	1,420,300	2,460,500	3,757,000
Dominion of Canada	†1,895,800	†674,400	80,700	12,300	148,100
Argentina-Uruguay	1,368,700	124,700	2,814,500	6,500	39,800
Commonwealth of Australia	1,727,300	114,300			900
India	1,686,500		39,100	2,700	1,800
Rumania	290,900	10,500	4,598,000	1,351,200	381,300
Bulgaria	109,000		135,600	44,800	2,400
Turkey in Asia	57,700	1,900	405,200	924,200	125,700
Turkey in Europe	22,400	100	262,900	71,700	69,300
German Empire	4,600	12,400	8,200	192,600	1,151,600
France		291,500	.	46,000	48,700
Austria-Hungary	1,200	288,500	4,700	78,800	
Chili	21,400	4,800	1,600	110,700	13,900
Belgium	1,400	43,100	100		
Egypt			41,800	26, 700	
Sweden and Norway			.		109,300
New Zealand				7,400	16,300
Holland	100	6,400		9,000	44,300
Denmark				56,400	8,000
Morocco		.	.	74,500	
Algeria				63,100	.
Tripoli			.	54,000	
Other countries	1,300	16,300	2,900	4,800	8,900
Totals	17,726,100	7,885,500	10,831,400	6,416,600	6,227,200

*Some of this may have been produced in Canada, †some of this may have been produced in the U S A

1926–27

	Wheat (qr. 480lb).	Flour (sacks 280lb)	Maize (qr. 480lb)	Barley (qr. 400lb.)	Oats (qr. 320lb)
United States	*8,587,500	*1,296,000	150,500	1,212,500	109,500
Canada	†7,795,500	†2,175,500	2,000	437,500	334,000
Argentina	3,773,000	314,000	7,451,000	80,000	707,500
Australia	2,785,500	563,500	.	53,500	.
Russia	985,500	500	142,000	584,000	9,500
British India	734,500	1,500		18,500	
Germany	128,500	29,500	500	2,500	71,000
Belgium	48,000	2,500	57,000	9,500	500
Netherlands	33,000	17,000	14,500	500	5,000
Uruguay	11,500		9,500		
Irish Free State	7,500	28,500	500	49,500	284,500
Denmark	6,500			1,000	
Poland	4,500			1,500	6,000
Rumania	3,500	.	405,000	63,500	
France	2,000	27,500		3,000	
Sweden	1,000				27,000
Persia	1,000			232,000	.
Italy		9,000			.
Latvia		6,000	.		.
Egypt	.	3,500		500	.
Madagascar		1,000			
Turkey in Asia		1,000		104,500	2,500
Turkey in Europe	.		1,500	4,500	
Kenya Colony			222,500	500	.
South Africa			41,000	1,000	
Port. East Africa		.	16,000		..
Chili		.	15,500	287,500	374,000
Spain		.	6,000		
Czecho-slovakia			.	54,500	..
North Africa			.	122,000	.
Mesopotamia				262,000	3,500
Austria-Hungary		1,000	.		..
New Zealand		500	..	.	1,500
Brazil		500	3,500		
Other countries	2,000	2,500	12,000	8,000	1,000
Totals	24,910,500	4,481,000	8,550,500	3,594,000	1,937,000

*Some of this may have been produced in Canada, †some of this may have been produced in U S A.

Factors of the British Loaf.—The average quartern loaf sold in Great Britain at the beginning of the century and in 1927 was made from wheat grown in the following countries and in the proportions mentioned. (*See* also FLOUR AND FLOUR MANUFACTURE.)

Average Content of Quartern Loaf
1901–02

	1901–02		1926–27	
	oz	or expressed in percentages	oz	or expressed in percentages
U.S A.	31	49	18	28
U.K.	14	21	11	17
Canada	5	8	18	28
Australia	4	6	5½	9
India	4	6	1	2
Argentina	3	5	8	12
Russia	1	2	2	3
Rumania and Bulgaria	1	1	.	
Others	1	2	½	1

The Flour Trade.—The British trade in imported flour was at one time important and represented as much as 25% of the total British supplies, but now it is only 10 4%, and the reduced trade is maintained with difficulty owing to the fierce competition of British millers. The United States and Canada are the main sources of supply with Australia a bad third. The United States and Canada ship to free trade Holland and a few other Continental countries, but foreign flour is mostly barred out by high import tariffs. Practically every civilized country being overmilled, all, or nearly all, protect their home markets and at the same time try to export. A good trade is done by the big exporters with Africa, the Orient, East and West Indies, Central and South America

PRICES OF GRAIN

The comparative prices of wheat and feeding grain given in the table on the next page are those current on Nov 15 This date is selected because at that time all the important crops of the world have been harvested and their outturns officially estimated; in the case of the southern hemisphere, the crops are sufficiently advanced to permit of reasonably accurate forecasts of outturn, so that the new supplies have exerted their influence on the leading markets, although not their full influence, which is felt later on when the movement is in full swing throughout the whole world

English Wheat Prices.—There are records of the prices of English wheat dating back to 1656, the figures for the more distant years having been originally published by Mr T Smith, Melford. The records start with 38/2 in 1656, in the fifty years 1678 to 1727 the average was 40/8; 1728 to 1777, 37/9; 1778 to 1827, 66/9; 1828 to 1877, 54/6; 1878 to 1927, 39/9,—all per quarter of 480 pounds The highest point in recent times was 81/1, the average for the year 1920, and the lowest point was 26/9 in the year 1903

GRAIN FREIGHTS

Many years ago the belief was held rather widely that ocean transport costs gave British farmers an effective protection of about 10/– per quarter. Sir J. Caird writing in 1880 put the figure lower than this, however, and reckoned 30/– per ton or about 6/6 per quarter But events proved that even the latter figure was much too high for by 1900 the average freight on the wheat imports of the British Isles was no more than 3/6 per quarter. It was higher in 1927, namely 4/7 per qr, but this must be considered a modest advance, especially as much greater quantities are now coming on long voyages from Vancouver and Australia The following tabular statements illustrate the points mentioned —

Quantity of Wheat and Wheaten flour (as wheat) imported into the United Kingdom from various sources during the calendar year 1927, together with the average rate of freight

Countries of origin	Quantities qrs. 480lb	Ocean freight to United Kingdom per 480lb		Total cost of ocean carriage
		s	d	£
Atlantic America	7,370,950	2	1	767,800
Pacific America	2,849,050	7	4	1,044,700
Pacific Canada	1,552,000	7	4	569,100
Russia	574,500	3	0	86,200
Atlantic Canada	7,950,000	2	9	1,093,100
Argentina and Uruguay	4,928,000	5	8	1,396,300
Belgium	52,500	1	6	4,000
India	1,170,000	4	6	263,300
Holland	37,000	1	0	1,800
Persia	23,500	4	6	5,300
Germany	80,000	1	9	7,000
Australia	4,234,000	8	7	1,817,100
Other countries	143,500	2	0	14,300
Total	30,965,000	Average 4s	7d	£7,070,000

A comparison of the figures for 1927 with those of 1900 shows how greatly British Empire supplies have increased since the beginning of the twentieth century, a result largely due to the modern development of transportation

Between the years 1872 and 1900 freights declined about 2/11 per qr (480lb.) but this was a mere trifle compared with the fall of wheat prices. From 1900 to 1927 freights rose about 1/1 per qr but wheat in Liverpool rose no less than 21/– per quarter It is an indisputable fact that freights influence grain prices, but the latter are affected so strongly by supply and demand that usually the resulting price movements quite overshadow any fluctuations caused by variations in freight rates The following data

Quotations of 15th November

	Wheat				Maize	Barley	Oats
	Chicago No. 2 Red winter (cents per bushel futures)	Winnipeg No. 1. N Manitoba (cents per bushel futures)	Liverpool Good Red (shillings per 480lb spot)	England and Wales Home-grown (shillings per 480lb spot)	London La Plata (shillings per 480lb C i f)	London Feeding (shillings per 400 lb C i f)	London La Plata (shillings per 320lb. C i f)
1913	88	83	34	31	21	20	16
1914	114	119	46	35	25	28	24
1915	108	104	56	53	38	40	32
1916	184	200	77	69	60	62	41
1917	217	221	76	70	75	72	61
1918	223	224	83	72	90	77	64
1919	227	224	62	73	65	73	54
1920	188	211	118	90	55	64	40
1921	119	111	51	46	32	31	24
1922	117	106	53	42	35	29	24
1923	105	97	46	40	37	28	21
1924	156	167	62	54	44	39	28
1925	164	140	56	48	36	28	23
1926	138	140	59	54	32	33	24
1927	130	144	50	44	32	34	26
Percentage advance from 1913 to 1927	48	73	47	42	52	70	62

1900

Countries of origin	Quantities qrs. 480lb.	Ocean freight to United Kingdom per 480lb		Total cost of ocean carriage
		s.	d	£
Atlantic America	11,171,100	2	3	1,257,100
South Russia	569,000	2	2	62,000
Pacific America	2,389,900	8	1	966,000
Canada	1,877,100	2	8	250,000
Rumania	176,400	2	6	22,000
Argentina and Uruguay	4,322,300	4	10	1,045,000
France	251,900	1	3	16,000
Bulgaria and Rumelia	30,600	2	6	4,000
India	2,200	4	0	400
Austria-Hungaria	389,300	1	9	34,000
Chili	600			
North Russia	462,700	1	6	35,000
Germany	438,700	1	6	33,000
Australasia	883,900	6	5	284,000
Minor countries	225,100	2	6	28,000
Total	23,190,800	Average 3s	6d	£4,036,500

bearing on the subject is partly taken from the *Corn Trade Year Book*.—

Year	United Kingdom annual imports wheat and flour qrs	Ocean freight to United Kingdom Per qr		Aggregate cost of carriage
		s	d	£
1872	9,469,000	6	5	3,040,000
1882	14,850,000	7	4	5,420,000
1894	16,229,000	3	9	3,041,000
1895	25,197,000	3	0	3,825,000
1896	23,431,000	2	9	3,258,000
1900	23,196,000	3	6	4,036,000
1927	30,965,000	4	7	7,070,000

American Interior Freights.—As Great Britain and Ireland still draw large supplies from the United States, transport charges from Chicago to New York and thence to Liverpool have a direct bearing on prices at which exporting firms can offer to sell to importers. The following data give the price of the grain and the transport charges to Liverpool from Chicago.

As Canada is, 1928, the leading grain exporter, it is of interest to compare her transport rates with those of the United States. In 1924 Mr F. J Horning, chief of the Internal Trade Division of the Dominion Bureau of Statistics, issued a statement of the cost of transporting 1,000 bushels of wheat from the centre of

Annual Average Freight Rates on Wheat from Chicago via New York to Liverpool 1881 to 1924
(average rates per bushel)

Calendar year	Price per bushel	By lake and canal	By lake and rail	All rail	New York to Liverpool steamer
	$	cents	cents	cents	pence
1881	1.11	8 19	10 4	14 4	4⅛
1901	.72	5 14	5 57	9 02	1¼
1911	.99	5 35	5 23	7 80	2
1914	1.02	5 31	6 54	7 80	3
1921	1.47	10 29	10 91	17 16	7½
1922	1.32	11 63	11 93	16 15	3¼
1923	1.17	10 94	12 43	13 15	3
1924	1 29	8 67	10 92	13 15	4

It may be noted that the rates in 1924 differed very little from those of 1881

Canada to Liverpool and his figures are shown in the statement given below

Items	Dollars per 1,000 bushels	Cents per bushel	Per cent of total
Freight by rail	150 00	15 0	38
Freight by inland waters	82 92	8 3	21
Ocean freight	62 10	6 2	15
Commission, profits, fees, loading and other handling charges	87 03	8 7	22
Insurance	15 26	1 5	4
Total	397 31	39 7	100

The rate of 8 3 cents per bushel for water carriage, that is from the head of the Lakes to Montreal, compares with 8 67 cents in the United States for transporting the same unit from Chicago to New York, the distance for each voyage being practically the same. Comparative figures published in 1925 gave more definite information on the point of land carriage The charge for hauling 100 pounds for 650 miles in Canada was 22½c. compared with 32c. in the United States, for hauling the same quantity a thousand miles, the charge in Canada was 23 cents against 43 cents in the United States, the latter haul being from a point in Montana to Duluth, but this rate evidently was not universal, for grain was hauled the thousand miles between Chicago and New York, all rail, for the equivalent of 21·9 cents per 100 pounds.

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GRAINS OF PARADISE, the seeds of *Amomum Melegueta,* a reed-like plant of the *Zingiberaceae* family, also called guinea grains and Melegueta pepper It is a native of tropical western Africa, and of Prince's and St Thomas's islands in the Gulf of Guinea, and cultivated in other tropical countries The plant has a branched horizontal rhizome; smooth, nearly sessile, narrowly lanceolate-oblong alternate leaves, large, white, pale pink or purplish flowers, and an ovate-oblong fruit, ensheathed in bracts, which is of a scarlet colour when fresh, and reaches under cultivation a length of 5in The seeds are contained in the acid pulp of the fruit, are commonly wedge-shaped and bluntly angular, and about 1½ lines in diameter and have a glossy dark-brown husk, with a conical light-coloured membranous caruncle at the base and a white kernel They contain a neutral essential oil, having an aromatic, not acrid taste and an intensely pungent, viscid, brown resin

Grains of paradise were formerly officinal in British pharmacopoeias, and in the 13th and succeeding centuries were used as a drug and a spice, the wine known as hippocras being flavoured with them and with ginger and cinnamon They are now exported almost exclusively from the Gold Coast

GRAM or CHICK-PEA, called also Egyptian pea or Bengal gram, *Cicer arietinum,* so named from the resemblance of its seed to a ram's head It is a member of the family Leguminosae, largely cultivated as a pulse-food in the south of Europe, Egypt and western Asia as far as India, but is not known undoubtedly wild The plant is an annual herb with flexuose branches, and alternately arranged pinnately compound leaves, with small, oval leaflets The flowers are borne singly in the leaf-axils on a stalk about half the length of the leaf and jointed and bent in the middle; the corolla is blue-purple The inflated pod, 1 to 1½ in long, contains two roundish seeds It was cultivated by the Greeks in Homer's time under the name *erebinthos* Alphonse de Candolle (*Origin of Cultivated Plants*) suggests that the plant originally grew wild in the countries to the south of the Caucasus and to the north of Persia In the East the seeds are eaten raw or cooked in various ways, both ripe and unripe, and when roasted and ground serve the same purposes as ordinary flour. In Europe the seeds are used as an ingredient in soups

The seed of *Phaseolus Mungo,* or green gram, a form of which plant with black seeds is termed black gram, is an important article of diet among the labouring classes in India. A variety, *var radiatus,* also known as green gram, is perhaps the most esteemed of the leguminous plants of India, where the meal of its seed enters into the composition of the more delicate cakes and dishes. Horse gram, *Dolichos biflorus,* which supplies in Madras the place of the chick-pea, affords seed which, when boiled, is extensively employed as a food for horses and cattle in south India, where also it is eaten in curries

See H. Drury, *The Useful Plants of India* (1873); U. C. Dutt, *Materia Medica of the Hindus* (Calcutta, 1877); G. Watt, *Dictionary of the Economic Products of India* (1890).

GRAMINEAE, in botany, the grass family (*see* GRASSES), comprising about 450 genera and 4,500 species.

GRAMMAR. According to the definition of the late Dr Henry Sweet a grammar gives the general facts of language, while a dictionary deals with the special facts of language. But the two domains frequently overlap, so that one and the same fact finds its place in the grammar as well as in the dictionary; this is because in order to state a rule correctly we must also state its limitations, *i e*, the special cases in which it does not hold good If we give the rule that English substantives form their plurals in *-s,* we must add that besides this regular formation we have the irregular plurals *men, women, oxen,* etc And as languages are not constructed after ideal patterns, such exceptions to the rules must necessarily take up much space in all books on grammar.

To the ordinary man, grammar means a set of more or less arbitrary rules which he has to observe if he wants to speak or write correctly This is especially the case if he is engaged in the study of a foreign language, but he is often led to the same point of view by the grammar of his own native language, as taught in schools Grammar treated in this way may be called *normative* or *prescriptive* grammar

But to the scientific grammarian the subject has a different aspect to him the rules are not what he has to observe but what he observes (in a different sense) when he examines the way in which speakers and writers belonging to a particular community or nation actually use their mother-tongue His attitude towards linguistic phenomena is therefore much more that of a naturalist observing the facts of nature, he stands more objectively outside the language he is studying, and perhaps never has to form one single sentence in it for himself. This we term *descriptive* grammar

The grammatical observer, like the observer in other fields, seeks, wherever possible, to go beyond the mere facts in order to find their explanation This is the function of *comparative historical* grammar, a creation of the 19th century (*see* PHILOLOGY) Many things which seem strange from the point of view of merely descriptive grammar find their natural explanation when viewed in the light of earlier periods of the same language or of related languages Take such an abnormal plural as *feet* from *foot:* the historian finds that its long vowel goes back through a regular phonetic development to an earlier *ōē* which, wherever it was found, was treated in the same way (thus in *feed, green, sweet*) and like other *ōē's* was a mutated form of a still earlier *ō*—the vowel that is better preserved in the singular *foot,* where, however, it has now been shortened and raised. The mutation was here, as elsewhere, due to the existence of an earlier *i* in the final syllable, which was dropped in all analogous cases Now we know that the ending in the plural in the earliest Germanic was very often *-iz,* which corresponds to a still earlier *-es,* preserved in Latin and Greek, the form *feet,* which from the one-sided Modern English point of view was an isolated fact, is thus seen to correspond to the Greek plural *πόδες* and to be connected with that form through a long series of perfectly normal historical changes, which do not only affect such plural forms but find parallels in other words as well. The historical and comparative method of explaining grammatical facts has been carried to a rare degree of perfection, but it is clear that it can only be employed to the full where we have early linguistic documents of the same language or of nearly related languages to refer to The great majority of languages are only known to us in quite recent stages; here, however, a similar method of explanation may be used if there are other now existing languages that are akin to that we are examining, and the comparative method then sometimes allows us within certain limits to reconstruct a common basis from which the several languages have started, as with the numerous African languages known as Bantu

Grammatical reconstructions should always be made with great caution, for the ways in which languages develop are not always easy to calculate We may take the Romanic languages (Italian, French, Spanish, etc) as a test case. all these languages have been known to us for several centuries, now in some cases it would be possible from existing forms in them to infer what the common basis must have been, and the forms thus reconstructed would agree pretty closely with the forms of what we know to have been the basis, namely Latin; but the method fails utterly,

as has been well remarked, with regard to many other forms: no one would be able, for instance, to conclude from the forms of Romanic substantives that Latin had ever had an accusative in *-m*, for the only remnant is French *rien* from Latin *rem* "a thing" —and that now means "nothing" and can no longer be called an accusative

The method of comparative grammar was especially developed in the study of our own family of languages, the Aryan or Indo-European family (*q v*), and at a certain stage of its development scholars were naturally tempted to dwell on and to a certain extent exaggerate those features that were common to these languages, and to take less account of features which were peculiar to one or a few of them There was always a tendency to think that these were survivals of primitive common phenomena which were lost in the other languages of the group This may be true in some cases, but more often we see that something found in one language only is a recent development that has really nothing to do with the rest of the family and may constitute a new grammatical type or phenomenon. Comparative grammar should therefore always be supplemented by *separative* grammar which does full justice to what is peculiar to each separate language and treats each on its own merits.

Differences of Structure.—Languages differ very considerably in their grammatical structure; subtle nuances which in one language are considered absolutely necessary are utterly disregarded in others Things which we should naturally look upon as belonging necessarily to the grammar of any language, are in other languages either not expressed at all or expressed by means that are utterly different from ours We have separate forms for the superlative, but French simply uses the comparative form with a defining word: *mon meilleur ami*, "my best friend," *la chose la plus nécessaire*, "the most necessary thing" Semitic verbs originally had no indications of the three time distinctions, past, present and future, but possessed two forms that showed whether an action was completed or not, no matter whether it was in the past, present or future time—distinctions which were later partly utilized to show time relations as well. Chinese substantives have no separate forms for singular and plural, and their verbs none for different tenses. Inversely, where we have only one "third person," American Indian languages very carefully distinguish between the first and second "third person" mentioned; the English sentence "John told Robert's son that he must help him" is capable of six different meanings which in Chippeway would be carefully distinguished by different forms of the pronouns for "he" and "him" Many languages have separate reflexive pronouns, like Latin *se*, himself, herself, themselves, *suus* his, her, their (own), these indicate identity with the subject of the sentence, but their sphere of application varies very considerably from one language to another, sometimes they refer to all three persons, sometimes only to the third, sometimes only to the singular, not to the plural, etc. In the oldest English we find *sin* as a reflexive possessive pronoun, but afterwards this solitary survival of the reflexive pronouns beginning with *s* disappeared from English, while such forms are still found in German, Scandinavian, etc

Thus not only separate grammatical forms, but whole grammatical categories may be dropped in course of time Generally this does not take place all at once but gradually, those forms which are in constant use being sometimes preserved for a long time after the others have been given up. The old Aryan (Indo-European) languages had separate forms for the dual number, distinct from the plural, but that distinction has been nearly universally lost. In Greek the dual was an archaism in Homer, though it lived on as a colloquialism in Attic till finally it disappeared there too In the oldest English a few pronominal forms such as *unc* us two, *inc* you two, are the only survivals of a separate dual, and from about 1250 they go completely out of use. In Russian the dual, which ended in *-a*, has left some curious traces which are no longer felt as a separate number: some words denoting parts of the body which are found in pairs, form their plural in *-a: glaza* eyes, *roga* horns, etc.; after the numerals 2, 3, 4 a form that looks like a genitive singular is used instead of the usual plural form: it is the old dual in *-a*, which is extended to three and four.

In dealing with any definite period of a language it is important to state exactly which categories are found and which not Old English had, but Modern English has not, a dative case. When the old forms were given up in the Middle English period, traces of them were still preserved in some survivals, *e.g.*, in Chaucer *of towne* (with *e* pronounced as a separate syllable), *yeer by yere, by weste;* a few isolated remnants exist still, though no longer felt as separate case-forms: *alive*="on life" (dat), *Atterbury*= "at the (dat.) borough" In a sentence like "he gave his children food" or a phrase like "from his children," Old English used the form *cildrum*, while the form was *cildru* in the nominative and accusative plural Now the distinction has disappeared To say that English still uses a dative case in these combinations is just as unhistorical as to say that Normandy and Massachusetts still form parts of the British Empire. This does not, of course, amount to denying that *children* in the sentence above is an indirect object, to be distinguished from the direct object (*food*). If we were to speak of a dative case here we might just as well say that in "Tom and Mary are children" the last word is grammatically in the dual number, but who would say this?

A word or form belonging to one grammatical category may in course of time be shifted insensibly into another one. Thus *near* at first was the comparative of *nigh*, with a superlative *next;* but in such a sentence as "Come near!" the meaning might be equally well taken as "closer" or "close," and thus the word passed into its modern use as a "positive" and it became possible to form a new comparative and superlative *nearer, nearest*, while the old superlative *next* was specialized in its use, and *nigh* became obsolete

New grammatical categories may develop, examples are the English "expanded" or "progressive" tenses. *he is running, was running, has been running*, etc , as distinct from *he runs, ran, has run*. The distinction between "absolute" (primary) and "conjoint" (adjunctive) possessive pronouns, e g , *mine, yours* as distinct from *my, your*, is another case in point There is in some languages a tendency in regard to personal pronouns to merge the distinction of nominative and objective in that of conjoint and absolute, the old nominative being used only when it stands in immediate connection with a verb as subject, and the old objective in all other positions. This has become the rule in French, where *je* is used only in combinations like *je dis, dis-je* (I say, say I) and *moi*, which is the stressed form of the accusative *me*, is found in *c'est moi* and *Qui l'a dit? Moi* (Who said it? I). In Italian we see similar tendencies, and in modern colloquial English *me* tends to supersede the literary *I* in *It is me* and *Who's there? Me*

As languages are thus seen to be in constant flux, and as grammatical categories may to a certain extent change from language to language and even from one period to another—and as exotic and "savage" languages possess many categories unknown to our European languages, it will easily be understood how injurious it is to a scientific conception of grammar to measure it always and everywhere by the same standard. But that is what grammarians of former centuries and even recent writers have been and are in the habit of doing; for Latin was for centuries the only language studied grammatically, and its privileged position made people think it a pattern by which to measure all other languages. Not only those languages that were similar in structure to Latin, but even the most heterogeneous languages were indiscriminately saddled with the elaborate Latin system of tenses and moods, and by means of such Procrustean methods the actual facts of many languages were distorted and misrepresented Discriminations which had no foundation in reality were nevertheless insisted on, while discriminations that happened to be non-existent in Latin were apt to be overlooked As A H Sayce writes in the 9th edition of the *Encyclopædia Britannica*, "The endeavour to find the distinctions of Latin grammar in that of English has only resulted in grotesque errors, and a total misapprehension of the usage of the English language" Happily things are improving very considerably in this respect.

Spoken and Written Language.—A modern philologist always looks upon the spoken language as the essential thing to study; in languages with a traditional spelling he must constantly be on his guard against misconceptions arising from that source To the uniform English plural ending in the written words *kings, dukes, princes* correspond three different forms in the spoken language; on the other hand the French forms (*je*) *donne,* (*tu*) *donnes,* (*ils*) *donnent,* though differently spelt, are the same in sound, and thus in numerous cases. Many things of great grammatical importance, like intonation, stress, etc., are not shown in our traditional spellings Grammars of spoken as distinct from written English have been written by Henry Sweet and Harold Palmer Dialect grammars and grammars of the languages of uncivilized races deal of necessity only with spoken words

THE SYSTEM OF GRAMMAR

Most grammars, at any rate most of those dealing with our own family of speech, are built up in the traditional way with the following main divisions —

I Phonology This treats of the general theory of the sounds and sound-combinations of the language concerned, and expounds the orthography, where there is occasion

II Accidence or Morphology, the theory of forms (German *Formenlehre* is a better term than those used in English) This generally treats of the traditional "parts of speech" in their usual order, substantives, adjectives, etc The main subject is the changes words undergo in flexion, paradigms being given which show all the forms of one and the same typical word, but the point of view is not pursued consistently, for under "numerals" we generally find an enumeration of all these words in their natural order, though most of them are subject to no formal changes

III Word-formation, dealing with prefixes, suffixes and other means of forming one word from another

IV Syntax, generally in its first part taking the parts of speech separately as in II and stating the rules for the use of each case, tense, mood, etc A second part then deals with word-order, etc

This system, which varies a good deal in details, has been repeatedly criticized (by J Ries, Noreen, Jespersen), but no other system has been universally accepted In France, F Brunot has proposed basing the teaching of grammar not, as is usually done, on the forms from which the pupils proceed to their syntactical use, but on the inner meanings expressed by grammatical phenomena, stating in each case secondarily the external forms, etc, which are used to express them

As a matter of fact, grammatical phenomena can be viewed from two different angles one that of the hearer (reader), to whom a certain series of sounds (letters) is presented, the inner meaning of which it is his task to understand he begins from the outside and moves inwards; the other that of the speaker (writer) he has certain ideas which he wants to communicate to others; he therefore has to choose the forms (sounds, etc) that serve best to express these ideas he moves from within to without

We are thus led to the following two main divisions of grammar. I The theory of Forms II The theory of Notions Both deal with the same grammatical facts but from opposite points of view

I. The Theory of Forms.—The following is a systematic survey of the external means used in languages for grammatical purposes

(1) A simple sequence of words This is seen, for instance, in compound substantives like *post-office* The importance of the order in which words are arranged, is seen in cases like *garden-flower* and *flower-garden,* where the first element limits and defines the meaning of the second, and in the distinction between *Paul loves Ann* and *Ann loves Paul,* where word-order shows which is subject and which object.

(2) "Empty words," *i e*, words which have no proper meaning of their own, but merely serve to indicate the relations of other words Examples *of* in "the father of the boy" (=the boy's father), "the City of Rome," "that scoundrel of a servant", *to* in "I want to hear," "he refused food to the poor", *that* in "I saw that he came," etc. There is no hard-and-fast distinction between full and empty words; *to* in "I give food to the poor" has still something of its local meaning found in "go to London," etc.

(3) Prefixes, e g, *for-* in *forbid, be-* in *besiege.*

(4) Infixes, e g, *n* in Latin *vinco,* cf. the perfect *vici,* English *stand,* cf. *stood, messenger,* cf. *message.*

(5) Suffixes, e g, *-ness* in *goodness, -en* in *blacken;* these cannot be separated from such "inflexional endings" as *-s* in *kings, -en* in *oxen*

(3) (4) (5) together may be termed affixes The origin of some of these is quite obvious they were at one time independent words joined to other words like those in (1) A word may easily be accentually subordinated to another with which it is continually combined, especially if the combination acquires a meaning of its own, independent of that of each element, as in *blackbird,* in *postman,* the vowel of the second element is obscured, and in other cases further phonetic changes take place; *gentlemanlike* and *gentlemanly* show two stages in the development of a suffix from what was originally an independent word, *for-* in *forgive* is an old preposition, though perhaps not exactly identical with the ordinary *for; be-* is a weakened form of *by* But it is not all affixes that originate in this manner from independent words *-en* in *oxen* originally belonged to the stem of the word in all its forms, and it was only through the accident of this syllable having been lost in the singular, but not in the plural, that it came to be felt as an affix to denote the plural number The origin of most of our affixes is hopelessly obscure

(6) Change in intonation, stress or quantity, e g., *Yes?* with a rising tone in a question, *Yes* with a falling tone as an affirmative answer; *object* with varying stress according as it is a substantive or a verb

(7) Consonantal changes, e g., *send, sent; half, halve, use* as a substantive with unvoiced, as a verb with voiced consonant

(8) Vocalic changes, e g, *feed, fed, see, saw, man, men, drink, drank, drunk*

(6) (7) (8) are phonetic changes, which may be due to the most different causes, some are recent, others go back to the most remote times, some have only in various circuitous ways acquired significative grammatical importance

(9) Combined changes, affixes like those in (3) (4) (5) being joined to phonetic changes like those in (6) (7) (8) Examples. *forgot* (3) (8), *forgotten* (3) (8) (5), *drunken* (5) (8), *halves* (5) (7), *men's* (5) (8), *won't* (5) (7) (8)

(10) Supplementing with different stems *I, me, we, us; am, is, was, been; good, better*

Some languages make a more extensive use of some of these grammatical means than of others Chinese uses scarcely anything but word order and empty words; some languages are predominantly prefix-languages, as for instance, the Bantu family, others predominantly suffix-languages, *e g*, Eskimo and Turkish As will be seen from the examples, English uses all these means freely, though there are few examples of infixes

We must here mention a classification of all the languages of the world according to their morphological system, which played a great rôle in the discussions of the 19th century, but has now been given up as superficial, namely, into (1) isolating languages or root-languages like Chinese, (2) agglutinative languages like Finnish and Turkish, which use affixes, but have no internal changes in the roots, (3) flexional languages like those of the Aryan and Semitic families. The last were also supposed to have gone through the isolating and agglutinative stages in their prehistorical development, while Chinese was thought to represent the earliest childlike linguistic structure The latter supposition has been shown to be wrong, as the earliest Chinese in some respects was "flexional," and those hundreds of languages that were formerly classed together as "agglutinative" represent the most diverse types of morphological structure The world is more complex than our ancestors imagined

II. The Theory of Notions.—A comprehensive system of all the notions that find expression in language would be impracticable on account of the infinite complexity of mental and physi-

cal phenomena. But we are here concerned with those notions only that have found grammatical expression, and this makes our task somewhat less difficult, though far from easy. The following necessarily very brief survey does not claim to be either complete or final.

(1) Parts of speech. It is usual to divide words grammatically into the following classes and to define them somewhat as is here (very succinctly) indicated.—

(*a*) Substantives—denoting "persons" and "things"

(*b*) Adjectives—showing qualities

Substantives and adjectives are often classed together as "nouns," but many grammarians make the term "noun" equivalent to "substantives," and do not comprise under it adjectives

(*c*) Pronouns—used instead of nouns "to designate a person or thing already mentioned or known or forming the subject of inquiry." Various well-known subclasses: personal, demonstrative, relative, interrogative, indefinite The so-called articles, as well as numerals, are best treated as subdivisions of pronouns

(*d*) Verbs—denoting actions, states or happenings

(*e*) Adverbs—serving to modify adjectives or verbs

(*f*) Prepositions—marking relations between words

(*g*) Conjunctions—used to connect clauses or to coordinate words in the same clause.

(*h*) Interjections—ejaculations, standing outside ordinary sentences

This division and the definitions usually given have, however, been subjected to severe criticism and should not be taken at their face value. One of the chief difficulties with substantives is the existence of such words as *arrival* and *kindness,* which are undoubtedly substantives and are treated grammatically as such, but cannot be termed names of "things", they represent "nexus" (*see* p. 615). Adverbs, prepositions and conjunctions are best classed together as "particles"

(2) Rank. While the division under (1) concerns words separately, we here have a distinction that has regard to words or word-groups in combinations, namely into.

(*a*) Primary

(*b*) Secondary

(*c*) Tertiary—words or word-groups

The three ranks to some extent, but only to some extent, correspond to substantives, adjectives and adverbs respectively Secondary elements serve to modify or delimit primaries, tertiary elements to modify or delimit secondaries, as will be seen from the following examples in which those words or groups are italicized which belong to the rank under which they are classed —

(*a*) The King's *palace* The *King* arrived I know *when he arrived*

(*b*) *The King's* palace *A big* palace The palace *that he built.*

(*c*) A *really* big palace I was present *when he arrived*

The combination of a primary and a secondary element in the way exemplified under (*b*) is termed *junction;* the adjective or (relative) clause standing as secondary is called an *adjunct* Tertiaries are also termed *subjuncts*

(3) Other classifications Many languages classify words in such a way that a class is indicated either in the word itself or in the form required in those adjuncts, etc , which belong to it Sometimes the distinction is into animate and inanimate, sometimes into big and small things, sometimes into male, female and sexless, but such distinctions are rarely indicated with what we should call consistency; some languages, for instance, that have the main distinction "animate inanimate," reckon certain parts of the human body as animate, others as inanimate Sometimes it is impossible to see what is really the notional basis of a classification When the distinction is connected with sex, as in most of the Aryan languages, we speak of *gender;* but the actual distinction between masculine, feminine and neuter gender does not correspond at all exactly with that between male and female beings and sexless things; very often it is impossible to discern why one word belongs to one gender rather than to another In Old English, for instance, *stan* stone, *daeg* day, *finger, wifmann* woman were masculine; *niht* night, *ecg* edge, *hand* feminine; and *treow* tree, *gear* year, *blod* blood, *wif* wife neuter. This word-gender, which is still found in German, and which influenced the flexion of the words and the form of the article and adjective belonging to them, disappeared gradually from English in the Middle English period In Semitic languages, the sex of the subject influences the form of the verb

(4) Number. On the dual number *see* above. The distinction between "one" and "more than one" is very easy from a notional point of view, but not always so easy grammatically, partly because some things may be looked upon either as units (as German *brille*) or as composite (Engl. *spectacles*), partly from other causes. A collective is a word which though singular in form denotes a plurality, hence such anomalies as *twenty police; cf* also "my family is an old one" and "my family are early risers" Number properly belongs to primaries only, but many languages require secondaries to agree in number with their primaries, e g , *those trees,* and German *die hohen baume* the big trees, where in English the article and adjective are invariable. In English verbs the distinction has been given up in all past tenses, e g., *he went, they went* (except *he was, they were*), in the present tense it is preserved in the third person only *I go, we go, he goes, they go*

(5) Person, *i e ,* the distinction between the speaker, the person (or persons) addressed, and what is neither speaker nor spoken to The distinction is shown in pronouns and in many languages also in the verb The plural "we" does not mean two or more "first persons," but "I+you" or "I+some one or more persons besides," and some languages make a distinction according as the second person is included or not Such a pronoun as French *on,* Engl *one,* may be considered a "common person" (On reflexive pronouns, *see* above)

(6) Space Some languages have different forms according to distance from the speaker, etc Case-forms denoting existence in or at a place and movement to, towards or from a place are very frequent In our languages, with a view to greater precision, such case-forms were frequently supplemented by adverbs, and these in time became prepositions governing the cases which at first were sufficient in themselves to denote the spatial relation, eventually the case-endings were often dropped as superfluous

(7) Time With substantives the same means (case-forms, adverbs, prepositions) as are used to indicate spatial relations are as a rule also used to denote time relations But with verbs many, or perhaps most, languages have separate means of denoting time-relations, which cannot surprise us, as the idea of time is naturally associated with that of action or happening But while the notional division of time into past, present and future is quite simple, mankind has not, as a rule, found correspondingly simple grammatical expressions for time and its subdivisions, such distinctions as that between permanent and transitory, or between finished and unfinished, or between once and repeatedly, or between stability and change, or between resultative and non-resultative action being often inextricably connected with real time-indications in the "tenses" of verbs Expressions for the future are often much more vague than those for the past, and frequently expressions which at first had and still to some extent have the meaning of volition or obligation or motion are made to do duty as a kind of future tense, as in "he will come," "I shall come," "they are going to start" (French "on va partir"), etc Some languages have very elaborate tense systems with separate forms for imperfect, aorist, perfect, pluperfect, future in the past, etc , others rely more on the context or on adverbs for such nuances, if they are conceived at all.

(8) Comparison. The superlative ("strongest," etc) is really a kind of comparative. "he is the strongest of the boys" means the same thing as "he is stronger than the other boys," the difference being only that the result in the former sentence is stated with regard to all boys, himself included, while in the latter he is excluded A comparison results in expression of inequality or equality, as in "he is stronger than X" (*a*), "he is as strong as X" (*b*), "he is less strong than X" (*c*); of these (*a*)

and (*c*) are closely connected as they both denote inequality and therefore use the comparative Many languages even for this sense use the positive form and say "strong from X" or the like

(9) Nexus. This is a comprehensive term for the combination of two words (or word-groups) which stand to another in the relation of subject to predicate. The simplest case is a sentence with a subject and a verb, as "the doctor arrived" or with a subject, an "empty" verb ("copula") and a predicative, as "the doctor is clever." Compare also sentences without a verb like "Happy the man who . . ." and "He a doctor!" There are other cases of nexus, in which the nexus does not in the same way as here form a whole sentence, but only part of one, as in "the doctor's arrival," "the doctor's cleverness," "(I saw) the doctor arrive," "(we thought) the doctor clever," "(we count on) the doctor to arrive," "(he slept with) the window open," "every thing considered (he must be clever)"

A nexus of a different kind exists between a verb and its object, as in "we saw the doctor," or its two objects, as in "we offered the doctor money." Further, the theory of nexus leads to a contemplation of the relation between the active and the passive expression for one and the same thought: what in the active turn is an object, is made into a subject in the passive turn. "the doctor was seen (by us)," "money was offered (to) the doctor," "the doctor was offered money."

(10) Affirmation and negation In some languages the verb has special forms for negation this is to a certain extent true of English, especially in its colloquial form *won't*, cf *will, shan't*, cf *shall;* note also the use of the auxiliary *do* in most negative sentences which contain no other auxiliary. "The doctor did not arrive"

(11) Subjective attitude of the speaker By the side of simple ("flat") assertions we find others in which the speaker does not want to commit himself, but speaks with a certain hesitation, doubt, hope or fear, and such emotional repressions often manifest themselves grammatically, either in particles like Greek ἄν or in special forms of the verb (chiefly the subjunctive mood) The same means are frequently applied in conditioned clauses, which range from those in which doubt is not expressed at all or slightly hinted at, to those in which unreality is expressly indicated In the latter kind some languages use a special conjunction, while others show that "the condition is rejected" by shifting the mood into the subjunctive and the tense into the preterite or by the latter means alone In connection with this must be mentioned the expression of diffidence or modesty in questions like "Could you (Would you) lend me a pound?" as against the simple and direct "Can you (Will you) . . .?" and the difference between the unrealizable wish in "Would he were still alive!" and the realizable wish in "May he be still alive!"

(12) Relation to the will of the hearer In one class of utterances (ordinary statements and exclamations, for example) the speaker does not want to influence the will of the hearer The aim of another class is to influence the will of the hearer, that is, to make him do something This may be effected by requests, which range from brutal commands or orders through demands, implorations, invitations, etc, to the most humble entreaty or supplication One of the linguistic forms for requests is the imperative, other forms are seen in "One minute!" and "Hands off!" Questions belong to requests, as they imply a request (command, prayer, etc) to give the original speaker a piece of information They are of two distinct kinds according to the existence or non-existence of an "unknown quantity" expressed by means of an interrogative pronoun or adverb "Who said that?" "What did he say?" and "When did he say that?" are examples of one kind, "Did he say that?" of the other kind Questions, and requests generally, are naturally liable to those influences which were dealt with under (11); questions are likewise notionally related to negations, whence they often employ similar grammatical means, this is seen, for instance, in the English use of the auxiliary *do* in both kinds of sentences

The system here given shows how a notional arrangement leads to the separation of things which in the ordinary grammatical system are placed together. Under case, accordingly, we have things which have relation to junction (the chief use of the genitive is to make a word the adjunct of another word), to space (the so-called locative cases) and to nexus (nominative to denote the subject, accusative and dative, for various kinds of objects). Here, as elsewhere, we see that linguistic phenomena are capable of being viewed from different angles and that they present all kinds of intersections and overlappings.

In the treatment of each particular language we meet with units which are units neither from the purely formal nor from the purely notional point of view, but which nevertheless must be taken together as what might be called functional units. Take the English preterite. it is not a formal unit, because it is formed in different ways. *ended* from *end, sent* from *send, thought* from *think, put* from *put, saw* from *see, was* from *be,* etc Neither is it a notional unit, for sometimes it indicates the past time pure and simple, sometimes unreality ("if he came"), or modesty ("Could you . . ?") or even future time ("it is time you went to bed"), and it has even more spheres of application Yet all these formal and notional things go together and form one separate unit in English grammar, which is different from such units in any foreign grammar as in some ways correspond to it in French, for instance, we have two or three tenses (*je finissais* and *je finis* or colloquially *j'ai fini* corresponding to *I ended*), each of which is a unit in the same way as the English preterite is But all the units we arrive at through our analysis of grammatical phenomena are at best symbols or shadowings of the innermost notional categories

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(O. J)

GRAMMICHELE, a town of Sicily, province of Catania, 55 m. S W. of it by rail and 31 m direct Pop (1921) 23,169 (town), 24,767 (commune). It was built in 1693, after the destruction by an earthquake of the old town of Occhialà to the north, the latter, on account of the similarity of name, is generally identified with Echetla, a frontier city in the time of Hieron II.

GRAMONT, ANTOINE AGENOR ALFRED, DUC DE, DUC DE GUICHE, PRINCE DE BIDACHE (1819–1880), French diplomatist and statesman, was born in Paris on Aug 14, 1819, of a family originally royalist, though the younger members were Bonapartist Antoine was educated at the École Polytechnique, but entered the diplomatic service His promotion began with the accession of Louis Napoleon to the supreme power. He was successively minister plenipotentiary at Cassel and Stuttgart (1852), at Turin (1853), ambassador at Rome (1857) and at Vienna (1861) On May 15, 1870 he was appointed minister of foreign affairs in the Ollivier cabinet, and was thus concerned in the bungling of the negotiations between France and Prussia arising out of the candidature of Prince Leopold of Hohenzollern for the throne of Spain, which led to the disastrous war of 1870–71 The famous declaration read by Gramont in the Chamber on July 6, the "threat with the hand on the sword-hilt," as Bismarck called it, was the joint work of the whole cabinet; the original draft presented by Gramont was judged to be too "elliptical" in its conclusion and not sufficiently vigorous The history of the affair is given in detail by Emile Ollivier himself in his *Empire libéral* (vol xii, 1909) It was Gramont who pointed out to the emperor, on the evening of the 12th, the dubious circumstances of the act of renunciation of the prince of Hohenlohe-Sigmaringen on behalf of his son, and on the same night, without informing Ollivier, he despatched to Benedetti at Ems the fatal telegram demanding the king of Prussia's guarantee that the candidature would not be revived. The supreme responsibility for this act must rest with the emperor, "who imposed it by an exercise of personal power on the only one of his ministers who could have lent himself to such a forgetfulness of the safeguards of a parliamentary régime" says Ollivier

Gramont resigned office with the rest of the Ollivier ministry (Aug. 9), and after the revolution of September he went to Eng-

land, returning after the war to Paris, where he died on Jan. 18, 1880. He published various apologies for his policy in 1870, notably *La France et la Prusse avant la guerre* (1872).

GRAMONT, PHILIBERT, COMTE DE (1621–1707), the subject of the famous *Memoirs*, came of a noble Gascon family, said to have been of Basque origin His grandmother, Diane d'Andouins, comtesse de Gramont, was "la belle Corisande," a mistress of Henry IV. The grandson assumed that his father Antoine II. de Gramont, viceroy of Navarre, was the son of Henry IV. Philibert was educated for the church at the *collège* of Pau, in Béarn, but he joined the army of Prince Thomas of Savoy, then besieging Trino in Piedmont He afterwards served under his elder half-brother, Antoine, marshal de Gramont, and the prince of Condé He favoured Condé's party at the beginning of the Fronde, but changed sides before he was too severely compromised During the Commonwealth he visited England, and in 1662 was exiled from Paris for paying court to Mademoiselle de la Motte Houdancourt, one of the king's mistresses He found a congenial atmosphere at the court of Charles II, and married in London, under pressure from her two brothers, Elizabeth Hamilton, the sister of his future biographer and one of the great beauties of the English court In 1664 he was allowed to return to France. He revisited England in 1670 in connection with the sale of Dunkirk, and again in 1671 and 1676 In 1688 he was sent by Louis XIV to congratulate James II on the birth of an heir In 1696 he had a dangerous illness, during which he became reconciled to the church He was 80 years old when he supplied his brother-in-law, Anthony Hamilton, with the materials for his *Mémoires*. He died on Jan. 10, 1707, and the *Mémoires* appeared six years later

Hamilton's portrait of Gramont is drawn with such skill that the count, in spite of his biographer's candour, imposes by his grand air on the reader much as he did on his contemporaries The book is the most entertaining of contemporary memoirs, and gives a vivid, truthful, and graceful description of the licentious court of Charles II His scandalous tongue knew no restraint, and he was a privileged person who was allowed to state even the most unpleasing truths to Louis XIV Saint-Simon in his memoirs describes the relief felt at court when the old man's death was announced *See* also HAMILTON, ANTHONY.

Mémoires de la vie du comte de Grammont were printed in Holland with the inscription Cologne, 1713 Other editions followed in 1715 and 1716. An Eng trs. *by Mr [Abel] Boyer* (1714) was supplemented by a "compleat key" in 1719 The *Mémoires* "augmentées de notes et d'éclaircissemens" were edited by Horace Walpole in 1772. Among more modern editions are those by Sir Walter Scott (1846), frequently reprinted, by H Vizetelly (1889), and G G Goodwin (1903) *See* also R. Clark, *Anthony Hamilton, Author of Memoirs of Count Gramont* (1921)

GRAMOPHONE. An instrument for reproducing sound (Gr γράμμα, letter, φωνή, sound), by transmitting to the air the mechanical vibrations of a stylus in contact with a sinuous groove in a moving record In a wider sense the term might be applied to any instrument for the recording or subsequent reproduction of sound As long ago as in 1857 Leon Scott had, by the invention of the "Phonautograph," provided means whereby *visual* records could be made of the vibrations of a diaphragm, but it was not until 1877 that the first "Talking Machine" was patented Scott's Phonautograph consisted of a thin membrane, to which a delicate lever was attached The membrane was stretched over the narrow end of a parabaloidal funnel, while the end of the lever was brought against the surface of a cylinder covered with paper on which soot had been deposited The cylinder was fixed on a fine screw which moved horizontally when the cylinder was rotated The marker thus described a spiral line on the blackened surface When sounds were transmitted to the membrane and the cylinder was rotated the oscillations of the marker were recorded Thus tracings of the vibrations were obtained (Comptes Rendus 53 p. 108) The actual *audible* reproduction of recorded sound was first accomplished by T A. Edison in 1876, the first patent specification being dated January 1877. In this instrument a spiral groove was cut on a brass drum fixed on a horizontal screw, so that when the drum was rotated it moved from right to left, as in the Phonautograph. The recorder consisted of a membrane of parchment or gold-beater's skin stretched over the end of a short brass cylinder about two inches in diameter. In the centre of the membrane there was a steel needle having a chisel-edge, and a stiff piece of spring steel was soldered to the needle near its point, the other end of the spring being clamped to the edge of the brass cylinder. The recorder was then so placed beside the large cylinder that the sharp edge of the needle ran in the middle of the spiral groove when the cylinder was rotated. The cylinder was covered with a sheet of tin-foil During rotation of the cylinder, the sharp edge of the marker indented the tin-foil into the spiral groove, and when the membrane was caused to vibrate by sounds being thrown into the short cylinder by a funnel-shaped opening, the variations of pressure corresponding to each vibration caused the marker to make indentations of varying depth on the tin-foil in the bottom of the groove These indentations corresponded to the sound-waves To reproduce the sounds a second marker was caused to pass over the grooves of the cylinder, the marker being alternately elevated or depressed according to the nature of the indentations, and so transmitting to its membrane vibrations corresponding after a fashion to those which it was originally made to execute. These were then communicated to the air, so that the sound previously given to the "phonograph" (as Edison termed his invention) was reproduced in a crude but unmistakable manner.

Many improvements were attempted In Edison's wax-cylinder phonograph, and in the "graphophone" of Graham Bell and C S Tainter, the sound record was produced by *cutting* instead of *indenting* an up-and-down line in the record material. Reproductions were made by an electro-deposition process similar to that used later for disc records Machines employing cylindrical records of the phonograph type enjoyed a wide popularity for many years But the non-linear relation between the driving force and the amplitude of the cut, inherent in this method, led to the adoption of means whereby the resistance of the record material to the motion of the cutting stylus was made more uniform, while the movement of the diaphragm in reproduction was positively controlled by the record, and was not at times wholly dependent on

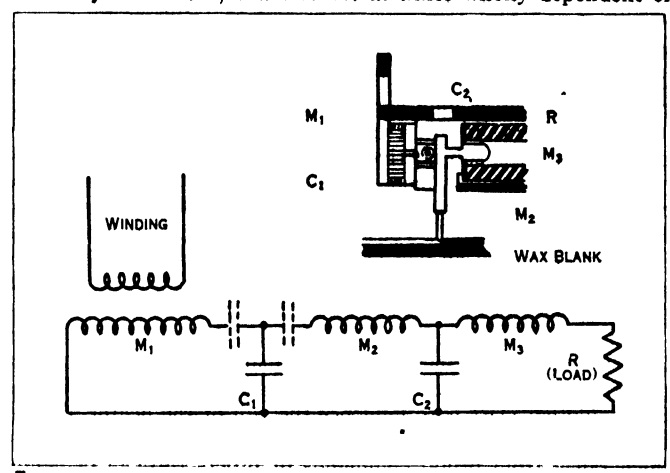

FIG 1.—DIAGRAM SHOWING A GRAMOPHONE OF THE EQUIVALENT ELECTRICAL CIRCUIT

The inductance (m_1) represents the mass of the armature, which, when acted on by the magnetic field, forms the driving portion of the mechanical system. (c_1) Condenser showing the compliance of the shaft connecting the armature to the stylus holder (m_2) Mass of the stylus and its holder (c_2) Compliance of the shaft connecting the stylus holder with the metal piece which fits into the rubber damping element (m_3) Mass of this metal piece. (R) Damping element. The two condensers, shown dotted and unlabelled, represent the effect of the magnetic field on the armature and the restoring force of the balancing springs which hold the armature in its central position

the elasticity of the diaphragm, as in the phonograph These improvements were introduced in 1887 by Emile Berliner Berliner named his instrument the "gramophone" In the first drawing of his original patent specification, a cylindrical record, consisting of a strip of paper, coated with a layer of lamp-black and stretched round a drum, is used Movement of the recording stylus is horizontal and causes the removal of the lamp-black from the surface in a sinuous, spiral line For purposes of reproduction he copied the record in a resisting material, either mechanically, or by engraving or etching, and this gave him a permanent record, con-

sisting of a wavy grooved line in a strip of copper, nickel or other material To reproduce the sounds recorded, this strip was in turn stretched round a drum, the point of the stylus placed in the groove, and the drum rotated Thus the first of Berliner's inventions was virtually to provide means whereby Scott Phonautograph records could be reproduced In this connection it is to be noted that eleven years previously Charles Cros, a Frenchman, had deposited with the Academie des Sciences, Paris, a sealed packet

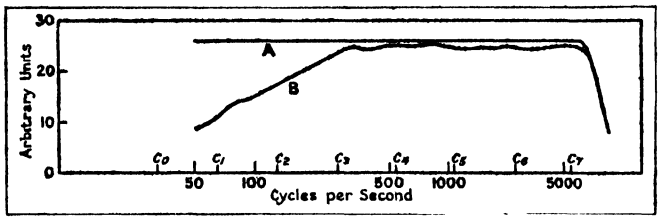

FIG 2.—CURVE A SHOWS CURRENT IN THE SERIES BRANCHES OF A LOW-PASS FILTER AS A FUNCTION OF PITCH CURVE B, CALIBRATION OF A RECORD INSTRUMENT

containing a suggestion for doing this very same thing, though he cannot be said to have carried his ideas very far

In the second or improved form of gramophone described in Berliner's patent specification, a flat record is used which, he says, offers advantage for copying purposes. A glass disc is covered with a semi-fluid coating of ink or paint, in which the stylus cuts a sinuous spiral running from the outer edge of the record to the centre, or vice versa A turntable carries the record disc, and is rotated by any suitable means

Berliner's next step was to make a record in a solid material by direct etching To this end he coated a disc or cylinder of zinc or glass with some substance which, while offering little resistance to the movements of the recording stylus, resisted the chemical action of acids The coating he preferred consisted of beeswax dissolved in benzine When the recording stylus had traced out its line on the record, and exposed the solid disc below, the latter was etched, and a permanent record produced Copies could be made by the galvano-plastic process, by making a matrix, and impressing discs of hard rubber or the like Owing to the undercutting of the protective coating by the acid a very rough record resulted, and it was not until the end of 1897 that the manufacture of disc records became a commercial success The technique of record-making was now briefly as follows —

Early Methods of Recording.—The players or singers were placed immediately before the mouth of a horn, which was used to concentrate the sound energy on the recording diaphragm Singers were instructed to draw away from the horn at the moment of singing loud notes, in order to prevent "blasting" Orchestras were small, the players were crowded together and in some cases were given instruments of special construction to make up for the deficiencies in their number The horn (or horns, for sometimes there were several) protruded through a screen, on the opposite side of which was the recording machine, carrying a disc-shaped blank of wax-like material, on which the recording stylus traced its spiral From this disc, a solid metal negative or matrix was obtained by electro-deposition. Copies of the original record were then pressed from this matrix in a material which, while normally hard, became plastic under heat

About this time a number of inventors began to turn their attention to the improvement of the reproducing machine. Successive stages of development are well illustrated by an interesting series of machines exhibited at the Science Museum of London, beginning with an early Berliner disc machine with metal diaphragm sound-box and hand-drive Mechanical governing was introduced in 1896 and by the end of the century a clockwork machine, intended solely for reproduction, was made This was provided with a celluloid diaphragm, but two years later mica was being used. By 1905, a type of sound-box had been evolved, the use of which persisted without radical change for twenty years A mica diaphragm was held lightly at its edges by hollow rubber gaskets, the fulcrum of the lever connecting the centre of the diaphragm to the needle-point being formed by knife-edges and its movements controlled by delicate springs. It was found that better reproduction resulted from the use of larger horns, and when these became too heavy for their weight to be carried by the record they were removed from the sound-box and fixed to a bracket on the machine cabinet, the sound-box being connected to the small end of the horn by a piece of straight tubing known as a "tone-arm" This arrangement gave rise to increased distortion of the sound-waves, until steps were taken to design the tone-arm as a tapering continuation of the horn The appearance of the horn being looked upon by the public with disfavour, it became inverted and was placed inside the cabinet From 1910 onwards this type of construction was generally preferred for domestic use

Position of the Gramophone in 1925.—Such, then, was the typical reproducing instrument of 1925. Much painstaking work had enabled machines and records to be produced which were capable of yielding results acceptable to music-lovers. But knowledge of the fundamental principles was so imperfect that there was nothing in the nature of a standardized basis of recording to give results of uniform quality It was necessary to introduce deliberate errors into one part of the system to compensate for errors in another part, and progress was naturally slow and unsatisfactory. The neglect of the industry to institute proper scientific research into the all-important problems of acoustics and vibrational mechanics might have indefinitely retarded its growth, for it cannot be said that any obvious improvement had been overlooked When help came, it was from another quarter

The problems of electrical communication by line and radio had been intensively studied for many years by experts equipped with measuring instruments of a sensitivity and accuracy then unknown in acoustic research. *Microphones* (*q v*) and *amplifiers* (*q v*) of high quality were developed in connection with telephony and broadcasting, and were now available for the gramophone It was therefore no longer necessary for the recording stylus to be actuated directly by the acoustic output of the performers themselves, grouped closely round the mouth of a horn The performers could now be permitted to carry on their work in front of the microphone in commodious studios resembling more nearly the normal conditions of musical performance or even in the actual concert-hall The existence of amplifiers also made possible the use of quality-correcting devices which, even if it had been feasible to apply them in the acoustic recording process, would have unduly attenuated a motive energy already far too weak for many requirements On the reproducing side, the proper function of a horn in communicating to the air the vibrations of a diaphragm had been investigated by A G. Webster, who, in an important paper[1], outlined the properties of a logarithmic horn and also drew attention to the advantages to be derived by applying the conception of electrical impedance to acoustic and mechanical systems. The logarithmic horn was studied in detail by Hanna and Slepian, by P B Flanders, and by H C Harrison* What remained to be done was to devise a systematic linkage between the microphone and the recording stylus, and between the reproducing point and the mouth of the horn, of such a kind as take the fullest advantage of these new components.

Theory of Modern Gramophone Design. *Electro-mechanical Analogy*—A mathematical statement of the behaviour of mechanical and electrical systems discloses the existence of a remarkable analogy between such quantities as mass and compliance (*i e*, reciprocal stiffness) on the one hand, and inductance and capacity on the other. For example, the kinetic energy of a particle of mass M moving with velocity V is $\frac{1}{2}MV^2$, while the electrical energy in an inductance L carrying a current I is $\frac{1}{2}LI^2$ Again, the potential energy of a compliance C exerting a force F is $\frac{1}{2}CF^2$, that of a condenser of capacity C charged to a potential V is $\frac{1}{2}CV^2$ The logical necessity for the existence of such an analogy can be deduced from the observed phenomena of wave motion in mechanical and electrical systems. A highly important feature of the development of some of the later recording and reproducing instruments has been their quantitative design as imitations of electrical circuits, it having so happened that the science of electrical wave transmission had by this time outstripped the

[1] See bibliography

knowledge of oscillation mechanics.

As previously mentioned, A. G. Webster had in 1919 already suggested the conception of mechanical and acoustic impedance as an aid to correct design. In 1926 J. P. Maxfield and H. C. Harrison published an account of their work in designing complete recording and reproducing systems as analogues of the electric wave filters invented by G. A Campbell in 1917[1] Such filters are ideally composed of infinitely repeated similar sections, each section comprising one or more series and shunt elements. Structures of this type have in general one or more transmission bands of zero attenuation and one or more bands having infinite attenuation; in gramophone technique single band-pass filters are of chief interest, as will be seen later. Suppression of all but the first few sections of such an ideal structure does not seriously affect its properties so long as a suitable terminating resistance is applied. Without this termination the structure reduces to an assembly of n similar tuned circuits having collectively n different natural frequencies Multi-resonant mechanical systems can, by the employment of damping and at the expense of efficiency, be designed to have excellent frequency characteristics, but the behaviour of such systems is best considered after that of a true mechanical band-pass filter has been thoroughly grasped

Frequency Requirements of a Recording System —The efficiency with which a sound of any given pitch is radiated from a horn is independent of the intensity of the sound. This relation may be expressed in the form

$$P = kV^2$$

where P is the power radiated, V the R M S velocity of the air particles, and k a constant which may be defined as the radiation resistance of the horn at a particular frequency. When making records intended for mechanical reproduction, therefore, it is seen that, for correct balance, the recording tool should be made to move at constant maximum velocity at all frequencies Under these conditions, for a given sound intensity, the amplitude of the cut is inversely proportional to the frequency Whatever may be the degree of coarseness of the spiral record trace, therefore, there must be some limit of frequency below which it is impossible to maintain a constant velocity without encroaching on the adjacent groove. Also, an upper frequency limit is imposed by the physical dimensions of the reproducing point, which is unable to follow the grooves when, at very high frequencies, their radius of curvature becomes extremely small Maxfield and Harrison considered this matter and adopted a frequency characteristic of the uniform velocity type between the frequencies of 200 and about 4,000 cycles per second Below 200 the system was modified to operate at approximately constant amplitude and above 4,000 at approximately constant acceleration In this manner they were able to extend the range of frequencies recorded to 60 and to 6,000 cycles, with some falling off towards these two opposite extremes.

Applications of the Theory.—In the design of their recording and reproducing systems, Maxfield and Harrison made use of the following table of corresponding mechanical and electrical quantities:

Mechanical.	*Electrical.*
Force (dynes)	Electromotive Force (volts)
Velocity (cm/sec)	Current (amperes)
Displacement (cm)	Charge (coulombs)
Impedance (dyne sec/cm)	Impedance (ohms)
Resistance (dyne sec/cm) (or mechanical ohms)	Resistance (ohms)
Reactance (dyne sec/cm) (or mechanical ohms)	Reactance (ohms)
Mass (gms)	Inductance (henries)
Compliance (cm/dyne)	Capacity (farads)

In deriving the equivalent circuit of any mechanical device, a compliance between two consecutive moving members is represented by a shunt capacity, and between a moving member and a rigid support by a series capacity. By proportioning the parts of a mechanical system it can be made to behave as an equivalent electrical network, and hence the peculiar properties of electrical filter circuits can be simulated.

[1]*See* bibliography

The matter may be put somewhat differently as follows. In the older recording and reproducing systems there were numerous abrupt changes in the nature of the path along which the vibrations were conducted from the mouth of the recording horn to the record and back again to the listener. This had the effect of introducing numerous resonances and greatly limited the range of musical tones which could be covered By properly proportioning the parts of each system, Maxfield and Harrison were able to smooth out these irregularities, with the result that the musical compass of the gramophone, and its fidelity to the original sounds within that compass, were greatly increased.

Maxfield-Harrison Recorder and Gramophone.—Fig 1 is a diagrammatic representation of a Maxfield and Harrison recording instrument and of the equivalent electrical circuit. This instrument is a mechanical filter of the low-pass type, provided that the two undesignated condensers are omitted In this particular case the filter has three sections and a terminating resistance In designing mechanical analogues of such a system, the problem is threefold; first, that of arranging the parts so that they form repeated filter sections; second, determining the magnitude of these parts so that the separate sections all have the same characteristics; third, providing the proper resistance termination This last requirement was found specially difficult to meet owing to the lack of satisfactory non-reactive mechanical resistances In the recorder illustrated, Maxfield and Harrison made use of a rubber rod along which the vibrations travel torsionally with heavy attenuation. A correctly designed three-section filter would secure a sensitiveness at the various pitches as represented by curve A in fig 2. The actual recorder, however, owing to the presence of the two undesignated condensers shown in fig 1 has a loss of response at the low pitch end as indicated by curve B (fig 2) This loss is deliberately introduced in order to limit the amplitude, as previously explained The power required to actuate this recorder is only a fraction of a watt, whereas a damped resonant system may therefore require a power of several watts.

Maxfield-Harrison Gramophone —The analogy between the mechanical and electrical filter is more perfectly shown in the reproducing equipment. The principle of "matched impedance" is of fundamental importance in the design of machines for mechanical reproduction, for here there are no amplifiers to make good the losses incurred in suppressing resonances. In applying the principle it was necessary to take into consideration the behaviour of an air-chamber behind the diaphragm and to determine its equivalent electrical elements before formulating the design Fig 3 shows a section of the Maxfield-Harrison sound

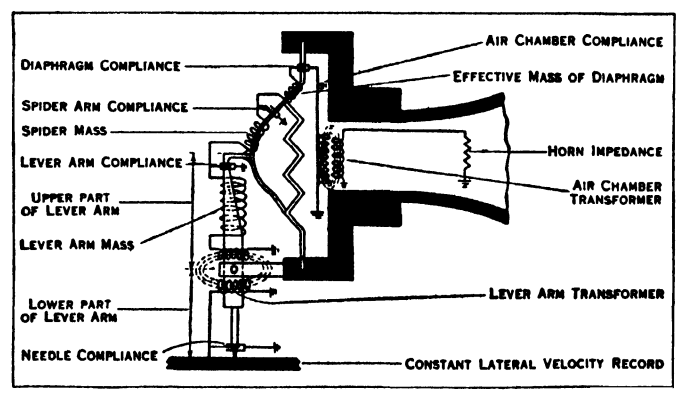

FIG 3 —SECTIONAL DRAWING OF A SOUND BOX

box Superimposed on each component the equivalent electrical component is shown, while in fig 4 the mechanical elements are arranged diagrammatically for comparison with a simple form of electrical filter, combining two sections of low pass construction with a single band-pass element As the series (diaphragm) compliance is so large that the low frequency cut-off which it causes lies well below that created by the horn, an inappreciable error is introduced in using for design purposes formulae of low pass filters In an ordinary electrical filter, any section through the centre of the series impedances divides the filter into two

parts, the impedances of which, looking forward and backward from the line of section, are matched In this sound box two transformers are used, the needle arm with its lever action and the ratio of the areas of diaphragm to horn opening Each of these steps up the velocity and hence in usual nomenclature would be described as a step-down transformer The matching of impedances by equivalent transformers is one of the chief points in the

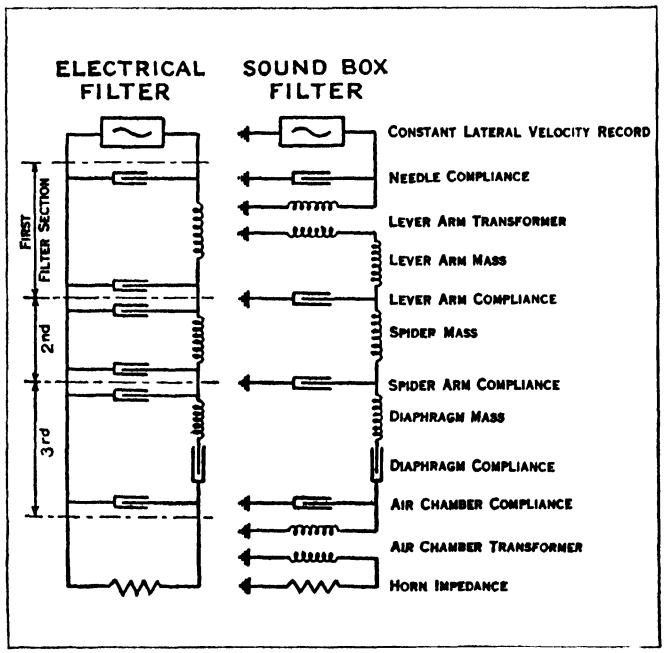

FIG 4 —ELECTRICAL EQUIVALENT OF THE SOUND BOX COMPARED WITH THE COMPONENTS OF A SIMPLE FORM OF ELECTRICAL FILTER, COMBINING TWO SECTIONS OF LOW-PASS CONSTRUCTION WITH A SINGLE BAND-PASS ELEMENT

design of this sound box In fig 4 the record is to be regarded as the approximate equivalent of a constant current electrical generator, whose impedance is infinite That this is not strictly true is evident from the fact that some record wear still occurs, but in spite of the increased amplitude of cut in records made by the electrical processes, less wear occurs with this type of sound box than with the earlier records and instruments

The two formulae on which the design is based are as follows

$$f_c = \frac{1}{\pi}\sqrt{\frac{1}{MC}} \qquad (1)$$

$$z_0 = \sqrt{\frac{M}{C}} \qquad (2)$$

whence

$$C = \frac{1}{\pi^2 f_c^2 M} \qquad (3)$$

where f_c = the cut-off frequency of a transmission system in cycles per second, C = the shunt compliance per section in centimetres per dynes, M = the series mass per section in grams, z_0 = the value of the characteristic impedance over the greater part of the band range

It was found possible to make a satisfactory diaphragm of effective area 13 sq cm with a mass of 0 186 grams, this value was therefore taken for M The cut-off frequency was chosen as 5,000, a compromise between the highest frequency occurring in the record and the increase in surface-noise when the cut-off frequency is raised Using these arbitrary values for two of the variables, equation (3) above shows that the values of all the equal shunt compliances and series masses in fig 4 are determined; while by substituting these values in equation (2) the characteristic impedance of the system can be computed For this particular design it is 2,920 mechanical ohms Maxfield and Harrison made experiments from which it was calculated that for the reproduction to be sufficiently loud the radiation resistance of the entire system (*ie*, the impedance as viewed from the record) should be approximately 4,500 mechanical ohms A lever-arm transformer ratio of $\frac{4,500}{2,920}$ was therefore incorporated to produce the necessary resistance

The terminating resistance of the filter is provided by the horn, which is of the logarithmic type. There are two fundamental constants of such a horn. The first is the area of the large end and the second is the rate of taper The area of the mouth determines the lowest frequency which is radiated satisfactorily The energy of the frequencies below this is largely reflected if it is permitted to reach the mouth From the equations given by Webster it can be shown that all logarithmic horns have a low-frequency cut-off which is determined by the rate of taper It is, therefore, possible to build a horn in which the lowest frequencies are prevented from reaching the mouth and so undergoing reflection, while all frequencies above the cut-off value are radiated Such a horn will have no marked fundamental resonance and will behave substantially as a pure acoustic resistance as required by the theory Since the characteristics of the horn are determined by the area of its mouth and by its rate of taper, the length of the horn is determined by the area of the small end This in turn is determined by the mechanical impedance and effective area of the system which it is terminating It is seen, therefore, that the length of the horn should not be considered as a fundamental constant Where it has been necessary to make a folded horn, difficulties have been encountered in settling the proper shape that this should take in order that its performance may approximate to that of a straight exponential horn In practice a number of assumptions have been made which although not rigorously correct, have permitted the construction of compact horns having approximately the same properties as a straight logarithmic horn

Outline of Modern Record Manufacture.—Some of the details of record manufacture are known only to the trade, but the following is a general description of the procedure The dispositions of the performers, microphones, etc are similar to those used in Broadcasting, *ie*, they may be located in a public auditorium or in special studios In the latter case, such reverberation or echo effect as is desired is obtained by adjusting the amount of acoustic damping material in the studio, or by the use of an auxiliary microphone, placed in a separate "Echo room" containing a loud-speaker coupled through an amplifier to the microphone in the main studio

The output from the microphone or microphones is in most cases passed through a series of distortionless amplifying stages direct to the recorder, which is provided with a V-shaped cutting tool The record blank is a tablet of a soapy wax, carried on a horizontal table which is rotated with uniform angular velocity by a weight-driven motor As the table rotates it also travels laterally at a uniform speed, being carried on a revolving threaded spindle The cutting point is lowered so as to enter the surface of the blank to a depth of a few mils, and as the machine runs it cuts a fine spiral groove of uniform depth, running from the circumference of the blank to within 2 or 3 inches of the centre The lateral travel of the turntable is such that a record having about 100 grooves to the inch is made

The record so prepared is dusted with graphite to make it electrically conductive, and is then slowly rotated in a copper-plating bath A homogeneous deposit of copper having thus been grown, it was at one time usual to take "dubs" or impresses in wax from the resulting negative From this in turn one or more working matrices were made, from which the records were pressed More recently, however, it has become standard practice to grow a whole series of negatives upon the original record, thereby obviating any necessity for a second wax impression

Two classes of materials are used in the manufacture of the common breakable type of record, viz ,—resins and gums (of which the principal example is shellac); and various mineral fillers, which are used to lower the cost of production and to give increased resistance From this material, records are pressed from the matrices in steam-heated hydraulic presses

Flexible records, composed principally of celluloid, are also made They are exceptionally free from surface noise but have hitherto proved inferior to wax in wear-resisting qualities

Methods of Measurement.—Side by side with the introduc-

tion of electrical recording methods, and of reproducing mechanisms based on electrical theory, there have also been developed electrical methods for the measurement of mechanical impedance and for determining the acoustic output of a gramophone at any given frequency The masses and compliances of the various members of a recorder or sound-box assembly are seldom separately located but are usually distributed in a complex manner.

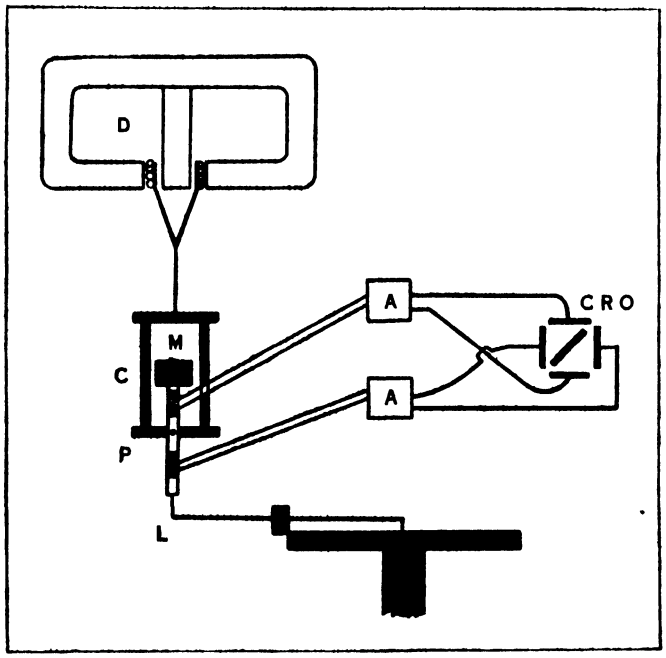

FIG 5.—IMPEDOMETER, FOR THE MEASUREMENT OF MECHANICAL IMPEDANCE
Cage C is driven by the coil and magnet system D. If the quartz strip is fixed to the cage at P, and the forces at each end of the strip are dependent upon the known mass M and the unknown impedance L, piezo-electric changes are liberated on the silvered electrodes and conveyed to separate amplifiers A, A From the figure obtained in the cathode-ray oscillograph C,R,O, the unknown impedance may be determined

Moreover, they cannot at once be determined by static measurements alone It is necessary to have some means for measuring the mechanical impedance of the parts in the degrees of freedom in which it is desired that they shall operate, as well as in those directions in which they should not be permitted to vibrate

Fig 5 shows diagrammatically a method of making such measurements A known mass *M* is attached to one end of a quartz strip, the other end of which is fixed to the driving point of the impedance *L* under examination The strip is rigidly fastened at its centre *P* to a cage *C* which can be driven at any desired frequency by an electro-magnetic coil and magnet system *D* Near each end of the strip the two faces are silvered and connected through an amplifier *A* to one pair of plates of a cathode-ray oscillograph (*see* INSTRUMENTS, ELECTRICAL). The natural frequency of the strip being made high in comparison with the frequencies of operation, the piezo-electric effect (*see* ELECTRICITY) liberates on the electrodes at each end instantaneous charges whose magnitudes are proportional to those of the mechanical forces set up by the known mass and the unknown impedance respectively The cathode beam is acted upon by these two forces at right angles to each other From the resultant figure it is therefore possible to determine the relative phase and magnitude of the force exerted by the impedance under measurement For example, if the impedance is purely reactive a straight line figure is produced, if resistive, the combination of forces due to the mass and to this resistance will give rise to an elliptical figure. The instrument, which is termed an "Impedometer," is likely to be of value in the further practical applications of Maxfield and Harrison's ideas, especially in the search for suitable non-reactive mechanical resistances. A method which is used for obtaining the curve of response of a gramophone is as follows.—

A number of records are made on a constant-velocity basis, of pure tones of given intensity These are played on the machine under test, which is placed in a special room with heavy acoustic damping The sound from the machine is picked up by a calibrated microphone which is swung from side to side during the test in order to nullify any effects due to standing waves in the room. The microphone is connected to an amplifier of which the performance is known, and the output from this is taken through a low-pass filter and a variable resistive network to a thermionic voltmeter. The acoustic output of the gramophone at any frequency is measured by the amount of attenuation it is necessary to introduce into the resistive network in order to obtain a standard reading on the voltmeter A low-pass filter is necessary in order to eliminate from the measurement the effect of any harmonic frequencies which may be accidentally present in the record and radiated by the machine The voltmeter is given a very slow natural period in order to obtain a mean value of the output from the swinging microphone

Fig 6 shows the frequency response curves for two gramophones The dotted curve is of a machine of 1897, with massive moving parts and short conical horn The full line curve is of a 1928 cabinet model, designed according to electrical analogies as the equivalent of a band pass filter In this diagram the abscissae are frequencies plotted on a logarithmic scale and the ordinates represent the gain or amplification required to bring the output up to an arbitrary energy level These are plotted in transmission units, which are defined as $10 \log_{10} E/E'$, where E is the energy output and E′ is a standard energy level The transmission unit scale is roughly proportional to the audible value of the sound Three units represent a noticeable change in intensity.

Electrical Reproduction.—If the sound-box of a gramophone is removed and replaced by a device which generates a fluctuating voltage, the instantaneous values of which are proportional to those of the air pressures originally impressed on the recording microphone, it is possible to obtain a telephonic version of the

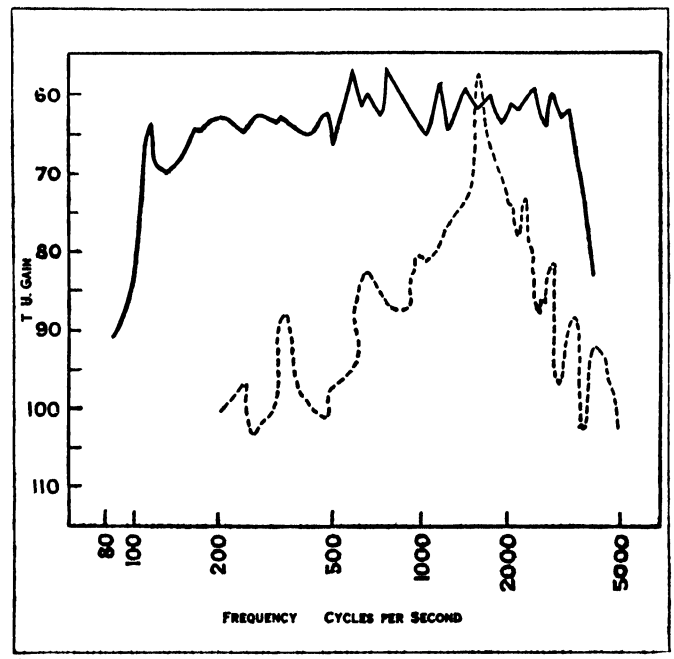

FIG 6.—GRAPH SHOWING FREQUENCY-RESPONSE CURVES FOR TWO GRAMOPHONES

original performance. The output from the pick-up device may be passed through an amplifier to one or more loud-speakers, hence, almost any desired volume may be obtained, and electrical correction circuits introduced if required for any purpose.

A variety of pick-up devices have been utilised, but whether they comprise a moving-iron or a moving-coil system, an electrostatic arrangement or a piezo-electric crystal, there is in every case a reactive load due to the mass and compliance of the moving parts, so that it is generally necessary to apply some form of damping.

The lateral forces which act on the needle during reproduction (apart from that which urges it towards the centre of the record)

are, first, a steady force, due to the fact that a line passing through the needle-point and the axis of rotation of the tone-arm cannot be exactly tangential to the record groove; and second, a force due to the vibratory motion of the needle-point. The first of these can easily be kept within reasonable limits by careful design. The second may be regarded as the mechanical equivalent of an alternating voltage applied to a network—*i.e.*, there can be any phase-relation with the current, which is here analogous to velocity. If the force and velocity are 90 deg out of phase, no useful work is done, and the load is then purely reactive Such a load would be furnished in electrical parlance by a pure inductance or pure capacity; mechanically, by a pure mass or compliance In the older gramophones the load on the needle-point was extremely destructive to the record There were numerous resonances, and the load, which was purely resistive only at the peaks, was elsewhere almost wholly reactive. Under such conditions a large proportion of the energy is reflected back into the record groove with a difference of phase which in some cases may even result in the needle leaving the grooves altogether and cutting across them, with disastrous effects on the life and reproduction of the record (Plate fig. 6). It is, in fact, only possible to construct a mechanical system which shall not be harmful to records if it is substantially resistive over a wide frequency range, *i e*, if it is a network correctly terminated by a resistance equal to its characteristic impedance. We have seen in the case of a sound-box that this resistance is provided by the horn. In the case of an electrical reproducer a difficulty arises owing to the fact that it is not required to do work, but only to generate variations of electric potential. It has been stated that the provision of a pure mechanical resistance is not a simple matter The use of rubber, for example, introduces a reactive component which is large compared with its resistance, and may lead to very heavy record wear if other compliances are added

Long-playing Records.—There are several ways in which the playing time of a disc record of given diameter may be increased In one method the principle of recording and reproducing with the turntables rotating at constant angular velocity is abandoned in favour of some other type of motion, for example, a constant linear velocity of the record relative to the needle Using the former method, it is necessary to make the minimum linear velocity (when the needle is near the centre) great enough to ensure proper recording of the high frequencies In all other parts of the record the velocity is then unnecessarily high If the record is made with varying angular velocity, some form of governor or variable gear must be linked with the tone-arm of the reproducing machine to control the speed of the turntable, and care must be taken to ensure that the power is adequate to drive the record under all conditions

A second method of increasing the playing time, which could be combined with the above, consists in cutting the record with uniform amplitude instead of with uniform velocity, and correcting for the error by a suitable reproducing system In the case of electrical reproduction this can easily be arranged, moreover it is permissible to reduce the amplitude down to any point where the ratio of surface noise to music is still reasonably small In this way a much larger number of grooves may be included in the record But records so made would be unsuitable for use with mechanical instruments of the type described in this article

Light Recording.—Recently a number of sound-reproducing systems have been devised for use in conjunction with synchronised motion-pictures In some cases a disc record with electrical reproducing equipment has been used, while in others the sound is recorded on a moving photographic film, either on a narrow strip beside the picture or else on a separate film. These records may be of constant density and variable width, or the density of the photographic image may vary in accordance with the sound pressure. They are made by means of a beam of light which is deflected (*e.g.*, by a galvanometer) or caused to fluctuate in intensity before reaching the film Among other methods of producing a fluctuating beam, use may be made of mechanically or electrically operated shutters, microphone-controlled gas glow lamps, or the Kerr or Faraday effects in liquids In the latter case the microphone is caused to produce a varying magnetic field, which rotates the plane of polarisation of a beam of light after passing through a Nicol prism Hence the amount of light which will pass through a second Nicol prism or analyser to the photographic film is controlled. The record may be reproduced by passing it between a light source and some form of light sensitive cell, from which, after amplification, a powerful audio-frequency current is obtained This current may in turn be used to operate one or more loud-speakers, or alternatively, using an electromagnetic recorder, an ordinary wax disc record may be cut in which case the speed may be lowered with a corresponding reduction of some of the difficulties in mechanical recording By so transferring the film record, however, many of the potential advantages of light recording, such as freedom from noise and ability to deal with the highest frequencies, are sacrificed

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GRAMOPHONE MUSIC

Gramophone music as a thing to be taken seriously by cultivated musicians has been a matter of slow growth and development Invented as a by-product of telephone research, reared in the atmosphere of booths, side-shows and acrimonious litigation, a horror to eye and ear, this crazy, ridiculous machine, that contained none the less such remarkable potentialities, won its way to the recognition of the astute and the respectable through even longer years of ignominy and disrepute than the, at first, equally crude and grotesque motor car

Even now, in 1928, the gramophone suffers from two major disadvantages which have dogged it from the start It still cannot reproduce sounds quite faithfully, and it (excepting a few electric record changing machines) requires mechanical attention, disadvantages that have caused the hostility of critics and teachers who, almost without exception—and the exceptions, Sir Walford Davies, Mr Robin Legge and Mr Percy Scholes especially in England, deserve the gratitude of millions—cast for long years a supercilious, perhaps sometimes a nervous, eye upon the gradual evolution of the present standard of gramophone reproduction

The three outstanding landmarks in the past have been, first,

the records made by Caruso, and the other "celebrities" of the early catalogues of the Gramophone Company (H M.V); secondly, the adoption of the Columbia "silent surface" in 1922, which converted the music-loving public; and thirdly, the use of the microphone, which superseded the "acoustic" system of recording in 1925 It is probably just to anticipate a fourth landmark, the perfection of electrical reproduction in place of the present tone-arm and sound-box

If the handicap of surface noise is ignored, it would be idle to suggest that the music lover in 1923 or even earlier could not collect a very substantial nucleus of good music on gramophone records Most of the celebrated conductors—Toscanini, Nikisch, Wood, Coates, Ronald—with singers such as Melba, Patti, Destinn, Bispham, Elwes, Caruso, Battistini, Santley and Edward Lloyd, and instrumentalists such as Kreisler, Kubelik, Casals, Paderewski, Busoni, Joachim, Ysaye, had made records, it was possible to procure at least fifteen more or less complete chamber music works played by such distinguished bodies as the Flonzaley, Léner and London String Quartets, and records of still wider scope, such as complete operas and oratorios (*Elijah* for example) were available

It was about this period that the late Arthur Clutton Brock wrote one of his last essays entitled "The Psychology of the Gramophone," in which he confessed that "always with the Gramophone we have to make allowances, and these are most easily made when others help us to make them unconsciously . . . There are qualities of the orchestra," he added, "that never survive on the gramophone, the sharpness of attack on the strings, the clearness of their different parts, and the full distinction between strings and wood wind, pizzicato is usually unpleasant, seeming to intrude between you and the rest of the music; while all the bass parts are apt to be a mere rumble " Clutton Brock also added that sometimes by playing an orchestral record with the thinnest possible needle he could persuade himself that he had produced "a delicate, distant kind of fairy music, something not at all like the actual orchestra, but with an original quality of its own "

From these quotations it is possible to perceive a kind of romantic despair, acquiescing in the limitations of the gramophone and attempting to find a new quality of pleasure in its very imperfections Against this tendency the "realists" opposed a feverish energy in experiments with soundboxes and gramophone design in general, coupled with a constant demand for the recording of classical masterpieces without "cuts", but it was not till the benefits of the research work done in radio laboratories were felt that the gramophone and the record as we know them today were developed by anything but the most empirical methods.

No one in his senses would claim that he no longer had to "make allowances" for the gramophone, but musical critics of high standing have been astounded by the rapid progress made

At present the library of gramophone records has reached vast proportions, the Beethoven and Schubert centenaries adding a notable contribution At least a hundred albums of symphonies and concertos and of chamber music are now available, and it is not uncommon to hear of record libraries containing from four to seven thousand discs of good music

The educational uses of gramophone records are also becoming more and more widely recognised The Gramophone Company has its own education department with a staff of lecturers, the Columbia Company publishes records for the International Educational Association, research work in phonetics and anthropology is carried on with recording apparatus; "courses" in foreign languages have a large and eager public, and such institutions as the National Gramophonic Society of England, with similar bodies in the United States and in Japan, for the recording of unusual works for distribution to their members, are eloquent evidence of the part which the gramophone is able to play in the musical culture of communities and of the individual

The only dangers that threaten are that the listener may insensibly be trained to accept distortions for facts and that he may accept not quite perfect interpretations and performances of the great classical works as a standard of perfection ineradicable from his mind. The limitations of recording hitherto have often led to faulty tempi, to the distortion of orchestral balance, and the like, with the result that the bottled fruit may sometimes have, not so much lost flavour, as acquired an exaggerated flavour. None the less it may be said that the stage of commercial barbarism and academic snobbishness has now been passed, and that the inherent disadvantages of the gramophone have been, if not completely, at any rate to a great extent, surmounted. It is now possible to obtain satisfactory, if not absolutely perfect, records of Wagner's works made actually at Bayreuth; of symphonies played by full-sized orchestras, not in studios, but in the leading concert halls; of the famous organists playing in their own cathedrals, of stage performances of opera or oratorio, and even of important open-air events, so that it is true to say today that wherever a microphone can be installed a gramophone record can be made (C. Mac.; C Sto)

GRAMPIANS, THE, a mass of mountains in central Scotland, occupying the area between a line drawn from Dumbartonshire to the North sea at Stonehaven, and the valley of the Spey or even Glenmore (the Caledonian canal) Their trend is from south-west to north-east, the southern face forming the natural division between the Lowlands and Highlands They lie in the shires of Argyll, Dumbarton, Stirling, Perth, Forfar, Kincardine, Aberdeen, Banff and Inverness Among the highest summits are Ben Nevis, Ben Macdhui and Cairngorm, Ben Lawers, Ben More, Ben Alder, Ben Cruachan and Ben Lomond The principal rivers flowing from the watershed northward are the Findhorn, Spey, Don, Dee and their tributaries, and southward the South Esk, Tay and Forth with their affluents On the north the mass is wild and rugged, on the south the slope is often gentle, affording excellent pasture in many places Both sections contain some of the finest deer-forests in Scotland The rocks consist chiefly of granite, gneiss, schists, quartzite, porphyry and diorite Their fastnesses were inhabited by the northern Picts, the Caledonians who, under Galgacus, were defeated by Agricola in A D 84 at Mons Graupius—the false reading of which, Grampius, has been perpetuated in the name of the mountains This site has not been ascertained

GRAMPOUND, a small market town, Cornwall, England, 9 m N E of Truro, and 2 m from its station (Grampound Road) on the G W. railway Pop. (1921) 419 On the river Fal, it retains an ancient town hall, there is a good market cross, and in the neighbourhood, along the Fal, are several early earthworks Grampound (Ponsmure, Graundpont, Grauntpount, Graundpond) and the hundred, manor and vill of Tibeste were formerly closely associated At the time of the Domesday Tibeste was granted to the count of Mortain The burgensic character of Ponsmure first appears in 1299 John of Eltham (1334) granted to the burgesses the whole town of Grauntpount This grant was confirmed in 1378 as well as two fairs at the feasts of St Peter in Cathedra and St Barnabas, both of which are still held, and a Tuesday market (now held on Friday). Two members were summoned to parliament by Edward VI in 1553 The venality of the electors (about 50) became notorious In 1821 the borough was disfranchised

GRAMPUS (*Orcinus orca*), a cetacean belonging to the *Delphinidae* or dolphin family, characterized by its rounded head without distinct beak, high dorsal fin and large conical teeth The upper parts are nearly uniform glossy black, with a white eye-stripe and the under parts white. The animal is also known as the "killer," in allusion to its ferocity in attacking its prey, which consists of fishes, seals, porpoises, and the smaller dolphins It is very voracious In the Antarctic several will combine to break the ice in order to throw their prey (and, it is said, even men) into the water where they can kill it These cetaceans sometimes hunt in packs and commit great havoc among the belugas (*q v*) and other whales. The grampus inhabits both northern and southern regions, and is by no means uncommon in British waters. The number of species is doubtful, but only one is usually recognized *Grampus* is used as the generic name of Risso's dolphin. (*See* Cetacea)

GRANADA, LUIS DE (1504–1588), Spanish preacher and ascetic writer, was born of poor parents at Granada. He became a Dominican and after studying at Valladolid, was appointed procurator at Granada. Seven years later he was elected prior of the convent of Scala Caeli in the mountains of Cordova, where he became one of the most famous of Spanish preachers He went to Portugal in 1555 and became provincial of his order, declining the offer of the archbishopric of Braga but accepting the position of confessor and counsellor to Catherine, the queen regent At the expiration of his provincialship, he retired to the Dominican convent at Lisbon, where he died His mystical teaching was said to be heretical, and his famous *Guia de Peccadores,* which has been translated into nearly every European tongue, was put on the Index together with his book on prayer, in 1559. In 1576 the prohibition was removed and his works became much prized by St Francis de Sales, St Teresa and St Peter of Alcantara

The collected works appeared in 9 vols at Antwerp in 1578 *See* L. Monoz, *La Vida y virtudes de Luis de Granada* (1639), P Rousselot, *Mystiques espagnoles* (1867), Fitzmaurice Kelly, *Hist of Spanish Lit* (1926)

GRANADA, one of the chief cities of Nicaragua, Central America, capital of the province of the same name, and the terminus of the Pacific railroad It is 36 m S E of Managua, the national capital, and 118 m from Corinto, the chief Pacific port and the northern terminus of the railroad Granada's population was in 1928 about 15,000, and it lies at an altitude of 180 ft above sea-level, on the shores of Lake Nicaragua where steamers and launches connect it with the lake towns It is remarkable for the considerable number of Roman Catholic churches, schools and institutions, including the pretentious University of Central America, on the shores of the lake, is the seat of a bishop, and as the headquarters of the Conservative party in Nicaraguan politics is closely linked with the religious interests of the country The city itself is laid out like most Spanish towns, on a rectangular "grid-iron" style, the houses are mostly one story, but include many fine old mansions dating from colonial times, the churches are massive and some of them ornate The city lies back from the shore of the lake, whose clustered islands near Granada (called "*Los Diamantes*" or "the Diamonds") are the recreational resort of the city Granada is an important trading centre and most of the old families there are engaged in commerce The products of the locality are cattle and hides, cacao, sugar, cotton, indigo, alcohol and coffee

Granada was founded in 1523 by Francisco Fernandez de Córdova, early became the centre of the Conservative life and trade of the region, and from earliest times has been a keen political and trade rival of León (*q v*), further north, the centre of the Liberal party, and now a more populous and prosperous business rival of Granada The present capital, Managua (*q v*) was founded between the two older cities as a political compromise Granada was raided by pirates from the Caribbean many times in the 17th century and in 1606 it was sacked and burned William Walker (*q.v*), the American filibuster, made Granada the centre of his attacks and his headquarters during the period (1855–59) when he was active in Nicaragua, and as leader of the Liberals sacked and partially burned Granada in 1855

GRANADA, a maritime province of southern Spain, formed in 1833 of districts belonging to Andalusia, and formerly centre of the ancient kingdom of Granada Pop (1920) 573,682, area, 4,838 sq miles Granada is bounded on the north by Cordova, Jaén and Albacete, east by Murcia and Almería, south by the Mediterranean sea, and west by Málaga. It includes the western and loftier portion of the Sierra Nevada (*q v*), a vast ridge rising parallel to the sea and attaining its greatest altitudes in the Cerro de Mulhacén (11,427 ft) and Picacho de la Veleta (11,338 ft), which overlook the city of Granada Lesser ranges, such as the Sierras of Parapanda, Alhama, Almijara, Harana or Baeza, adjoin the main ridge In this central watershed rise the three principal rivers of the province Southward flows the Guadalféo to the Mediterranean, westward the Genil, and northward the Guadiana Menor and its many tributaries draining the north-eastern districts. Both the Genil and the Guadiana join the Guadalquivir outside the province Summer drought predominates and only the mountain slopes are forested, mainly with pine trees The soil of the high basins north of the Sierra is, however, fertile, that of the Vega of Granada being considered the richest in the whole peninsula, and from the days of the Moors it has been systematically irrigated Sheep and goats are reared in the Sierra and esparto grass is obtained from the upland areas Fine alabaster, jasper and other precious stones occur in the mountains behind Granada, but are little worked The only important industry is sugar refining This developed rapidly after the loss of the Spanish West Indies and the Philippine Islands in 1898, with the consequent decrease in competition, and there are now factories in many towns, especially in the Vega and along the coast Apart from the great highways traversing the province, which are excellent, the roads are few and ill-kept The main Madrid–Málaga–Algeciras railway passes through the capital. At Moreda a line branches south-east to Almería, passing through Guadix, junction for Murcia, and through La Calahorra, where a short line runs out to Alquife A line connects Granada with Motril on the coast, and an electric railway runs from the capital up into the Sierra Nevada The chief towns are Granada, the capital (pop 1920, 103,368), Loja (20,493), Motril (16,809), Guadix (16,141), Baza (15,935), Montefrío (11,729) and Alhama de Granada (7,591) These are described in separate articles Other towns of over 7,000 inhabitants are Illora (11,179), Huéscar (9,102), Pinos-Puente (8,796), Almuñécar (8,022), Santafé (7,951), Cúllar de Baza (7,908), Puebla de don Fadrique (7,887) and Albuñol (7,685) (*See* also ANDALUSIA and, for the history of the ancient kingdom, the city of *Granada* below)

GRANADA, the capital of the province, and formerly of the kingdom of Granada, in southern Spain, on the Madrid-Granada-Algeciras railway Pop (1920), 103,368 Granada is well situated, 2,195 ft above the sea, on the north-western slope of the Sierra Nevada, overlooking the fertile lowlands known as the Vega de Granada on the west and overshadowed by the peaks of Veleta (11,148 ft) and Mulhacen (11,421 ft) on the south-east The southern limit of the city is the river Genil, the Roman *Singilis* and Moorish *Sheni,* a swift stream flowing westward from the Sierra Nevada, with a considerable volume of water in summer, when the snows have thawed Its tributary the Darro, the Roman *Salon* and Moorish *Hadarro,* enters Granada on the east, flows for upwards of a mile from east to west, and then turns sharply southward to join the main river, which is spanned by a bridge just above the point of confluence The waters of the Darro are much reduced by irrigation works along its lower course, and within the city it has been canalized and partly covered with a roof

Granada comprises three main divisions, the Antequeruela, the Albaicin and Granada properly so-called The first division, founded by refugees from Antequera in 1410, consists of the districts enclosed by the Darro, besides a small area on its right, or western bank It is bounded on the east by the gardens and hill of the Alhambra (*q v*), the most celebrated of all the monuments left by the Moors The Albaicin (Moorish *Rabad al Bayazin,* "Falconers' Quarter") lies north-west of the Antequeruela Granada, properly so-called, is north of the Antequeruela, and west of the Albaicin The origin of its name is obscure, it has been sometimes derived from *granada,* a pomegranate, in allusion to the abundance of pomegranate trees in the neighbourhood A pomegranate appears on the city arms The Moors, however, called Granada *Karnattah* or *Karnattah-al-Yahud,* and possibly the name is composed of the Arabic words *kurn,* "a hill," and *nattah,* "stranger"—the "city" or "hill of strangers"

Granada is the see of an archbishop Its cathedral, begun in 1529 by Diego de Siloe, and finished only in 1703, is profusely ornamented with jasper and coloured marbles, and surmounted by a dome The interior contains many paintings and sculptures by Alonso Cano (1601–1667), the architect of the fine west façade, and other artists In one of the numerous chapels, known as the Chapel Royal (*Capilla Real*), is the tomb of Ferdinand and Isabella, the first rulers of united Spain The Cartuja, or

Carthusian monastery north of the city, was built in 1516 in memory of the Great Captain, Gonzalo de Córdoba (1453–1515), whose tomb is in the convent of San Jerónimo.

After the Alhambra, and such adjacent buildings as the Generalife and Torres Bermejas, which are more fitly described in connection with it, the principal Moorish antiquities of Granada are the 13th-century villa known as the Cuarto Real de San Domingo, admirably preserved, and surrounded by beautiful gardens; the Alcazar de Genil, built in the middle of the 14th century as a palace for the Moorish queens, and the Casa del Cabildo, a university of the same period, converted into a warehouse in the 19th century. Granada has an active trade in the agricultural produce of the Vega, and manufactures liqueurs, soap, paper and coarse linen and woollen fabrics.

History.—The identity of Granada with the Iberian city of *Iliberris* or *Iliberri*, which afterwards became a flourishing Roman colony, has never been fully established, but Roman tombs, coins, inscriptions, etc., have been discovered in the neighbourhood. Under the caliphs of Cordova the family of the Zeri, Ziri or Zeiri maintained itself as the ruling dynasty until 1090; it was then displaced by the Almohades, who were in turn overthrown by the Almoravides, in 1154. The dominion of the Almoravides continued unbroken, save for an interval of one year (1160–61), until 1229. From 1229 to 1238 Granada formed part of the kingdom of Murcia; but in the last-named year it passed into the hands of Abu Abdullah Mohammed Ibn Al Ahmar, prince of Jaen and founder of the dynasty of the Nasrides. Al Ahmar was deprived of Jaen in 1246, but united Granada, Almeria and Malaga under his sceptre, and made peace with Castile. Al Ahmar and his successors ruled over Granada until 1492, in an unbroken line of 25 sovereigns. Their encouragement of commerce—notably the silk trade with Italy—rendered Granada the wealthiest of Spanish cities, their patronage of art, literature and science attracted many learned Muslims such as the historian Ibn Khaldun and the geographer Ibn Batuta, to their court, and resulted in a brilliant civilization, of which the Alhambra is the supreme monument.

The two noble families of the Zegri and the Beni Serraj, better known in history and legend as the *Abencerrages* (*q.v.*), encroached greatly upon the royal prerogatives during the middle years of the 15th century. A crisis arose in 1462, resulting in the dethronement of Abu Nasr Saad, and the accession of his son, Muley Abu'l Hassan, whose name is preserved in that of Mulhacen, the loftiest peak of the Sierra Nevada. Muley Hassan weakened his position by resigning Malaga to his brother Ez Zagal, and incurred the enmity of his first wife, Aisha, by marrying a beautiful Spanish slave, Isabella de Solis, who had adopted the creed of Islam and taken the name of Zorayah, "morning star." Aisha or Ayesha, who thus saw her sons Abu Abdullah Mohammed (Boabdil) and Yusuf in danger of being supplanted, appealed to the Abencerrages. (*See* ALHAMBRA.) In 1482 Boabdil succeeded in deposing his father, who fled to Malaga, but the gradual advance of the Christians under Ferdinand and Isabella forced him to resign the task of defence into the more warlike hands of Muley Hassan and Ez Zagal (1483–86). In 1491 Boabdil was compelled to sign away his kingdom, and on Jan. 2, 1492, the Spanish army entered Granada, and the Moorish power in Spain was ended.

GRANADOS CAMPINA, ENRIQUE (1867–1916), Spanish pianist and composer, was born at Lerida on July 29, 1867. After studying in Barcelona under Pujol and Pedrell he went to Paris, where he worked chiefly under de Bériot. In 1898 his first opera, *Maria del Carmen*, was produced in Madrid. Two years later he founded the Sociedad de Conciertos Clásicos and, in 1901, the Academia Granados. He had a brilliant career as a pianist, playing chiefly in France and Spain but visiting America in 1915 and in 1916, when his opera *Goyescas* was performed in New York. On his return home he met his death on the "Sussex," which was sunk in the Channel by a German submarine on March 24. His most characteristic writing is to be found in his piano music, which is full of the colour and rhythm of Spanish folk-tunes. Especially in the *Goyescas*—two sets of pieces from which he took the material for his opera of that name—he produced melodies of great beauty, drawing his inspiration from Goya's paintings and tapestries and the life of the period in Madrid. Among his other piano compositions are: 12 Spanish dances; children's pieces, six pieces based on Spanish popular songs; romantic scenes; poetic scenes; book of hours and impromptus. His operas include *Picarol, Gaziel, Liliana, Petrarca* and *Follet*. He also wrote a symphonic poem: *Nit del Mort* and several orchestral suites, an "Oriental" for oboe and strings; a collection of canciones amatorias and another of seven Tonadillas for the voice.

GRANARIES AND GRAIN ELEVATORS. With the disappearance of the old type of granary, the term grain elevator has in the United States and Canada almost wholly ousted the older term. A modern granary, with its elaborate organizations, may be likened to a scientific development of the fundamental theory laid down by Joseph of Old in Egypt. In modern civilization granaries play probably the most important part in the world's economy, since they are instrumental in distributing the daily bread from the sparsely populated new countries where production, on the virgin soil, is greater than the consumption, to the densely populated old countries, where conditions are reversed. Beyond the obvious purpose of providing safe storage, modern granaries provide automatic handling for the grain to and from storage with a maximum of speed and a minimum of cost. An outstanding advantage of the system is that a farmer can store his wheat or maize at a moderate rate and can get an advance on his warrant if he is in want of money. Moreover, a holder of wheat in a Chicago granary can withdraw wheat of similar grade from one in New York, thus saving freight. America is the home of great granaries, which are called "elevators" in that country, but it is not generally known that a certain Robert Dunbar, a native of Carabee, Fifeshire, Scotland, designed the first modern type of granary at Buffalo, where he had settled in 1834.

Granary Building Materials.—Until within a few years of the close of the 19th century silo granaries were in vogue, built of timber on the crib system, somewhat after the fashion of blockhouses; the silos, however, were of sawn timber, generally about 12ft. square, and the planks were nailed one on top of the other overlapping at the corners, beginning at the base with those of 6 to 10in. width, and finishing at the top with those of 4 inches. This construction was quite satisfactory, but the high cost and growing scarcity of timber necessitated the use of other materials.

During the opening years of the 20th century cylindrical steel silos were built with conical or flat bases, the former being constructed of steel and the latter of concrete. This type of granary is comparatively cheap and the weight of the structure is light relative to the amount of grain stored. Formerly all steel silos were built with riveted joints, but bolts are now largely used, the cost of erection being thereby considerably reduced, since skilled riveters are no longer required to put the tanks together on the site. Steel was soon ousted by tiles reinforced by steel rods for square silos and rings for circular ones. The concrete type of granary is the most recent and by far the most satisfactory form of construction, and the majority of large granaries built of late years are of this type. They are proof against both fire and vermin and have the advantages of utility, longevity and economy.

Granaries are built with what is known as a cupola which is erected above the silos, in the early days this, too, was built of timber. It consists of one or more working floors where the elevator tops and the band conveyors are located and manipulated. Nowadays these cupolas are also built of ferro-concrete.

The development in the mechanical equipment since 1896 must be likewise recorded. This is in keeping with the general progress in engineering practice by which all industries have more or less benefited during the period in question. It is now customary, with the advent of the individual motor, to drive each conveyor or elevator unit by a separate motor through silent chain and double helical speed reduction gear instead of, as formerly, all machines being driven by means of ropes and countershafts from one prime mover on the ground floor. This means great saving of space, increase of storage room, altogether greater compactness, convenience of operation with a minimum of manual attention

and better facilities for dust elimination. The very latest improvement noted is the employment of roller bearings on all of the machinery.

At the No 3 Montreal Granary, where all these mechanical improvements are in use, a saving of one-third in driving power has been effected over all of the earlier and the more cumbersome methods.

Risk of Explosion.—One phase of the granary problem has hitherto been barely touched upon, and that is safeguarding against explosions. So far, the only precautions taken have been the adoption of numerous methods of ventilation and dust collection. Such apparent neglect is only due to the fact that an explosion was scarcely ever heard of in connection with the earlier and relatively smaller granaries Then came a rude awakening. Since 1916, 26 serious explosions have occurred, involving the loss of 67 lives, injuries to 72 persons and great monetary loss The risk of explosion can never be entirely eliminated, because grain cannot be handled without the creation of dust, and dust when mixed with air in a certain proportion must constitute an explosive mixture which, on being brought into contact with some external source of heat equal to the ignition temperature, causes catastrophe. A broken electric light bulb, or even a static spark, would be sufficient

While the developments enumerated above have improved the general condition of granaries, they have incidentally reduced the risk of explosion by lessening the possibility of producing static sparks The introduction of roller bearings has minimized the danger due to overheated bearings, and the increased size of main-bucket-elevator head-pulleys has practically excluded elevator chokes with their inevitable production of dust

It has only recently been fully recognized that granary engineers should take measures to reduce the risk of explosion when designing a granary The John S. Metcalf Co Ltd, of Montreal, have realized that though an initial explosion is often only a small affair, it may give rise to a second, and even to a third, each one increasing in extent and violence They have therefore in the construction of the Port of Montreal granary, concentrated on the prevention or localization of the initial explosion To this end they have segregated the granary into smaller units, thereby reducing the danger to a possible minimum, as will be seen later

Fortunately, Great Britain has not suffered from any serious explosion, probably on account of the fact that about 75% of imported wheat is used, which has already passed through granaries in the countries where it has been grown, so that a goodly percentage of dust has already been eliminated Another reason for this immunity from explosions is probably that the British granaries are smaller In Great Britain there are climatic difficulties in the way of storing the native grain on a large scale. To preserve newly harvested grain in good condition it should be kept as far as possible from moisture and heat, because it has a tendency to sweat when brought into a warehouse, and in this condition will easily heat, such heating, if allowed to continue, impairing the quality of the grain These difficulties have been largely overcome by frequently transferring it from one silo to another.

Modern granaries are all built on the same fundamental plan and the mechanical equipment for receiving and discharging grain is similar in all of them For taking in rail-borne grain the mechanical handling equipment consists essentially of truck-unloading devices, bucket elevators and band conveyors, while in addition to these both barge elevators and pneumatic grain-handling plant are employed, principally for transferring grain from vessels to granaries In most cases it is necessary to receive and distribute grain by both rail and waterways, and since the railway system is the more flexible, most of the important granaries are located on the waterside, where large vessels may be berthed for the discharging and receiving of the grain, while the railway sidings on the land side connect the granaries with the chief lines in the district The Montreal granaries, for instance, are connected with the lines which traverse the Canadian wheat belt—Manitoba, Saskatchewan and Alberta

Granaries as a rule are enormously heavy and the soil on which they are constructed is in many cases alluvial, consequently the question of foundations is at all times of the greatest importance.

Harbour Commissioners of Montreal Granary No. 3.—This granary is of concrete construction and it has a total capacity of 2,000,000 bushels; it has been specially designed with the view of guarding against explosions Each department of the plant is segregated to form an isolated unit The receiving-house, for instance, which is perhaps the dustiest section, and therefore the place where explosions would be most likely to occur, stands quite apart from the granary proper The unloading of the grain cars on their arrival at the granary is accomplished by a dumping process in which the car is first lifted and simultaneously tilted forward, then rocked endwise With this, the unloading of a 60-ton car takes only seven minutes, and one such car dumper can unload from seven to ten 2,000-bushel cars per hour

The granary itself is divided into two units, each having a storage capacity of one million bushels, and separated from the working house, which is located between them, by substantial concrete walls The only apertures in these walls are small openings for the belt conveyors to pass through, and those for the necessary iron doors Moreover, the lowest floor of the working house is on a level with the floor above the silo cells, while the space between the working house and ground level (about 100ft) is entirely open, allowing the elevator legs to pass through In these circumstances, should an explosion occur in the receiving house it would spend itself locally, since the only connections between it and the working floors are the elevator legs which are in the vast open space between the working floors and the ground The casings, of light steel sheets, are carried up to a considerable height in the open, so that an explosion would blow them out and escape before it reached the building above. An explosion on either of the working floors would be kept from spreading to the adjacent granaries by the concrete walls, which would, at the same time, protect the working house if an explosion occurred in either of the two granaries As an additional precaution, every bucket elevator and every silo cell has a separate vent through the roof to the open The numerous windows are all hinged from the top and swing outwards with the least pressure from the inside Practically speaking, all avenues through which an explosion can spread are closed The risk of explosion is further reduced by the provision of roller bearings on all the machines, for the true rolling motion reduces friction to a minimum and prevents heating of the journals Lubricating difficulties are likewise overcome, since roller bearings require very little lubricant and that only periodically As a matter of fact there are over 53,000 Hyatt roller bearings in this plant, and the motors installed for the conveyors are of one-third less power than those formerly employed when bearings of solid type were used Moreover, reduction of strain permits the use of lighter and less costly conveyor belts

Durban Terminal Granary.—This large granary installation is an enterprise of the Government of the Union of South Africa, it has a storage capacity of 42,000 short tons of maize, but provision has been made to increase the capacity to a total of 78,000 tons The building is of ferro-concrete and structural steel and comprises a main working house and several annexes The working house block is 194ft long by 70ft wide and is divided into 80 rectangular storage silos with a total capacity of 15,000 tons A basement working floor beneath the silos, and likewise one immediately above them, accommodate the band conveyors for distributing and withdrawing grain to and from the silos Above the silos is a cupola, to the highest point of which the four main intake elevators reach Accommodation is provided in this cupola for the weighing machines with their receiving and delivery hoppers, from the latter of which maize is spouted on to the distributing band conveyors as well as on to the transverse conveyors, which communicate with the storage annexe This consists of 50 hoppered cylindrical silos, each 18ft in diameter, and 36 interspace bins with a total capacity of 27,000 tons. These are of the same depth as the others, just over 90ft, and are constructed of ferro-concrete 7in thick Their tops, like those of the silos in

the working house, are covered by a reinforced concrete floor. The structure above the annexe is of steel, with brickwork between the steel uprights Galleries of reinforced concrete connect the annexe at the top with the working house, while in the basement connection is afforded by underground tunnels Alongside the working house is a track shed, 188ft. long by 70ft wide, which extends over four rail tracks and in which the operation of unloading the wagons takes place

Since damp or dirty grain has occasionally to be stored, means have been provided for drying and cleaning it These operations are carried out in a ferro-concrete annexe, 55ft long by 15ft wide The drying plant is capable of evaporating from 4% to 5% of moisture from the grain at the rate of 600 bushels per hour The cleaning machinery has a combined capacity of 3,600 bushels per hour

The grain is delivered at the track shed in bulk wagons of 45 tons capacity, which are spotted by electric capstans and end-tipped by four hydraulically operated tipplers, one of which works in connection with each of the four railway lines The grain is tipped into four under-rail hoppers, each of a capacity of 40 tons Beneath these hoppers are four band conveyors to receive and deliver the grain to the four main elevators which deposit it at the top of the building, whence it is conveyed, via weighing machines, spouting and conveyors, into any silo in the working house or storage annexe The capacity of this intake plant is 1,000 tons per hour if the supply is uninterrupted The contents of any of the silos can be transferred to the shipping silos adjoining by band conveyors and the five shipping elevators; or alternatively, they may be delivered from the hoppers below the weighing machines in the cupola by means of spouts A shipping conveyor in the working house, a conveyor affording a connection between this and the shipping conveyor in the inclined gantry, and quay conveyors in the gallery, the latter running parallel with the quay alongside which the ships are unloaded, provide loading facilities for water transport Grain can likewise be taken from the silos in the annexe by means of tunnel conveyors From the quay conveyors grain is delivered into the holds of vessels through loading-out shoots, which can be raised, lowered or telescoped, and which are so hinged that they can be swung through an angle of 180°. The shipping galleries and their supporting trestles are of structural steel, and can be seen with the inclined gantries in fig 5 These gantries are covered in with galvanized corrugated steel sheets and have cement floors The loading-out capacity is the same as that of the intake plant; *i e*, 1,000 tons per hour Grain can also be loaded, either loose or in sacks, into rail or road wagons in the track shed through special loading shoots, either from the working house or from the centre tower on the quay

For the purpose of removing the dust from all points where grain is fed on to, or delivered from, conveyors and elevators, as well as from the various tunnels, two dust extracting systems and one dust removal system with incinerator and packing machine have been provided The whole of the machinery is driven by electric motors, fitted with starters which can be operated from various points in the building A thermometer system has been fitted, which enables the temperature of the grain at various depths in each of the silos to be indicated on a dial in the granary office

No. 2 Granary, Manchester Ship Canal.—It is of reinforced concrete and has a storage capacity of 40,000 tons It comprises 260 storage bins and 81 shipping silos, as well as distributing, weighing and loading-out floors The building block is 295ft long and 165ft wide, the total height from the quay level to the top of the cupola being 168 feet The cupola is 238ft long and 37ft wide and rises, with its four floors, to a height of 70ft above the silos

General cargo, as well as grain, can be simultaneously discharged from ships in No 9 dock Grain is conveyed from the ships to the granary on belt conveyors in subways on both north and south quays That below the north quay extends about 950ft along the dock from the granary, so that two full cargoes of grain can be unloaded simultaneously The south subway extends the full length of five berths and is about half-a-mile long On this side of the dock grain can be taken from ships while general cargo is being discharged The conveyors in these subways can be fed from numerous points along the quay With the layout of these conveyors six separate streams of grain can be carried to the granary at the same time, and as each conveyor can handle 200 tons per hour, the plant has an hourly intake capacity of 1,200 tons The subway conveyors feed cross conveyors in the basement of the granary, these, in turn, feeding the six receiving elevators The grain is conveyed to the top of the cupola by these elevators and delivered into automatic weighing machines, whence it passes into a steel hopper below From this the grain is led by an elaborate system of spouts to the distributing conveyors over the silos, or, as an alternative, to a conveyor on the floor above the bins, which in turn feeds to the sacking and shipping bins on the west side

The silos round the four sides of the building, 81 in number, are divided into upper and lower parts by a sloping cross division inserted at a sufficient height to afford delivery by gravity from the upper part to the sacking sheds, and from the lower for shipping the grain Sacking sheds are provided on all four sides of the granary, and are so built that wheat may be sacked off from any number of points at the same time Railway wagons can be brought in and loaded on three sides of the granary under the sacking shed floors A very complete dust collecting system is provided, which includes exhausters from the garners above the weighers, while "sweep-ups" are provided on all floors The installation is electrically driven throughout (G F Z)

GRANBY, JOHN MANNERS, Marquess of (1721–1770), British soldier, the eldest son of the third duke of Rutland, was born in 1721, educated at Eton and Trinity college, Cambridge, and elected M P for Grantham in 1741 Four years later he received a commission as colonel of a regiment raised to assist in quelling the Highland revolt of 1745 This corps never got beyond Newcastle, but as a volunteer on the duke of Cumberland's staff, Granby saw active service in the last stages of the insurrection He was in the Flanders campaign of 1747, was promoted major-general in 1755, and three years later was appointed colonel of the Royal Horse Guards (Blues) He had married the daughter of the duke of Somerset, and in 1754 had begun his parliamentary connection with Cambridgeshire, for which county he sat until his death Dispatched to Germany in 1758, he was present at the battle of Minden, and later succeeded to the command of the British contingent after Lord Sackville's disgrace On July 31, 1760, Granby stormed Warburg at the head of the British cavalry, capturing 1,500 men and ten pieces of artillery A year later (July 15, 1761) the British defended the heights of Vellinghausen with great bravery, and in the last campaign, at Gravenstein and Wilhelmsthal, Homburg and Cassel, Granby's men bore the brunt of the fighting and earned the greatest share of the glory

Returning to England in 1763 the marquess found himself the popular hero of the war He was appointed to the Ordnance on July 1, 1763, and three years later he became commander-in-chief In this position he was attacked by "Junius" He died at Scarborough on Oct 18, 1770

Two portraits of Granby were painted by Sir Joshua Reynolds, one of which is now in the National Gallery His contemporary popularity is indicated by the number of inns and public-houses which took his name and had his portrait as sign-board.

GRAN CHACO, an extensive region in the heart of South America belonging to the La Plata basin, stretching from 20° to 29° S lat Its area is estimated at 300,000 sq miles The greater part is covered with marshes, lagoons and dense tropical jungle and forest, and is still unexplored On its southern and western borders there are extensive tracts of open woodland, intermingled with grassy plains, while on the northern side in Bolivia are large areas of open country subject to inundations in the rainy season It is traversed by two great rivers, the Pilcomayo and Bermejo, whose sluggish courses are not navigable The greater part of its territory is occupied by nomadic tribes of Indians, some of whom are still unsubdued, while others like the Matacos, are sometimes to be found on neighbouring sugar estates and *estancias* as labour-

ers during the busy season. The forest wealth of the Chaco region is incalculable, consisting of a great variety of palms and valuable cabinet woods, building timber, etc. Its extensive tracts of *quebracho colorado* (*Loxopterygium Lorentzii*) are of very great value because of its use in tanning leather Both the wood and its extract are largely exported Its possession was the cause of serious dispute and armed conflict between Bolivia and Paraguay in the winter of 1928.

GRAND ALLIANCE, WAR OF THE (alternatively called the War of the League of Augsburg), the third[1] of the great aggressive wars waged by Louis XIV. of France against Spain, the Empire, Great Britain, Holland and other states. The two earlier wars, which are redeemed from oblivion by the fact that in them three great captains, Turenne, Condé and Montecucculi, played leading parts, are described in the article DUTCH WARS. In the third war the leading figures are: Henri de Montmorency-Boutteville, duke of Luxemburg, the former aide-de-camp of Condé and heir to his daring method of warfare, William of Orange, who had fought against both Condé and Luxemburg in the earlier wars, and was now king of England; Vauban, the founder of the sciences of fortification and siegecraft, and Catinat, the follower of Turenne's cautious and systematic strategy, who was the first commoner to receive high command in the army of Louis XIV But as soldiers, these men—except Vauban—are overshadowed by the great figures of the preceding generation, and except for a half-dozen outstanding episodes, the war of 1689–97 was an affair of positions and chess-board manoeuvres

It was within these years that the art and practice of war began to crystallize into the form called "linear" in its strategic and tactical aspect, and "cabinet-war" in its political and moral aspect. In the Dutch wars, and in the minor wars that preceded the formation of the League of Augsburg, there were still survivals of the loose organization, violence and wasteful barbarity typical of the Thirty Years' War; and even in the War of the Grand Alliance (in its earlier years) occasional brutalities and devastations showed that the old spirit died hard But outrages that would have been borne in dumb misery in the old days now provoked loud indignation, and when the fierce Louvois disappeared from the scene it became generally understood that barbarity was impolitic, not only as alienating popular sympathies, but also as rendering operations a physical impossibility for want of supplies

Character of the War.—Thus in 1700, so far from terrorizing the country people into submission, armies systematically conciliated them by paying cash and bringing trade into the country. Formerly, wars had been fought to compel a people to abjure their faith or to change sides in some personal or dynastic quarrel But since 1648 this had no longer been the case The Peace of Westphalia established the general relationship of kings, priests and peoples on a basis that was not really shaken until the French Revolution, and in the intervening 140 years the peoples at large, except at the highest and gravest moments (as in Germany in 1689, France in 1709 and Prussia in 1757) held aloof from active participation in politics and war This was the beginning of the theory that war was an affair of the regular forces only, and that intervention in it by the civil population was a punishable offence Thus wars became the business of the professional soldiers in the king's own service, and the scarcity and costliness of these soldiers combined with the purely political character of the quarrels that arose to reduce a campaign from an "intense and passionate drama" to a humdrum affair, to which only rarely a few men of genius imparted some degree of vigour, and which in the main was an attempt to gain small ends by a small expenditure of force and with the minimum of risk As between a prince and his subjects there were still quarrels that stirred the average man—the Dragonnades, for instance, or the English Revolution—but foreign wars were "a stronger form of diplomatic notes," as Clausewitz called them, and were waged with the object of adding a codicil to the treaty of peace that had closed the last incident

Other causes contributed to stifle the former vigour of war Campaigns were no longer conducted by armies of ten to thirty thousand men Large regular armies had come into fashion, and, as Guibert points out, instead of small armies charged with grand operations we find grand armies charged with small operations The average general, under the prevailing conditions of supply and armament, was not equal to the task of commanding such armies Any real concentration of the great forces that Louis XIV. had created was therefore out of the question, and the field armies split into six or eight independent fractions, each charged with operations on a particular theatre of war From such a policy nothing remotely resembling the overthrow of a great power could be expected to be gained The one tangible asset, in view of future peace negotiations, was therefore a fortress, and it was on the preservation or capture of fortresses that operations in all these wars chiefly turned The idea of the decisive battle for its own sake, as a settlement of the quarrel, was far distant, for, strictly speaking, there was no quarrel, and to use up highly trained and exceedingly expensive soldiers in gaining by brute force an advantage that might equally well be obtained by chicanery was regarded as foolish

The fortress was, moreover, of immediate as well as contingent value to a state at war A century of constant warfare had impoverished middle Europe, and armies had to spread over a large area if they desired to "live on the country" This was dangerous in the face of the enemy (*cf* the Peninsular War), and it was also uneconomical The only way to prevent the country people from sending their produce into the fortresses for safety was to announce beforehand that cash would be paid, at a high rate, for whatever the army needed But even promises rarely brought this about, and to live at all, whether on supplies brought up from the home country and stored in magazines (which had to be guarded) or on local resources, an army had as a rule to maintain or to capture a large fortress Sieges, therefore, and limited manoeuvres are the features of this form of war, wherein armies progressed not with the giant strides of Napoleonic war, but in a succession of short hops from one foothold to the next The general character of the war being borne in mind, nine-tenths of its marches and manoeuvres can be almost "taken as read", the remaining tenth, the exceptional and abnormal part of it, alone possesses an interest for modern readers

In pursuance of a new aggressive policy in Germany, Louis XIV sent his troops, as a diplomatic menace rather than for conquest, into that country in the autumn of 1688 Some of their raiding parties plundered the country as far south as Augsburg, for the political intent of their advance suggested terrorism rather than conciliation as the best method The League of Augsburg at once took up the challenge, and the addition of new members (Treaty of Vienna, May 1689) converted it into the "Grand Alliance" of Spain, Holland, Sweden, Savoy and certain Italian states, Great Britain, the emperor, the elector of Brandenburg, etc

"Those who condemned the king for raising up so many enemies, admired him for having so fully prepared to defend himself and even to forestall them," says Voltaire Louvois had in fact completed the work of organizing the French army on a regular and permanent basis, and had made it not merely the best, but also by far the most numerous in Europe, for Louis disposed in 1688 of no fewer than 375,000 soldiers and 60,000 sailors The infantry was uniformed and drilled, and the socket bayonet and the flint-lock musket had been introduced The only relic of the old armament was the pike, which was retained for one-quarter of the foot, though it had been discarded by the Imperialists in the course of the Turkish wars described below The first artillery regiment was created in 1684, to replace the former semi-civilian organization by a body of artillerymen susceptible of uniform training and amenable to discipline and orders

Devastation of the Palatinate, 1689.—In 1689 Louis had six armies on foot That in Germany, which had executed the raid of the previous autumn, was not in a position to resist the principal army of the coalition so far from support Louvois therefore

[1]The name "Grand Alliance" is applied to the coalition against Louis XIV begun by the League of Augsburg This coalition not only waged the war dealt with in the present article, but (with only slight modifications and with practically unbroken continuity) the war of the SPANISH SUCCESSION (*q v*) that followed

ordered it to lay waste the Palatinate, and the devastation of the country around Heidelberg, Mannheim, Spires, Oppenheim and Worms was pitilessly and methodically carried into effect in January and February There had been devastations in previous wars, even the high-minded Turenne had used the argument of fire and sword to terrify a population or a prince, while the whole story of the last ten years of the great war had been one of incendiary armies leaving traces of their passage that it took a century to remove But here the devastation was a purely military measure, executed systematically over a given strategic front for no other purpose than to delay the advance of the enemy's army It differed from the method of Turenne or Cromwell in that the sufferers were not those people whom it was the purpose of the war to reduce to submission, but others who had no interest in the quarrel It differed from Wellington's laying waste of Portugal in 1810 in that it was not done for the defence of the Palatinate against a national enemy, but because the Palatinate was where it was The feudal theory that every subject of a prince at war was an armed vassal, and therefore an enemy of the prince's enemy, had in practice been obsolete for two centuries past, by 1690 the organization of war, its causes, its methods and its instruments had passed out of touch with the people at large, and it had become thoroughly understood that the army alone was concerned with the army's business Thus it was that this devastation excited universal reprobation, and that in the words of a modern French writer, the "idea of Germany came to birth in the flames of the Palatinate"

As a military measure even, it was unprofitable, for it became impossible for Marshal Duras, the French commander, to hold out on the east side of the middle Rhine, and he could think of nothing better to do than to go farther south and to ravage Baden and the Breisgau, which was not even a military necessity The grand army of the Allies, coming farther north, was practically unopposed Charles of Lorraine and the elector of Bavaria—lately comrades in the Turkish war (*see* below)—invested Mainz, the elector of Brandenburg, Bonn Mainz, valiantly defended by Nicolas du Blé, marquis d'Uxelles, had to surrender on Sept 8 The governor of Bonn, baron d'Asfeld, not in the least intimidated by the bombardment, held out till the army that had taken Mainz reinforced the elector of Brandenburg, and then, rejecting the hard terms of surrender offered him by the latter, he fell in resisting a last assault on Oct 12 Only 850 men out of his 6,000 were left to surrender on the 16th, and the duke of Lorraine, less truculent than the elector, escorted them safely to Thionville Boufflers, with another of Louis's armies, operated from Luxemburg (captured by the French in 1684 and since held) towards the Rhine, but was unable to relieve either Mainz or Bonn

In the Low Countries the French marshal d'Humières, being in superior force, had obtained special permission to offer battle to the Allies Leaving the garrison of Lille and Tournay to amuse the Spaniards, he hurried from Maubeuge to oppose the Dutch Coming upon their army (commanded by the prince of Waldeck) in position behind the river Heure, with an advanced post in the little walled town of Walcourt, he flung his advanced guard against the bridge and fortifications of this place to clear the way for his deployment beyond the river Heure (Aug 27) After wasting a thousand brave men in this attempt, to whose repulse a British regiment, the Coldstream Guards, contributed, he drew back For a few days the two armies remained face to face, cannonading one another at intervals, but no further fighting occurred Humières returned to the region of the Scheldt fortresses, and Waldeck to Brussels For the others of Louis's six armies the year's campaign passed off quite uneventfully

The War in Ireland, 1689–1691.—Simultaneously with these operations, the Jacobite cause was being fought to an issue in Ireland War began early in 1689 with desultory engagements between the Orangemen of the north and the Irish regular army, most of which the earl of Tyrconnel had induced to declare for King James The northern struggle after a time condensed itself into the defence of Derry and Enniskillen The siege of the former place, begun by James himself and carried on by the French general Rosen, lasted 105 days In marked contrast to the sieges of the continent, this was resisted by the townsmen themselves, under the leadership of the clergyman George Walker. But the relieving force (consisting of two frigates, a supply ship and a force under Major-general Percy Kirke) was dilatory, and it was not until the defenders were in the last extremity that Kirke actually broke through the blockade (July 31) Enniskillen was less closely invested, and its inhabitants, organized by Col. Wolseley and other officers sent by Kirke, actually kept the open field and defeated the Jacobites at Newton Butler (July 31). A few days later the Jacobite army withdrew from the north But it was long before an adequate army could be sent over from England to deal with it. Marshal Schomberg (*q v*), one of the most distinguished soldiers of the time, who had been expelled from the French service as a Huguenot, was indeed sent over in August, but the army he brought, some 10,000 strong, was composed of raw recruits, and when it was assembled in camp at Dundalk to be trained for its work, it was quickly ruined by an epidemic of fever But James failed to take advantage of his opportunity to renew the war in the north, and the relics of Schomberg's army wintered in security, covered by the Enniskillen troops In the spring of 1690, however, more troops, this time experienced regiments from Holland, Denmark and Brandenburg, were sent, and in June, Schomberg in Ireland and Major-general Scravemore in Chester having thoroughly organized and equipped the field army, King William assumed the command himself Five days after his arrival he began his advance from Loughbrickland near Newry, and on July 1 he engaged James's main army on the river Boyne, close to Drogheda Schomberg was killed and William himself wounded, but the Irish army was routed.

No stand was made by the defeated party either in the Dublin or in the Waterford district Lauzun, the commander of the French auxiliary corps in James's army, and Tyrconnel both discountenanced any attempt to defend Limerick, where the Jacobite forces had reassembled, but Patrick Sarsfield (earl of Lucan), as the spokesman of the younger and more ardent of the Irish officers, pleaded for its retention He was left, therefore, to hold Limerick, while Tyrconnel and Lauzun moved northward into Galway Here, as in the north, the quarrel enlisted the active sympathies of the people against the invader, and Sarsfield not only surprised and destroyed the artillery train of William's army, but repulsed every assault made on the walls that Lauzun had said "could be battered down by rotten apples" William gave up the siege on Aug 30 The failure was, however, compensated in a measure by the arrival in Ireland of an expedition under Lord Marlborough, which captured Cork and Kinsale, and next year (1691) the Jacobite cause was finally crushed by William's general Ginckell in the battle of Aughrim in Galway (July 12), in which St Ruth, the French commander, was killed and the Jacobite army dissipated Ginckell, following up his victory, besieged Limerick afresh Tyrconnel died of apoplexy while organizing the defence, and this time the town was invested by sea as well as by land After six weeks' resistance the defenders offered to capitulate, and with the signing of the treaty of Limerick on Oct 1, the Irish war came to an end Sarsfield and the most energetic of King James's supporters retired to France and were there formed into the famous "Irish brigade."

Fleurus, 1690.—The campaign of 1690 on the continent of Europe is marked by two battles, one of which, Luxemburg's victory of Fleurus (*q v*) belongs to the category of the world's great battles The conditions in which it was fought, however, were in closer accord with the general spirit of the war than was the decision that arose out of them Luxemburg had a powerful enemy in Louvois, and he had consequently been allotted only an insignificant part in the first campaign. But after the disasters of 1689 Louis re-arranged the commands on the north-east frontier so as to allow Humières, Luxemburg and Boufflers to combine for united action "I will take care that Louvois plays fair," Louis said to the duke when he gave him his letters of service Though apparently Luxemburg was not authorized to order such a combination himself, as senior officer he would automatically take command if it came about The whole force available was

probably close on 100,000, but not half of these were present at the decisive battle, though Luxemburg certainly practised the utmost "economy of force" as this was understood in those days (*see* also NEERWINDEN). On the remaining theatres of war, the dauphin, assisted by the duc de Lorgè, held the middle Rhine, and Catinat the Alps, while other forces were in Roussillon, etc, as before. Catinat's operations are briefly described below. Those of the others need no description, for though the Allies formed a plan for a grand concentric advance on Paris, the preliminaries to this advance were so numerous and so closely interdependent that on the most favourable estimate the winter would necessarily find the Allied armies many leagues short of Paris In fact, the Rhine offensive collapsed when Charles of Lorraine died (April 17), and the reconquest of his lost duchy ceased to be a direct object of the war.

Luxemburg began operations by drawing in from the Sambre country, where he had hitherto been stationed, to the Scheldt and "eating up" the country between Oudenarde and Ghent in the face of a Spanish army concentrated at the latter place (May 15–June 12) He then left Humières with a containing force in the Scheldt region and hurried back to the Sambre to interpose between the Allied army under Waldeck and the fortress of Dinant which Waldeck was credited with the intention of besieging His march from Tournay to Gerpinnes was counted a model of skill—the *locus classicus* for the maxim that ruled till the advent of Napoleon—"march always in the order in which you encamp, or purpose to encamp, or fight" For four days the army marched across country in close order, covered in all directions by reconnoitring cavalry and advanced, flank and rear guards Under these conditions eleven miles a day was practically forced marching, and on arriving at Jeumont-sur-Sambre the army was given three days' rest Then followed a few leisurely marches in the direction of Charleroi, during which a detachment of Boufflers's army came in, and the cavalry explored the country to the north On news of the enemy's army being at Trazegnies, Luxemburg hurried across a ford of the Sambre above Charleroi, but this proved to be a detachment only, and soon information came in that Waldeck was encamped near Fleurus Luxemburg knew that the enemy was marking time till the troops of Liège and the Brandenburgers from the Rhine were near enough to cooperate in the Dinant enterprise, and he determined to fight a battle at once He moved to Velaine, and thence, on July 1, forward to Fleurus, there winning one of the most brilliant victories in the history of the Royal army But Luxemburg was not allowed to pursue his advantage Thus Waldeck reformed his army in peace at Brussels, where William III of England soon afterwards assumed command of the Allied forces in the Netherlands, and Luxemburg and the other marshals stood fast for the rest of the campaign, being forbidden to advance until Catinat—in Italy—should have won a battle

Staffarda.—In this quarter the armed neutrality of the duke of Savoy had long disquieted the French court In consequence, a French army under Catinat had for some time been maintained on the Alpine frontier, and in the summer of 1690 Louis XIV sent an ultimatum to Victor Amadeus to compel him to take one side or the other actively and openly The result was that Victor Emmanuel threw in his lot with the Allies and obtained help from the Spaniards and Austrians in the Milanese Catinat thereupon advanced into Piedmont, and won, principally by virtue of his own watchfulness and the high efficiency of his troops, the important victory of Staffarda (Aug 18, 1690) This did not, however, enable him to overrun Piedmont, and as the duke was soon reinforced, he had to be content with the methodical conquest of a few frontier districts. On the side of Spain, a small French army under the duc de Noailles passed into Catalonia and there lived at the enemy's expense for the duration of the campaign

In these theatres of war, and on the Rhine, where the disunion of the German princes prevented vigorous action, the following year, 1691, was uneventful But in the Netherlands there were a siege, a war of manoeuvres, and a cavalry combat, each in its way somewhat remarkable The siege was that of Mons, which, like many sieges in the previous wars, was conducted with much pomp by Louis XIV. himself, with Boufflers and Vauban under him. On its surrender (April 8), Louis returned to Versailles and divided his army between Boufflers and Luxemburg, the former of whom departed to the Meuse. There he attempted by bombardment to enforce the surrender of Liége, but had to desist when the elector of Brandenburg threatened Dinant The principal armies on either side faced one another under the command respectively of William III and of Luxemburg The Allies were first concentrated to the south of Namur, and Luxemburg hurried thither, but neither party found any tempting opportunity for battle, and when the cavalry had consumed all the forage available in the district, the two armies edged away gradually towards Flanders. The war of manoeuvre continued, with a slight advantage on Luxemburg's side, until September, when William returned to England, leaving Waldeck in command of the Allied army, with orders to distribute it in winter quarters amongst the garrison towns This gave the momentary opportunity for which Luxemburg had been watching, and at Leuze (Sept 20) he fell upon the cavalry of Waldeck's rearguard and drove it back in disorder with heavy losses until the pursuit was checked by the Allied infantry

In 1692[1] the Rhine campaign was no more decisive than before, although Lorge made a successful raid into Wurttemberg in September and foraged his cavalry in German territory till the approach of winter The Spanish campaign was unimportant, but on the Alpine side the Allies under the duke of Savoy drove back Catinat into Dauphiné, which they ravaged with fire and sword. But the French peasantry were quicker to take arms than the Germans, and, inspired by the local gentry—amongst whom figured the heroine, Philis de la Tour du Pin (1645–1708), daughter of the marquis de la Charce—they beset every road with such success that the small regular army of the invaders was powerless Brought practically to a standstill, the Allies soon consumed the provisions that could be gathered in, and then, fearing lest the snow should close the passes behind them, retreated

Siege of Namur, 1692.—In the Low Countries the campaign as before began with a great siege Louis and Vauban invested Namur on May 26 The place was defended by the prince de Brabançon and Coehoorn (*q v*), Vauban's rival in the science of fortification Luxemburg, with a small army, manoeuvred to cover the siege against William III 's army at Louvain The place fell on June 5,[2] after a very few days of Vauban's "regular" attack, but the citadel held out until the 23rd Then, as before, Louis returned to Versailles, giving injunctions to Luxemburg to "preserve the strong places and the country, while opposing the enemy's enterprises and subsisting the army at his expense" This negative policy, contrary to expectation, led to a hard-fought battle William, as a ruse, announced his intention of retaking Namur, but set his army in motion for Flanders and the sea-coast fortresses held by the French Luxemburg, warned in time, hurried towards the Scheldt, and the two armies were soon face to face again, Luxemburg about Steenkirk, William in front of Hal William then formed the plan of surprising Luxemburg's right wing before it could be supported by the rest of his army, relying chiefly on false information that a detected spy at his headquarters was forced to send, to mislead the French But Luxemburg, although ill in bed when William's advance was reported, shook off his initial apathy, and, enabled by his outpost reports to divine his opponent's plan, met it (Aug 3) by a swift concentration of his army, against which the Allies, whose advance and deployment had been mismanaged, were powerless (*see* STEENKIRK) In this almost accidental battle both sides suffered enormous losses, and neither attempted to bring about, or even to risk, a second resultless trial of strength. Only after the armies had broken up into their winter quarters was an abortive attempt on Charleroi made, by Boufflers, at Louis' orders.

In 1693, the culminating point of the war was reached It began with a winter enterprise that at least indicated the

[1] Louvois died in July 1691

[2] A few days before this the great naval reverse of La Hogue put an end to the projects of invading England hitherto entertained at Versailles

aggressive spirit of the French generals. The grand army in the Netherlands this year numbered 120,000, to oppose whom William III. had only some 40,000 at hand But after reviewing this large force at Gembloux, Louis was driven to break it up, in order to send 30,000 under the dauphin to Germany, where Lorge had captured Heidelberg and seemed able, if reinforced, to overrun south Germany. But the imperial general Prince Louis of Baden took up a position near Heilbronn so strong that the dauphin and Lorge did not venture to attack him Thus King Louis sacrificed a reality to a dream, and for the third time lost the opportunity, for which he always longed, of commanding in chief in a great battle. He himself, to judge by his letter to Monsieur on June 8, regarded his action as a sacrifice of personal dreams to tangible realities. And, before the event falsified predictions, there was much to be said for the course he took, which accorded better with the prevailing system of war than a Fleurus or a Neerwinden. In this system of war the rival armies, as armies, were almost in a state of equilibrium, and more was to be expected from an army dealing with something dissimilar to itself—a fortress or a patch of land or a convoy—than from its collision with another army of equal force

Neerwinden and Marsaglia.—Thus Luxemburg obtained his last and greatest opportunity He was still superior in numbers, but William at Louvain had the advantage of position The former, given more latitude by his master this year, threatened Liége, drew William over to its defence and then advanced to attack him The Allies, however, retired to a strongly entrenched position around Neerwinden in which they were attacked by Luxemburg on July 29 The long and doubtful battle ended in a brilliant victory for Luxemburg, but his exhausted army could not pursue far; William was as unshaken and determined as ever, and the campaign closed, not with a treaty of peace, but with a few manoeuvres which, by inducing William to believe in an attack on Ath, enabled Luxemburg to besiege and capture Charleroi (October).

Neerwinden was not the only French victory of the year Catinat, advancing to the relief of Pinerolo (Pignerol), which the duke of Savoy was besieging, took up a position north of the village of Marsaglia (*q v*) Here on Oct 4 the duke of Savoy attacked him front to front But the greatly superior regimental efficiency of the French, and Catinat's minute attention to details in arraying them, gave the newly created marshal a victory that was a not unworthy pendant to Neerwinden The Piedmontese and their allies lost, it is said, 10,000 killed, wounded and prisoners, as against Catinat's 1,800 But here, too, the results were trifling, and this year of victory is remembered chiefly as the year in which "people perished of want to the accompaniment of *Te Deums*"

In 1694 (late in the season owing to the prevailing distress and famine) Louis opened a fresh campaign in the Netherlands The armies were larger and more ineffective than ever, and William offered no further opportunities to his formidable opponent In September, after inducing William to desist from his intention of besieging Dunkirk by appearing on his flank with a mass of cavalry, which had ridden from the Meuse, 100m , in four days, Luxemburg gave up his command. He died on Jan 4, and with him the tradition of the Condé school of warfare disappeared from Europe In Catalonia de Noailles gained some success

In 1695 William found Marshal Villeroi a far less formidable opponent than Luxemburg had been, and easily succeeded in keeping him in Flanders while a corps of the Allies invested Namur Coehoorn directed the siege-works, and, as in 1692, but with sides reversed, the defenders were progressively dislodged, the citadel itself being stormed by the "British grenadiers," as the song commemorates, on Aug 30

By 1696 necessity had compelled Louis to renounce his vague and indefinite offensive policy, and he now frankly restricted his efforts to the maintenance of what he had won in the preceding campaigns In this new policy he met with much success His marshals held their various spheres of operations without allowing the Allies to inflict any material injury, and also preserved French soil from the burden of their own maintenance In this, as before, they were powerfully assisted by the disunion and divided counsels of their heterogeneous enemies. In Piedmont, Catinat crowned his work by making peace and alliance with the duke of Savoy. The last campaign was in 1697. Catinat and Vauban besieged Ath. This siege was perhaps the most regular and methodical of the great engineer's career. It lasted 23 days and cost the assailants only 50 men King William did not stir from his entrenched position at Brussels Lastly, in Aug 1697, Vendôme, Noailles' successor, captured Barcelona. The peace of Ryswijk, signed on Oct. 30, closed this war by practically restoring the *status quo ante;* but neither the ambitions of Louis nor the Grand Alliance that opposed them ceased to have force, and three years later the struggle began anew (*see* SPANISH SUCCESSION, WAR OF THE).

Austro-Turkish Wars, 1682–99.—Concurrently with these campaigns, the emperor had been engaged in a much more serious war on his eastern marches against the old enemy, the Turks This war arose in 1682 out of internal disturbances in Hungary. The campaign of the following year is memorable for all time as the last great wave of Turkish invasion Mohammed IV advanced from Belgrade in May, with 200,000 men, drove back the small imperial army of Prince Charles of Lorraine, and early in July invested Vienna itself. The two months' defence of Vienna and the brilliant victory of the relieving army led by John Sobieski, king of Poland, and Prince Charles on Sept. 12, 1683, were events which, besides their intrinsic importance, possess the romantic interest of an old knightly crusade against the heathen But the course of the war, after the tide of invasion had ebbed, differed little from the wars of contemporary western Europe Turkey figured rather as a factor in the balance of power than as the "infidel," and although the battles and sieges in Hungary were characterized by the bitter personal hostility of Christian to Turk which had no counterpart in the West, the war as a whole was as methodical and tedious as any Rhine or Low Countries campaign

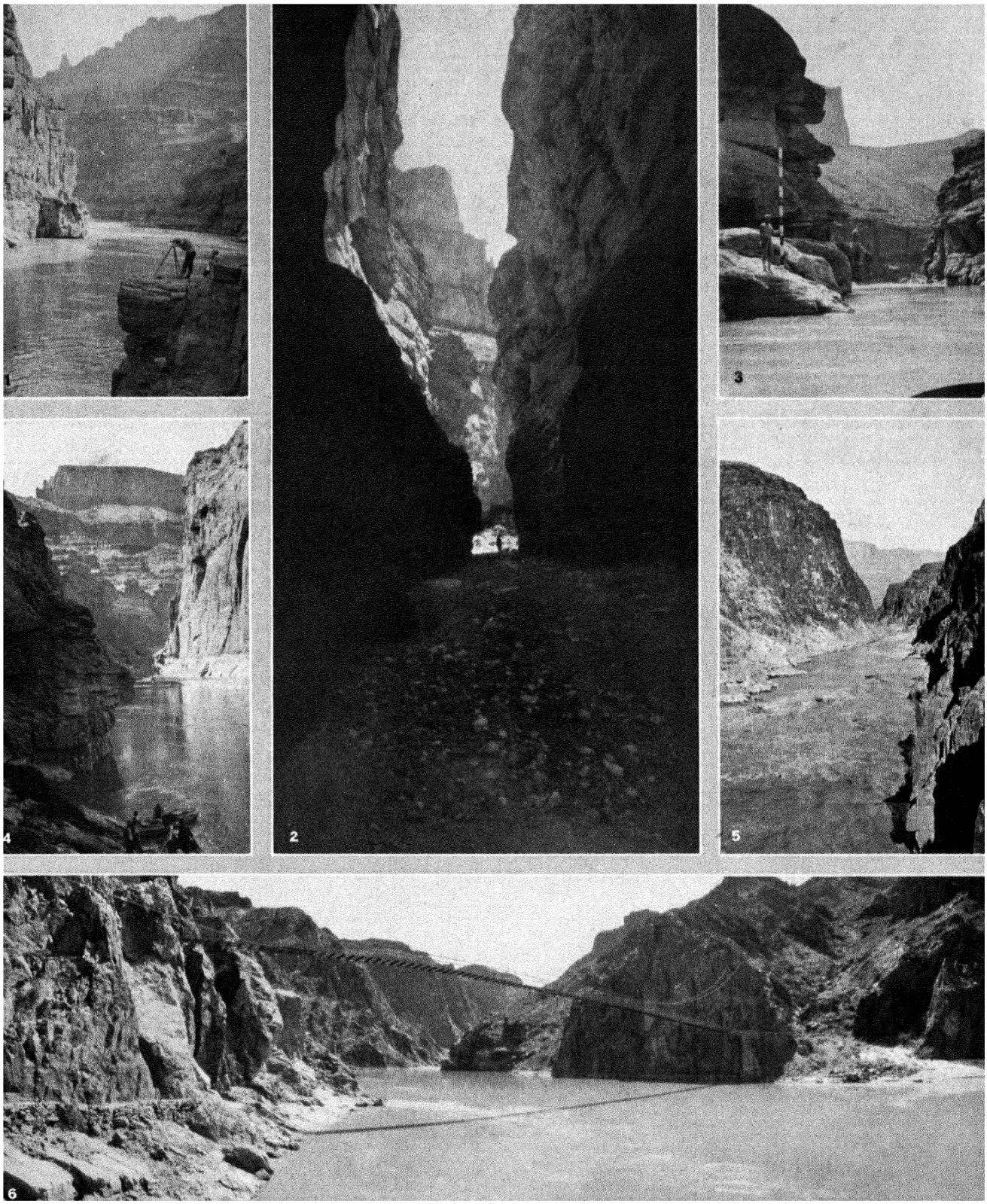
After gradually advancing his position in 1684–85, in 1686 Charles, assisted by the elector Max Emanuel of Bavaria, besieged and stormed Budapest (Sept 2) In 1687 they followed up their success by a great victory at Mohacz (Aug 12). In 1688 the Austrians advanced still further, took Belgrade and entered Bosnia Next year, in spite of the outbreak of a general European war, the margrave Louis of Baden, who afterward became one of the most celebrated of the methodical generals of the day, managed to win a battle at Nisch (Sept 24), to capture Widin (Oct 14) and to advance to the Balkans, but in 1690, more troops having to be withdrawn for the European war, the imperialist generals lost Nisch, Widin and Belgrade one after the other The new tide, however, was stopped, and several years of desultory war followed, until in 1697 the young Prince Eugene was appointed to command the imperialists and won a great and decisive victory at Zenta on the Theiss (Sept. 11) This induced a last general advance of the Germans eastward, which was definitely successful and brought about the peace of Carlowitz (Jan 1699)

(C. F. A.)

NAVAL OPERATIONS

The naval war opened with desultory fighting early in 1688, but nothing of importance happened till after William of Orange's successful expedition to England in November, which gave him strategic control of the English fleet and the whole anti-French alliance

In March 1689, Louis XIV. sent the exiled King James II. of England over to Ireland, to conduct guerilla operations against the Protestant forces of the new government. Admiral Arthur Herbert was unable to put to sea in time to stop him, and also failed to intercept reinforcements of 6,000 troops protected by a French fleet under Châteaurenault. He found them, however, in Bantry Bay on May 1, 1689, but in the action which followed he made little impression, chiefly owing to the reaction of internal politics on the morale and administration of his fleet. The French, however, did not press the Irish campaign; and after the relief of Londonderry on June 28 by Leake's ships, James' position deteriorated and English troops were able to cross from Chester unopposed. Early in 1690 Louis XIV ordered the Toulon fleet



BY COURTESY OF THE U.S. GEOLOGICAL SURVEY; PHOTOGRAPHS, (1, 3, 4) E. C. KOLB, (2, 6) E. C. LARUE, (5) LEWIS R. FREEMAN

THE GRAND CANYON OF THE COLORADO RIVER

1. Topographic engineer at work below Boulder Rapid in Marble Gorge
2. Fern Glen Canyon as it enters the Grand Canyon below Havasu Creek
3. A rodman at Sheer Wall Rapid
4. Marble Gorge, showing sheer walls 2,000 ft. high
5. Looking down Separation Rapid
6. Bright Angel Suspension Bridge in the Grand Canyon

to Brest, where it arrived after eluding an Anglo-Dutch squadron. The whole French fleet of 70 of the line then came up Channel under the Comte de Tourville and met the main Anglo-Dutch fleet off the Isle of Wight under Herbert, now Lord Torrington, who had only 55 of the line Torrington at once retired, not wishing to engage unless very favourably placed, and all the time seeking an opportunity to slip round to westward of the French and so cut them off from home However, in deference to the wishes of the Council of Regency, he forced an action on June 30 off Beachy Head and fought for many hours against his superior and well-ordered enemy, but was prevented from obtaining any definite successes by the impetuous conduct of his Dutch allies Meanwhile, with naval assistance, William III completely routed the Franco-Irish forces in the Boyne campaign

During 1691 Tourville contented himself with operations against English and Dutch commerce, and it was not till 1692 that he was ordered to attack the English fleet with the idea of covering the transport of an invading army across the Channel This time he had only 44 of the line against the Anglo-Dutch fleet of 99 under Admiral Edward Russell, but on finding them off Cape Barfleur on May 19, he engaged without the least hesitation Fickle winds and occasional fog assisted him, and after fighting for seven hours, without losing a ship, he began to withdraw. The allies pursued and his fleet was completely dispersed and routed, 12 of the line, which had taken refuge in the bay of La Hogue, being destroyed on the nights of May 23 and 24 by a light squadron under Admiral Rooke (*see* LA HOGUE, BATTLE OF, for account of the Barfleur campaign)

The French now entirely abandoned fleet operations, and again turned their attention to commerce destruction In this they were very successful, for the allies failed to exercise their undoubted command of the sea, and in June 1693 the outward-bound Smyrna convoy of some 400 ships, under a weak escort, was attacked by Tourville off Lagos, and 80 ships were lost Raids were, therefore, attempted on French bases, of which those on Brest in 1694 and Dunkirk in 1695 were the most important, but in most cases the French were well prepared and the attempts failed. French stations in the West Indies, Nova Scotia and on the West African coast were also attacked from 1690–93

In the concluding stages of the war, William III initiated a concentration of Anglo-Dutch forces in the Mediterranean under Russell, who in 1694 drove the French from Barcelona, Spain having joined the allies William now ordered Russell to winter his fleet at Cadiz, and though in the spring of 1695 it failed to attack Toulon owing to the defection of Savoy, French Mediterranean trade was temporarily ruined Rooke was now left in command and again wintered at Cadiz, but early in 1696, Louis XIV. feinted with another invasion scheme and got Châteaurenault's Toulon fleet safely into Brest All English forces were therefore concentrated in the Channel, and Rooke was recalled, thus ending the service of the new Mediterranean fleet, as the war reached its close

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(G A R C, W C B T)

GRAND CANARY (Gran Canaria), an island forming part of the Spanish archipelago of the Canary islands (*q v*) Pop. (1900) 127,471; area, 523 sq m Grand Canary, the most fertile island of the group, is nearly circular in shape, with a diameter of 24 m. and a circumference of 75 m The highest peak, Los Pexos, is 6,400 ft Large tracts are covered with native pine (*P canariensis*). Las Palmas (pop 44,517), the capital, is described in a separate article

GRAND CANYON, THE, an immense gorge cut by the Colorado river into the high plateau in the northern part of Arizona, U S A It is a broad, intricately sculptured chasm that contains between its outer walls a multitude of imposing peaks and buttes, of canyons within a canyon and of complex ramifying gulches and ravines It ranges in width from 5 to 15 m, its greatest depths lie more than a mile below its rim and it extends in a winding course from the head of Marble Gorge, near the northern boundary of Arizona, to Grand Wash Cliffs, near the Nevada line, a distance of about 280 miles. Its most impressively beautiful part, 105 m long, lies within the Grand Canyon National Park.

In its general colour the canyon is a dull red that glows when lit by the sun, but it displays the parallel edges of beds of many-coloured rocks, whose varied tints give it wonderful diversity—pale buff and grey, delicate green and pink, and, in its depths, chocolate-brown, slate-grey and other sombre hues Its distances are often suffused with a transparent blue-purple haze that contrasts with the deep green of the pine trees on its rim and the intense blue of the sky

The first white man to behold the Grand Canyon was García López de Cárdenas, who had been sent from Zuñi, New Mexico, to find a river far to the west, the existence of which had been learned from the natives In 1854 Lieut A W Whipple followed the lower course of the Colorado river as far up as the mouth of Diamond creek In 1857 Lieut J. C. Ives travelled through the gorge of Diamond creek and eastward to Havasu canyon, the San Francisco mountains, the Little Colorado and the country of the Hopi Indians

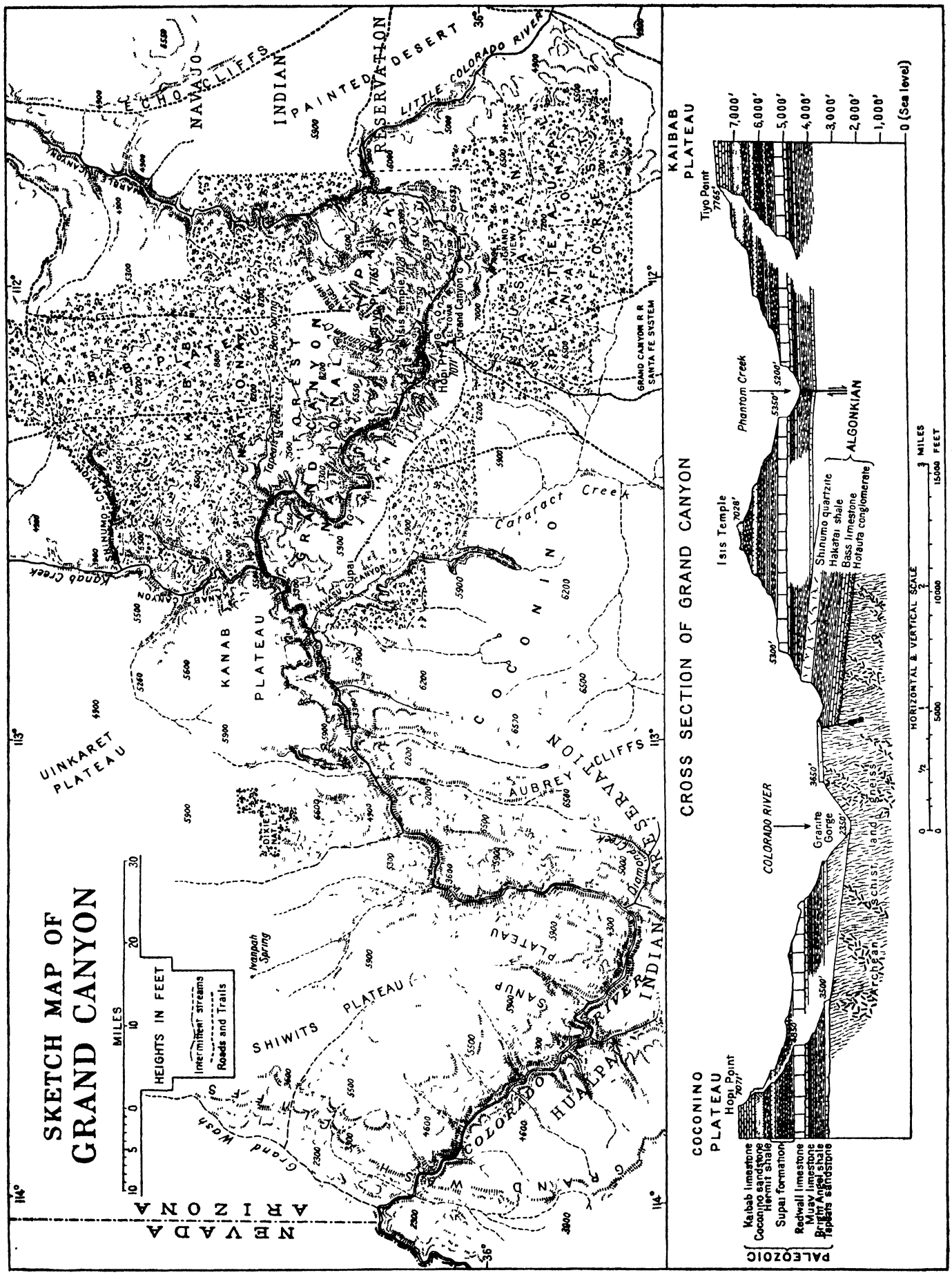
The first graphic and geological description of the Grand Canyon was given by Prof John S Newberry It remained for Maj. John W Powell to make the first voyage through the depths of the canyon He embarked in May 1869 at the bridge of the Union Pacific railroad over the Green river, in Wyoming, with nine companions, in four small rowboats After a perilous trip through turbulent rapids, covering three months, during which four of his men deserted, he emerged safely from the lower end of the canyon He put an end to many myths, including one about an underground "lost course" of the river

In 1870, under the auspices of the Smithsonian Institution, Powell set out to explore the Colorado more thoroughly For several years he carried on geographic, geologic and ethnologic studies in the region, and supervised the preparation of the first map of it In 1923 a Government expedition led by Col C H Birdseye, descended the Colorado in boats from Lee's Ferry to the mouth of the canyon to find sites for dams and to complete the survey of the profile of the river Accurate maps have now been prepared

The Grand Canyon is cut in a plateau that stands 5,000 to 9,000 ft above sea-level, a region of mesas and buttes diversified by lava flows, masses of intrusive rocks and hills composed of volcanic ash The plateau slopes in general south-westward, but the continuity of its surface is broken by terraces that represent either folds or faults in the beds of rock Only its higher surfaces are covered with forests, but even these are traversed by no perennial streams, and the rocks are generally bare of soil or of vegetation In the bottom of the canyon the heat is intense in summer and frost is rare in winter Here is a sparse growth of desert bushes and cactus, of Spanish bayonet and of agave or "the century plant," but only along the courses of a few rivulets Parts of the upper terraces bear clumps of juniper and gnarled piñon The Coconino plateau, which borders the canyon on the south at altitudes ranging from 6,000 to 7,000 ft above sea-level, receives enough precipitation in snow and showers to sustain an open forest of juniper and piñon, and on its higher parts there are groves of tall, straight yellow pines The Kaibab plateau, which stands on the north side of the canyon, at altitudes ranging from 8,000 to 9,000 ft above sea-level, has a mountain climate, snowy and severe in winter, agreeably cool in summer It bears majestic forests of yellow pine, with which is mixed some Englemann spruce Scrub oak and cottonwood grow in the bottoms of the shallow dry washes on the plateau and clumps of aspen line the grassy glades and natural "parks" in the valleys, where thousands of deer and, outside of the national park, herds of cattle find grazing ground

The Grand Canyon was formed by the ceaseless flow of the silt-laden Colorado river, by the storm waters that occasionally fall into the canyon, and by "weathering" processes The most effective of these agencies has been the river itself

Although the Colorado river has been the principal agent that


SKETCH MAP OF GRAND CANYON
MILES
HEIGHTS IN FEET
Intermittent streams
Roads and Trails
NEVADA
ARIZONA
UINKARET PLATEAU
KANAB PLATEAU
KAIBAB PLATEAU
NAVAJO INDIAN RESERVATION
ECHO CLIFFS
PAINTED DESERT
LITTLE COLORADO RIVER
GRAND CANYON NATIONAL FOREST
GRAND CANYON NATIONAL PARK
COCONINO
AUBREY CLIFFS
SHIWITS PLATEAU
SANUP PLATEAU
HUALPAI INDIAN RESERVATION
COLORADO RIVER
Grand Wash
Cataract Creek
Kanab Creek
Ivanpah Spring
Supai
Isis Temple
Hopi Point
Grand Canyon
GRAND CANYON R R SANTA FE SYSTEM
CROSS SECTION OF GRAND CANYON
KAIBAB PLATEAU
Tiyo Point
Phantom Creek
ALGONKIAN
Shinumo quartzite
Hakatai shale
Bass limestone
Hotauta conglomerate
Granite Gorge
Archean Schist and gneiss
COCONINO PLATEAU
Hopi Point
PALEOZOIC
Kaibab limestone
Coconino sandstone
Hermit shale
Supai formation
Redwall limestone
Muav limestone
Bright Angel shale
Tapeats sandstone
HORIZONTAL & VERTICAL SCALE
MILES
FEET
0 (Sea level)

formed the Grand Canyon, it has not directly carved the canyon to its full width; neither has it cut the embayments that scallop the rims of the plateaux It has cut its way vertically downward, maintaining its course almost without change Meanwhile the rocky walls of the canyon have been exposed to destruction by the action of rain and rill, of frost and landslide, of wind and chemical action.

The south rim of the canyon is nearer to the river than the north rim, and the erosion on the north side of the river is much greater than on the south side. This difference is due to several causes, which, named in the inverse order of their effectiveness, are as follow: (1) As the land in the plateau region slopes southwestward, at a right angle to the general course of the river, the streams of the Kaibab plateau, on the north, drain into the canyon, whereas those of the Coconino plateau, on the south, drain away from it; (2) the beds of rock in the region also slope toward the south-west, so that the underground water coming from the north, beneath the Kaibab plateau, flows into the canyon, whereas that going southward, beneath the Coconino plateau, flows away from it; (3) the north rim of the canyon is much higher than the south rim, and the streams that flow down it and the rainwater that falls on it make a longer descent and do correspondingly more erosional work; (4) fractures and faults by which the beds of rock have been so greatly broken that pieces of them have been easily removed by erosion are more numerous on the north side than on the south side. These fractures and faults have determined the course of some of the streams in the canyon. The intricate sculpture of the broad north side of the canyon, which is its most spectacular part, was thus determined in part by the network of fractures and faults in its rocks.

While the river has been cutting its way downward the land in the plateau region has been gradually rising, and both the uplift of the land and the carving of the canyon are events of recent geologic history The Grand Canyon is a relatively new geologic feature, even though the work of making it has been carried on for more than a million years Although the canyon is new, the beds of rock exposed in it are old, they tell a story that began many millions of years ago The geologic formations in the canyon are sedimentary—that is, they were laid down in water—but the Coconino sandstone, which underlies the Kaibab limestone, the uppermost formation exposed in the walls of the canyon, appears to be in part, at least, a deposit of wind-blown sand, a sort of fossil desert. At some places volcanic rock is seen The rock that lies below the sedimentary series is the Vishnu schist, which is greatly squeezed and crumpled and into which were injected, at some places, molten masses of igneous rock that formed dikes and sills The red Supai formation, which underlies the Coconino sandstone and which forms the wall of the part of the canyon in which the Supai Indians live, imparts the colouring matter of its shaly beds to the underlying Redwall limestone, a hard rock which is in itself pale blue and which forms steep cliffs that can be easily traced through the canyon At the foot of the Redwall begin the slopes of the light-buff Muav limestone and the greenish Bright Angel shale, which lead down for 700 ft to the broadest and lowest terrace of all, the Tonto platform

The Grand Canyon National Park, which was created by the U S Congress in 1919, embraces 56 sq m of the canyon The most prominent of the rock masses within the canyon have been called "temples," because of their resemblance to Oriental temples of worship—the pagodas of Asia These temples are carved from blocks of essentially horizontal strata, and some of them rise more than a mile above the level of the river and carry at their tops remnants of the bed that forms the surface of the plateau The great chasm contains towers, buttes, terraces, platforms, amphitheatres and other striking features to which distinctive names have been given Some of the formations contain traces of ancient life—impressions of seaweeds and of other plants long extinct, the remains of corals and marine shells and of extinct forms of fishes, as well as tracks of animals The Grand Canyon is therefore not only a remarkable example of earth sculpture produced by erosion but is of immense scientific interest because it discloses a great perspective of the geologic past.

By auto the Grand Canyon National Park may be most conveniently reached via the National Old Trails road, an ocean to ocean highway passing about 70 m. south of the Park From Maine, Arizona, a branch, known as the Grand Canyon highway, leads directly to the south rim of the canyon The south rim may also be reached by rail on a branch line of the Santa Fe system leading from the transcontinental line at Williams, Arizona The north rim of the canyon is accessible through Utah by rather strenuous, but intensely interesting, auto stage trips from the Union Pacific railway at Lund (285 m) or from the Denver and Rio Grande Western system at Marysville (250 m) A pack horse route down the Bright Angel trail across the river on a recently built suspension bridge and up Bright Angel canyon connects the southern and northern rims of the canyon

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GRAND-DUKE, a title borne by princes ranking between king and duke (Fr *grand-duc*, Ital *granduca*, Ger *Gross-herzog*). The dignity was first bestowed in 1567 by Pope Pius V on Duke Cosimo I of Florence, his son Francis obtaining the emperor's confirmation in 1576, and the predicate "Royal Highness" was added in 1699 In 1806 Napoleon created his brother-in-law Joachim Murat, grand-duke of Berg, and in the same year the title was assumed by the landgrave of Hesse-Darmstadt, the elector of Baden, and the new ruler of the secularized bishopric of Wurzburg (formerly Ferdinand III, grand-duke of Tuscany) on joining the Confederation of the Rhine According to the decision of the Congress of Vienna, the title was borne by the sovereigns of Luxemburg, Saxe-Weimar (grand-duke of Saxony), Mecklenburg-Schwerin, Mecklenburg-Strelitz, and Oldenburg (since 1829), as well as by those of Hesse-Darmstadt and Baden The emperor of Austria included among his titles those of grand-duke of Cracow and Tuscany, and the king of Prussia those of grand-duke of the Lower Rhine and Posen The title is also retained by the dispossessed Habsburg-Lorraine dynasty of Tuscany

Grand-duke is also the conventional English equivalent of the Russian *velikiy knyaz*, more properly "grand-prince" (Ger Grossfurst), at one time the title of the rulers of Russia, who, as the eldest born of the house of Rurik, exercised overlordship over the *udyelniye knyazi* or local princes On the partition of the inheritance of Rurik, the eldest of each branch assumed the title of grand-prince Until 1886 this title grand-duke or grand-duchess, with the style "Imperial Highness," was borne by all descendants of the imperial house It was then confined to the sons and daughters, brothers and sisters and male grandchildren of the emperor The other members of the imperial house bore the title

of prince (*knyaz*) and princess (*knyaginya* if married, *knyazhna* if unmarried) with the style of "Highness" The emperor of Austria, as king of Hungary, also bore this title as "grand-duke" of Transylvania, which was erected into a "grand-principedom" (Grossfurstentum) in 1765 by Maria Theresa

GRANDEE, a title of honour borne by the highest class of the Spanish nobility (Span *Grande*). It would appear to have been originally assumed by the most important nobles to distinguish them from the mass of the *ricos hombres,* or great barons of the realm It was thus, as Selden points out, not a general term denoting a class, but "an additional dignity not only to all dukes, but to some marquesses and condes also" (*Titles of Honor,* ed 1672, p 478) It formerly implied certain privileges; notably that of sitting covered in the royal presence Until the time of Ferdinand and Isabella, when the power of the territorial nobles was broken, the grandees had also certain more important rights, *e g*, freedom from taxation, immunity from arrest save at the king's express command, and even—in certain cases—the right to renounce their allegiance and make war on the king Their number and privileges were further restricted by Charles I (the emperor Charles V), who reserved to the crown the right to bestow the title The grandees of Spain were further divided into three classes (1) those who spoke to the king and received his reply with their heads covered, (2) those who addressed him uncovered, but put on their hats to hear his answer, (3) those who awaited the permission of the king before covering themselves All grandees were addressed by the king as "my cousin" (*mi primo*), whereas ordinary nobles were only qualified as "my kinsman" (*mi pariente*) The title of "grandee," abolished under King Joseph Bonaparte, was revived in 1834, when, by the *Estatudo real,* grandees were given precedence in the Chamber of Peers The designation is now, however, purely titular, and implies neither privilege nor power.

GRAND FORKS, a town in the Boundary district of British Columbia, at the junction of the north and south forks of the Kettle river, 2 m N of the international boundary, on the Canadian Pacific, Canadian National, and Kettle Valley railways Pop (1921) 1,469 It is in a good agricultural district, but owes its importance largely to works for smelting gold, copper and silver ores from the Boundary country It is a trade centre, with sawmills, wood and iron works, machine shops, etc

GRAND FORKS, a city of North Dakota, U S A , on the Red river, opposite the mouth of the Red Lake river, 80m N of Fargo, the second city of the State in size, and the county seat of Grand Forks county It is on Federal highways 2 and 81, is served by the Great Northern and the Northern Pacific railways, and has an airport. The population in 1925 (State census) was 15,168 About 20% are of foreign birth, chiefly Scandinavian and Canadian

Grand Forks is in the heart of the spring wheat country, where modern methods of cultivation are adding large acreages of other crops (notably sugar beets) and increasing the livestock and poultry. The All-American Turkey Show is an annual event, and the State Fair and the State Peony Show are also held here There are silver fox farms in the vicinity The city has a large wholesale and retail trade Bank debits to individual accounts amounted in 1926 to $107,714,000

The large terminal elevator and flour mill built (1922) and operated by the State are located here There are other large flour mills, packing-houses, brick yards, and sundry other industries The factory output in 1925 was valued at $4,257,944 Since then a large beet-sugar factory has been erected near the city The Great Northern has under construction (1928) new machine shops and extensions of its freight terminal

At the Bankside (open-air) theatre, founded by Frederick H Koch, amateur dramatic productions are given in a spring festival which has attained national reputation On the outskirts of the city is the University of North Dakota, founded by the Territorial Assembly in 1883 and opened in 1884 The enrolment is about 2,400. Connected with it are the State geological survey, the State public health laboratories, and a special meteorological station of the United States weather bureau. The university maintains a sub-station of the School of Mines at Hebron, and a biological station on the shores of Devils lake. Affiliated with the university is Wesley college, and a Lutheran Bible college is situated here.

A trading post of the North-West Fur Company was established on the site of Grand Forks in 1801 by John Cameron (d 1804), and later it passed to the Hudson's Bay Company. Permanent settlement began in 1871, and the city was chartered in 1881, the year when the Northern Pacific reached it In 1900 the population was 7,652; in 1910, 12,478, in 1920, 14,010

GRAND HAVEN, city of Michigan, U S A , on Lake Michigan, at mouth of the Grand river, about opposite Milwaukee; port of entry and the county seat of Ottawa county. It is on Federal highways 16 and 31, and is served by the Grand Trunk and the Pere Marquette railways, by lake steamers, and by interurban motorbus and trolley lines The population was 7,205 in 1920 (82% native white) and was estimated locally at 10,000 in 1928 The resident population is more than doubled in summer by visitors to the city and to other resorts near by, especially the village of Spring Lake, 1m north Grand Haven ships large quantities of celery, and over 1,000,000 crates of fruit annually to the Chicago market It has over 30 manufacturing plants, making almost as many different products, and a large fishing industry The traffic of the port (largely car-ferry traffic) amounted in 1925 to 953,658 tons, valued at $209,780,700 A trading post was established here about 1821 by the American Fur company Permanent settlement began in 1834, and a town was laid out in 1836 The city was chartered in 1867 Since 1916 it has had a city-manager form of government

GRANDIER, URBAIN (1590–1634), priest of Loudun (Vienne, France), was accused of witchcraft in 1632, found guilty and burnt alive on Aug 18, 1634. The accusation was due to a prevailing hysteria and the condemnation obtained through the influence of Cardinal Richelieu

See G Legué, *Urbain Grandier et les possédées de Loudun* (1880).

GRAND ISLAND, a city of Nebraska, U S A , on the Platte river and the Lincoln highway, at an altitude of 1,861ft , 85m W of Lincoln, the county-seat of Hall county It is served by the Burlington, the St Joseph and Grand Island, and the Union Pacific railways, and has an airport The population was 13,947 in 1920 (87% native white), and was estimated locally at 16,000 in 1928 The city lies on a slope rising from the broad bottomlands, opposite a narrow strip of land 42m long between two channels of the Platte river ("la grande île" of the early French-Canadian trappers) Sheep-feeding and the raising of sugar-beets are specialties of the region The city is an important horse and mule market and has large stockyards The output of its factories in 1925 was valued at $4,162,717. Over 10,000,000lb of beet-sugar are manufactured annually, and there are large packing plants, flour mills, vegetable canneries and creameries The Union Pacific maintains extensive shops here Grand Island is the seat of the State soldiers' and sailors' home (established 1888) and of Grand Island college (Baptist, established 1892). Settlement around here was begun in 1857 The city was laid out when the Union Pacific reached it in 1866, and was incorporated in 1873 It is in the midst of what was the great buffalo range. Buffaloes were still numerous in this region as late as 1866

GRAND JUNCTION, a city of western Colorado, U S A , 4,583ft above sea-level, at the confluence of the Gunnison river with the Colorado (formerly called the Grand in this part of its course); the county-seat of Mesa county It is on Federal highways 40S and 50; is served by the Denver and Rio Grande Western and the Grand River Valley railways; and has a municipal airport The population was 3,503 in 1900; 8,665 in 1920 (91% native white); and was estimated locally at 13,000 in 1928 It is the metropolis of an extensive irrigated region, and the industrial and jobbing centre of an area of 50,000 sq miles The orchards and the city's shade trees give the effect of an oasis From 30 to 50m north-east and east of the city are Battlement Mesa and the Grand Mesa, two vast tablelands about 10,000ft above sea-level, constituting together the Grand Mesa National forest; 11m. W are the fantastic red monoliths of the Colorado National

Monument Grand Junction was settled about 1881, and was incorporated in 1882

GRAND'MERE, an industrial town in Champlain county, Quebec, Canada, on the St Maurice river, 21 m N of the Three Rivers, and on the Canadian National and Canadian Pacific railways It is situated in a good farming district with excellent water-power facilities, which operate pulp and paper mills Its industries also include the manufacture of stoves Population (1921), 7,631.

GRANDMONTINES, a religious order founded by St Stephen of Thiers in Auvergne towards the end of the 11th century St Stephen was so impressed by the lives of the hermits whom he saw in Calabria that he desired to introduce the same manner of life into his native country A few disciples gathered round him, and a community was formed The rule was not reduced to writing until after Stephen's death, 1124 The life was eremitical and very severe in regard to silence, diet and bodily austerities About 1150 the hermits, being compelled to leave Muret, settled in the neighbouring desert of Grandmont, whence the order derived its name Louis VII founded a house at Vincennes near Paris, and the order had a great vogue in France, as many as sixty houses being established by 1170, but it seems never to have found favour out of France Later centuries witnessed mitigations and reforms in the life, and at last the order came to an end just before the French Revolution

See art "Grandmont, order of" in the *Catholic Encyclopaedia*, Max Heimbucher, *Orden und Kongregationen* (1896), 1 § 31, and the art in Wetzer and Welte, *Kirchenlexicon* (ed 2), and in Herzog-Hauck, *Realencyklopadie*

GRAND NATIONAL: *see* HORSE RACING

GRAND PRIX: *see* HORSE RACING

GRAND RAPIDS, a city of western Michigan, 30m from Lake Michigan, a port of entry, the county seat of Kent county, the second city of the State in size, and "the furniture capital of America" It is on federal highways 16 and 131, has a county airport; and is served by the Grand Trunk, the Michigan Central, the New York Central, the Pennsylvania, and the Pere Marquette railways, and by interurban motor-coach and truck lines The population was 137,634 in 1920 (20 6% foreign-born white) and was estimated locally at 176,000 in 1928 Nearly half of the foreign born (11,422 in 1920) are from Holland, the largest colony of Dutch in the country The city has an area of 22 5 square miles The valley here is about 2m wide, with a range of hills on either side, about equally distant from the river, which falls 18ft within a mile A comprehensive city plan, adopted in 1922, is in process of development A zoning ordinance became operative in 1923 Progress has already been made (1928) in eliminating grade crossings by viaducts and depressed roadways (to be completed by 1937), widening major streets, removing "dead ends" and "jog corners" which seriously obstruct the flow of traffic, re-routing the transit lines, and revising the layout of the north-eastern hill section so as to facilitate its utilization as a residential district, and plans are under way for broad esplanades along both banks of the river and a system of large parks and pleasure drives encircling the city The public parks and playgrounds cover 902 acres (1928), and are so distributed that there is one within 15 minutes' walk of every home in the city, and a supervised playground within half a mile of every child The public school system includes a junior college, and special classes for the deaf, for cripples, for the backward, and for other children who need exceptional consideration Grand Rapids is second only to Des Moines (among the large cities of the country) in the percentage of home ownership It has a high proportion of children in school, a small amount of child labour; a low percentage of illiteracy, a low general death rate, and a low infant mortality. Since 1916 it has had a commission-manager form of government The assessed valuation of property in 1927 was $255,274,746. On the outskirts of the city, overlooking the river, is the Michigan Soldiers' Home

The furniture industry, dating from 1859, is still the centre of the city's economic life, though the manufacture of aeroplanes and other essentials during the World War has resulted in a greater diversification of industries than prevailed formerly The aggregate factory output in 1925 was valued at $145,705,502, of which furniture accounted for $58,547,551, and this was nearly 7% of the value of all the furniture made in the United States Accessory industries (such as brass foundries, veneer plants, varnish works and mirror factories) are an important group; and Grand Rapids has the largest factories in the country making carpet-sweepers, school seats, church pews, opera chairs, showcases, refrigerators, gypsum products, folding paper boxes and fly-paper A furniture market (attended in recent years by 2,500–3,000 buyers) has been held semi-annually in Grand Rapids since 1878 Grand Rapids is in the heart of the Michigan fruit belt, and truck-farming is carried on extensively even within the city limits The Dutch are engaged largely in market-gardening and in raising tulip and gladiolus bulbs The city has a large wholesale and jobbing trade, amounting to $75,000,000 annually. Bank clearings in 1926 totalled $1,039,941,000

There was a large Ottawa Indian village on the site of Grand Rapids, and here a Baptist mission was established in 1824, and a trading post of the Hudson's Bay company in 1826 (by Louis Campau) The first sawmill was built in 1833, and in 1837 the village was incorporated In 1850, when the population was 2,686, it was chartered as a city By 1860 it had grown to 8,085, and in the next 30 years the population practically doubled in each decade Between 1890 and 1920 the increases per decade were successively 45%, 29% and 22% Annexations of territory gradually widened the corporate area until it is now 22 5 square miles The prosperity of the early days was based on lumbering When the great stands of soft woods were nearing depletion, attention turned to utilizing the maple, oak, birch, walnut and other hard woods that were left, and the steady industrial growth since the introduction of furniture-making in 1859 has been a natural development The native supply of hardwood is completely exhausted, and for many years the furniture factories have imported much of their lumber from Cuba, Central and South America, and other countries Between 1900 and 1927 the assessed valuation of property increased 490%, bank clearings 559%; post-office receipts 623%; and the building permits of the 28 years represent an aggregate value of $120,000,000

GRANDSON (Ger *Grandsee*), a town in the Swiss canton of Vaud, near the south-western end of the Lake of Neuchâtel, and by rail 20 m S W of Neuchâtel and 3 m N of Yverdon Its population in 1920 was 1,605, mainly French-speaking and Protestant The old church (once of a Benedictine monastery) contains Roman columns, etc, from Avenches and Yverdon It has now a tobacco factory Its lords were vassals of Savoy, till in 1475 the castle was taken by the Swiss at the beginning of their war with Charles the Bold, duke of Burgundy, whose ally was the duchess of Savoy It was retaken by Charles in Feb 1476, and the garrison put to death The Swiss avenged this deed in a famous battle (March 2, 1476), defeating Charles with great loss The battle was between Concise and Corcelles, at a place marked by several columns (*See* SWISS WARS) Grandson was till 1798 ruled in common by Berne and Fribourg, and then was given to the canton du Léman, which in 1803 became that of Vaud

GRANET, FRANÇOIS MARIUS (1775–1849), French painter, was born at Aix in Provence, on Dec 17, 1775, his father was a builder The boy's strong desires led his parents to place him in a school of art directed by Constantin, a landscape painter In 1793 Granet followed the volunteers of Aix to the siege of Toulon, at the close of which he obtained employment as a decorator in the arsenal Whilst at Aix he made the acquaintance of the young comte de Forbin, and upon his invitation Granet, in the year 1797, went to Paris De Forbin was one of the pupils of David, and Granet entered the same studio Later he got possession of a cell in the convent of Capuchins, which, having served for a manufactory of assignats during the Revolution, was afterwards inhabited almost exclusively by artists In the changing lights and shadows of the corridors of the Capuchins, Granet found the materials for the one subject to the painting of which he devoted his life In 1802 he left for Rome, where he remained until 1819, when he returned to Paris, bringing with

him besides various other works one of 14 repetitions of his celebrated Choeur des Capucins, executed in 1811 "Stella painting a Madonna on his Prison Wall," 1810 (Leuchtenberg collection); "Sodoma à l'hôpital," 1815 (Louvre); "Basilique basse de St François d'Assise," 1823 (Louvre); "Rachat de prisonniers," 1831 (Louvre); "Mort de Poussin," 1834 (Villa Demidoff, Florence), are among his principal works In 1819 Louis Philippe decorated Granet, and afterwards named him Chevalier de l'Ordre St. Michel, and Conservateur des tableaux de Versailles (1826) He became member of the institute in 1830 After 1848 he retired to Aix and died on Nov. 21, 1849 He bequeathed to his native town the greater part of his fortune and his collections, now exhibited in the local Musée, together with a fine portrait of the donor painted by Ingres in 1811

GRANGE, THE, known officially as the Patrons of Husbandry, is a national secret organization of farmers founded in Washington, D C, in 1867 by Oliver Hudson Kelley and six associates Growing slowly at first, the organization advanced rapidly in the early '70s This was a period of agrarian discontent, and the Grange, together with other societies of farmers, purposed to accomplish agricultural regeneration through education, legislation and other means What was known as "the Granger movement" resulted An impetus was given to regulation of railroads, agricultural investigation and education, more equitable taxation and more satisfactory rural life. A number of the western State granges established extensive co-operative business enterprises Developing too rapidly, these proved generally unsuccessful Their failure, coupled with internal dissensions, caused a heavy decline in membership of the Grange between 1875 and 1880, though the society retained a strong influence From 1880 on the society has gradually increased in membership. Social and educational features are now emphasized, though support is given to legislative measures in the interest of farmers. The Grange has always been open to both men and women There are seven degrees, and the names of these, as well as the ritual of the order, carry agricultural connotations. It is the only farmers' organization in the United States to extend to a foreign country. In 1872 it was organized in Canada, where, however, it never reached the prominence that it attained in its native land.

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GRANGEMOUTH, police burgh, seaport and parish, Stirlingshire, Scotland Pop (1921) 9,699 It is situated on the south shore of the estuary of the Forth, at the mouth of the Carron and also of Grange Burn, a right-hand tributary of the Carron, 3 m N E of Falkirk by the L M S R and L N E R It is the terminus of the Forth and Clyde Canal, from the opening of which (1789) its history may be dated, and is now the chief port of the Firth W of Leith With Stirling and Falkirk, Grangemouth returns one member to parliament The growth of the docks, which cover an area of 58 acres, rendered it necessary to divert the influx of the Grange from the Carron to the Forth Timber, iron and oil are the leading imports, and coal and oil the chief exports The industries include shipbuilding and rope and sail making There is regular steamer communication with London, Antwerp, Christiania, Hamburg, Rotterdam, Stockholm, etc Experiments in steam navigation were carried out in 1802 with the "Charlotte Dundas" on the Forth and Clyde Canal at Grangemouth

GRANGER, JAMES (1723–1776), English clergyman and print-collector, published a *Biographical History of England* (1769) "consisting of characters dispersed in different classes, and adapted to a methodical catalogue of engraved British heads" The work was supplemented in later editions by Granger, and still further editions were brought out by the Rev. Mark Noble, with additions from Granger's materials Blank leaves were left for the filling in of engraved portraits for extra illustration of the text, and it became a favourite pursuit to discover such illustrations and insert them in a *Granger,* so that "grangerizing" became a term for such an extra-illustration of any work, especially with cuts taken from other books.

GRANICUS, BATTLE OF THE (May–June, 334 B.C.). In the spring of 334 Alexander, having by various campaigns established a secure base of operations in Greece, set sail from Sestos to Abydos to carry out the invasion of Persia. His army consisted of about 30,000 foot and 5,000 horse, and it was accompanied by a siege train, a baggage train and a corps of engineers Having visited Ilium to crown the tomb of his traditional ancestor

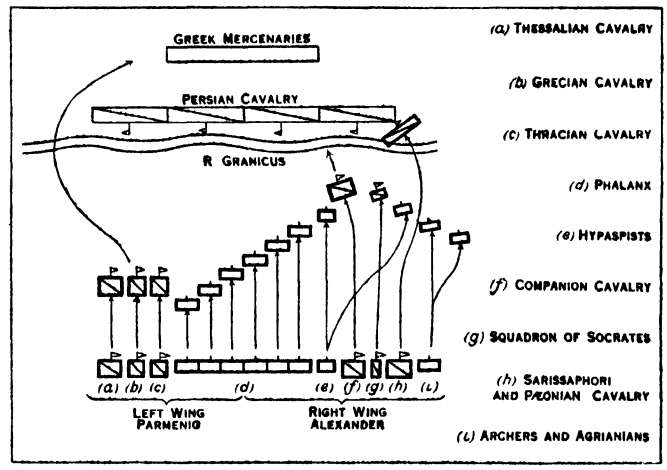

DIAGRAM SHOWING FORMATION OF TROOPS IN THE BATTLE OF THE GRANICUS, 334 B C

This, the first battle fought by Alexander the Great in his conquest of Asia, ended in victory for the Greeks. Alexander displayed the highest courage, first leading cavalry and then phalanx across the river in face of stubborn Persian resistance, and with his own hand slaying two Persian grandees

Achilles, he moved northwards through Lampsacus and came upon the Persian army on the river Granicus (Bigha-Chai), an army which, according to Arrian, numbered 20,000 Persian cavalry and 20,000 Greek mercenaries under Memnon Memnon, an able general, had suggested to Arsites and Spithridates, who were in joint command, that they should retire and lay waste the country, and then land an army in Macedonia and attack Alexander's base This they refused to do, and in place drew up their cavalry on the northern bank of the river with Memnon's infantry in rear Alexander, seeing this faulty distribution, determined on immediate attack, and deployed his army as shown in the diagram From the accounts of this battle as given by the classical historians, it is obvious that Alexander's intention was to refuse his left wing, pivot his right wing on the phalanx, and rapidly moving this wing forward concentrate his main blow against the Persian left In brief the action was as follows:—

The Battle.—The battle opened by a charge on the Persian left by the right wing light cavalry, who, after a severe engagement, were driven back Under cover of this attack Alexander advanced at the head of the Companion cavalry and charged the left centre of the Persian horse, for it was here that their leaders had posted themselves Little by little the Persians were pushed back until their left centre broke, whereupon both wings dispersed in flight. Alexander did not pursue them far, instead, he turned on the Greek mercenaries, and as Arrian says "leading the phalanx against these, and ordering the cavalry to fall upon them from all sides," he soon completely surrounded them and cut them up According to Diodorus, the Persians lost 12,000 in killed, and 20,000 were made prisoners Alexander is said to have lost less than 150 killed, this figure is probably an understatement

Tactics.—Though this battle was purely a cavalry action, it was not a blind charge of the Prince Rupert type, but an operation rendered only possible by the scientific organization of the Macedonian army which was the master-work of Philip, Alexander's father In the centre was the phalanx which possessed immense protective power, and on its flanks were two wings which could, like the fists of a pugilist, punch out from it Holding his left wing back, Alexander, under protection of the phalanx, which stood like a wall on the left of his right wing, first sent forward his light cavalry, protected on their outer flank by light infantry, to hold the Persian left wing by engaging their cavalry and simultane-

ously disorganize them Next he rapidly advanced the companion cavalry (the decisive attack) which advance drew the phalanx into an oblique order. This decisive attack was not directed on the Persian left flank, that is, it did not strike where the light cavalry had struck, but, in place, at the centre of the Persian left, for here the brains of the army (the generals) were assembled. This decisive attack moved down a protective funnel of men, for on its right were the light cavalry and light infantry, and on its left the hypaspists and the phalanx, both echeloned backwards. Whilst the Persian left flank was being pushed in confusion towards the centre, this centre was suddenly struck a terrific blow by a wedge of heavy cavalry followed closely by armoured infantry (the hypaspists) who worked into the enemy's shattered front and "ate" it away.

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GRANITE, in petrology, the group name for a family of plutonic or deep-seated acidic igneous rocks characterized essentially by the presence of the minerals, quartz, felspar (orthoclase, microcline, perthite, anorthoclase [rarely], acid plagioclase) and some ferromagnesian mineral (mica, amphibole or pyroxene) Granites are wholly crystalline and possess a typical hypidiomorphic or irregular granular (granitoid) texture—whence the name from Lat. "granum," a grain When, however, they are porphyritic, the phenocrysts may possess well defined crystallographic outlines In popular usage the term granite is applied to almost any crystalline rock, irrespective of its composition or origin

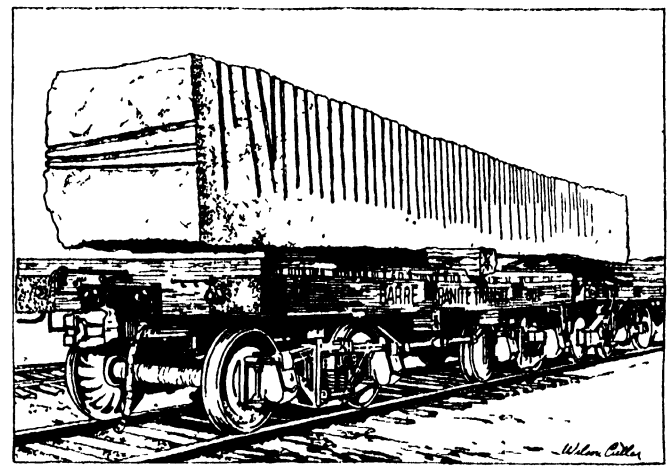
According to their mineralogical composition, the granites may be subdivided broadly into three groups. (*a*) alkali-granites (*b*) calc-alkali granites and the intermediate (*c*) adamellite granites This subdivision is based on the nature and quantitative proportions of the contained felspar, alkali granites possess a predominance of alkali felspar, calc-alkali granites a predominance of lime-bearing plagioclase, and the adamellite granites have alkali felspar and lime-bearing plagioclase in approximately equal proportions The alkali-granites are again subdivided into potash granites (dominant potash felspar) and soda granites (dominant albite felspar) The chief ferro-magnesian mineral of the former is biotite (lepidomelane, zinnwaldite) and may be accompanied by muscovite The rarer soda granites have as dark constituents soda-amphiboles (arfvedsonite, hastingsite or riebeckite) or soda-pyroxenes (acmite, aegirine or aegerine-augite)

The calc-alkali granites are typically represented by the great group of granodiorites, in which there is a great predominance of lime-plagioclase (oligoclase to andesine) The ferro-magnesian minerals are biotite, green hornblende or an alumina-poor pyroxene near diopside in composition These ferro-magnesian minerals also characterize the adamellite group of granites Different varieties are usually distinguished by prefixing the name of the dominant ferro-magnesian mineral, *e g*, hornblende-granite, aegirine granite, etc

The distinctive type carrying rhombic pyroxene (hypersthene) is usually referred to under the name charnockite (*q v*) Amphibole- and pyroxene-bearing granites never carry muscovite, which occurs only in association with biotite or alone, as in muscovite granite The granites usually carry minor amounts of other minerals, the principal being apatite, zircon (often enclosed in biotite and yielding pleochroic haloes due to their content of uranium or thorium), titanite, magnetite and ilmenite Less frequently monazite, spessartine-rich garnet orthite, topaz, fluorite and cassiterite occur Tourmaline may appear as a primary accessory, but it is most often of pneumatolytic origin (*see* PNEUMATOLYSIS) Cordierite and andalusite only occur in those granites which have assimilated the country rock into which they are intruded. These two minerals are well known in the granites of Cornwall and Devon

In hand specimens granites show a great variety of colour, dependent on the abundance of the dark constituents or the state of preservation of the contained felspar Many potash granites are pink or red, due to the colour of the orthoclase felspar Calc-alkali granites are more usually grey or white Porphyritic granites are common, the phenocrysts being felspars, some of the best known examples being those of Cornwall

In the field, granite usually occurs in great masses covering wide areas They form the rocks of many batholiths, laccoliths



BY COURTESY OF THE ROCK OF AGES CORPORATION

A BLOCK OF VERMONT GRANITE ON ITS WAY FROM QUARRY TO PLANT
Blocks of granite weighing many tons are lifted from the ground by electric hoists and sent on flat cars to the manufacturing plant, where they are sawed into sizes convenient for building purposes and then polished

and stocks, and frequently appear in the core of mountain ranges Granites are by far the most abundant of the plutonic intrusive rocks visible on the earth's surface, and appear in batholiths of great dimensions as in British Columbia and Patagonia It is probable that many apparently homogeneous granite laccoliths, etc., are not single intrusive masses but multiple intrusions in the form of sheets successively injected, as is the case for the granite laccolite of Dartmoor

Evidence of the intrusive character of granite is principally provided by the occurrence of transgressive dikes and veins proceeding from it into the surrounding strata, and by the alteration which the granite produces in the country rock through a zone varying from a few yards to a mile or more in breadth around it (*see* METAMORPHISM) Seen in natural sections, many granites have a rudely columnar appearance Others weather into large cuboidal blocks which may produce structures resembling cyclopean masonry The tors of the west of England are of this nature These differences depend on the disposition of the joint cracks which traverse the rock and are opened up by the action of frost and weathering

As a group the granites are of very great economic importance They form the country rock of a vast number of metalliferous deposits in many parts of the world Gold, tin, tungsten and bismuth may be especially mentioned The chinastone used in pottery is frequently derived by the pneumatolytic action of residual vapours upon the solidified granite As a building stone, granite is of great importance, particularly for works of some magnitude

The chemical composition of a few granites from different parts of the world is given below —

	SiO_2	Al_2O_3	Fe_2O_3	FeO	MgO	CaO	Na_2O	K_2O
1	73 66	13 81	0 21	1 51	0 45	0 67	2 89	5 02
2	70 40	7 85	6 08	2 08	0 52	0 26	4 05	4 45
3	71 24	13 78	1 30	2 83	tr	0 38	5 32	5 10
4	66 65	16 15	1 52	2 36	1 74	4 53	3 40	2 65
5	68 55	16 21	2 26		1 04	2 40	4 08	4 14

1 Biotite granite, Haytor, Dartmoor
2 Aegirine—Riebeckite granite, Ampasibitika, Madagascar
3 Katophorite granite, Ivisangusat, Greenland
4 Granodiorite, Nevada City, California
5 Adamellite, Shap, Cumberland

Only the most important constituents are shown in the table, but all granites contain also small amounts of MnO, P_2O_5, TiO_2, ZrO_2, BaO and water These aggregate usually less than 1%, except water, which may rise to 2 or more per cent in weathered rocks From the chemical composition it may be computed that granites contain 20% to 50% of quartz, the total silica content varying from 66% to 80% The shap granite, *e g.* (*see* analysis 5) by micrometric analysis is shown to contain quartz 24 4%, orthoclase 36 2%, plagioclase 33·6% and biotite 5·8% (*See also* PETROLOGY) (C E. T)

GRANITE CITY, a busy industrial city of Madison county, Ill., U S A, 10m N of Saint Louis, near the Mississippi river It is served by the Chicago and Alton, the Chicago and Eastern Illinois, the Big Four, the Illinois Traction (electric), the Saint Louis and Alton (electric), and the Wabash railways, and by five others for freight only In 1900 the population was 3,122, in 1920, 14,757; and in 1928, it was estimated locally at 25,000. There are steel foundries, rolling mills, car factories, syrup plants and many smaller manufacturing industries, with an aggregate output in 1925 valued at $46,985,391. The city was founded about 1893 and incorporated in 1896

GRAN SASSO D'ITALIA ("Great Rock of Italy"), mountain of the Abruzzi, Italy, culminating point of the Apennines, 9,560 ft in height It resembles the limestone Alps of Tirol and its elevated plateaux have a number of *doline* or funnel-shaped depressions into which melted snow and rain sink The summit is covered with snow for the greater part of the year The Alpine region beneath its summit is still the home of the wild boar, and here and there are dense woods of beech and pine The group has other lofty peaks, the Pizzo d'Intermesole (8,680 ft), the Corno Piccolo (8,650 ft), the Pizzo Cefalone (8,307 ft) and the Monte della Portella (7,835 ft) The most convenient starting-point for the ascent is Assergi, 10 m N E of Aquila, at the south foot of the Gran Sasso with its interesting Romanesque church (Sta Maria Assunta).

GRANT, SIR ALEXANDER, 8TH BART (1826–1884), British scholar and educationalist, was born in New York on Sept 13, 1826 After a childhood spent in the West Indies, he was educated at Harrow and Oxford He entered Oxford as scholar of Balliol, and subsequently held a fellowship at Oriel from 1849 to 1860 He made a special study of the Aristotelian philosophy, and in 1857 published an edition of the *Ethics* which became a standard text-book at Oxford. He spent nine years in India, filling various important educational positions in Bombay From 1868 until his death (which occurred in Edinburgh on Nov 30, 1884) he was principal of Edinburgh University The institution of the medical school in the University was almost solely due to his initiative

GRANT, DUNCAN (1885–), British painter, was born at Rothiemurchus, Inverness-shire, son of Major Bartle Grant, and was educated at St Paul's school, London He early showed his remarkable decorative sense, working with Roger Fry at the Omega Workshops, London, and at the same time produced some highly individual painting His early work included "The Lemon Gatherers" (1911), now in the Tate Gallery, and the "Seated Woman" (1912) Modern French influences, particularly those of Cézanne, made themselves strongly felt in his design and brushwork, as may be seen in the "Tight-rope Walker" (1918), "Snow Scene" (1921), "The Hammock" (1923) and many still-life pictures of this period Grant, who became a member of the London Group, also carried out interesting domestic and scenic decorations and designs for embroideries

See Duncan Grant, *A Collection of Plates,* with introduction by Roger Fry (1923)

GRANT, SIR FRANCIS (1803–78), Scottish portrait-painter, fourth son of Francis Grant of Kilgraston, Perthshire, born at Edinburgh, was educated for the bar, but at the age of 24 turned to art He began to exhibit at the Royal Academy, London, in 1843 He became a fashionable portrait-painter, among his society sitters being Lady Glenlyon, the marchioness of Waterford, Lady Rodney and Mrs Beauclerk He painted many of the celebrities of the time, including Scott, Macaulay, Lockhart, Disraeli, Hardinge, Gough, Derby, Palmerston and Russell, his brother Sir J. Hope Grant and his friend Sir Edwin Landseer. In 1842 he was elected A R A , and in 1851 R A.; in 1866 he was chosen to succeed Sir C. Eastlake as P R A Shortly after his election as president he was knighted. He died on Oct. 5, 1878

GRANT, GEORGE MONRO (1835–1902), principal of Queen's university, Kingston, Ontario, was born in Nova Scotia in 1835 and educated at Glasgow university, where he had a brilliant academic career; and having entered the ministry of the Presbyterian Church, he obtained a pastoral charge in Halifax, Nova Scotia, which he held from 1863 to 1877 When Canada was federated in 1867 Nova Scotia was strongly opposed to federal union Grant threw his influence in the federal scale, and his oratory played an important part in securing the success of the movement When the consolidation of the Dominion by means of railway construction was under discussion in 1872, Grant travelled from the Atlantic to the Pacific with the engineers who surveyed the route of the Canadian Pacific railway, and his book *Ocean to Ocean* (1873) helped to show Canadians the value of the heritage they enjoyed In 1877 Grant was appointed principal of Queen's university, Kingston, Ontario A tour in 1888 to Australia, New Zealand and South Africa strengthened the Imperialism which was the guiding principle of his political opinions He died at Kingston on May 10, 1902

GRANT, JAMES (1822–1887), Scottish novelist, was born in Edinburgh, the son of a captain in the 92nd Gordon Highlanders He entered the 62nd Foot as an ensign, but in 1843 he resigned his commission and devoted himself to writing novels, full of vivacity and incident, and dealing mainly with military scenes and characters His best work, however, is *Old and New Edinburgh* (3 vols , 1880)

GRANT, JAMES AUGUSTUS (1827–1892), Scottish explorer of eastern equatorial Africa, was born at Nairn, where his father was the parish minister, on April 11, 1827 He was educated at the grammar school and Marischal college, Aberdeen, and in 1846 joined the Indian army He saw active service in the Sikh War (1848–49), served throughout the mutiny of 1857, and was wounded in the operations for the relief of Lucknow He returned to England in 1858, and in 1860 joined J H Speke (*q v*) in the expedition which solved the problem of the Nile sources Grant served in the intelligence department of the Abyssinian expedition of 1868, he then retired from the army with the rank of lieutenant-colonel He died at Nairn on Feb 11, 1892 He wrote *A Walk Across Africa* (1864) and, among other papers, "Botany of the Speke and Grant Expedition" in vol xxix of the *Transactions of the Linnaean Society*

GRANT, SIR JAMES HOPE (1808–1875), English general, son of Francis Grant of Kilgraston, Perthshire, and brother of Sir Francis Grant, P R A , was born on July 22, 1808. He entered the army in 1826, becoming captain in 1835 In 1842 he was brigade-major to Lord Saltoun in the Chinese War, and received the rank of major and the C B for his services at the capture of Chin-Kiang He fought in the first Sikh War of 1845–46 and in the Punjab campaign, winning further promotion He took a leading part in the suppression of the Indian mutiny of 1857 After the recapture of Lucknow he was appointed to the command of the force employed for the final pacification of India. Before this task was quite completed he was created K C B In 1859, in command of the British land forces in the French and British expedition against China, he accomplished the object of the campaign within three months of the landing at Pei-tang (Aug. 1, 1860), occupying Peking For his conduct in this, which has been called the "most successful and the best carried out of England's little wars," he received the thanks of parliament and was gazetted G C B In 1861, as lieutenant general, he was appointed commander-in-chief of the army of Madras, on his return to England in 1865 he was made quartermaster general at headquarters, and in 1870 was transferred to the command of the camp at Aldershot. He took part in the reform of educational and training plans of the forces after the Franco-German war, and was largely responsible for the introduction of annual army manoeuvres. In 1872 he was gazetted general He died in London on March 7, 1875

Incidents in the Sepoy War of 1857–58, compiled from the Private Journal of General Sir Hope Grant, K C B, together with some explanatory chapters by Capt. H Knollys, Royal Artillery, was published in 1873, and *Incidents in the China War of 1860* appeared posthumously under the same editorship in 1875.

GRANT, SIR PATRICK (1804–1895), British field marshal, second son of Major John Grant, was born on Sept 11, 1804, at Auchterblair, Inverness-shire He entered the Bengal native infantry in 1820 and became captain in 1832 He served in Oudh from 1834–38 and raised the Hariana Light Infantry He became adjutant-general in 1846 He served under Sir Hugh Gough and was present at the battles of Maharajpur (1843), Moodkee (1845), Ferozshah (1846), and Sobraon (1846), receiving the C B and the brevet rank of lieutenant-colonel He was appointed aide-de-camp to the queen, and served in Kohat in 1851 From 1856 to 1861 he was commander-in-chief of the Madras army, was made K C B in 1857, and succeeded General Anson in command of the army in India He directed operations from Calcutta until the arrival of Sir Colin Campbell He left India in 1861, was promoted lieutenant-general in 1862, and was governor of Malta from 1867 to 1872 He was promoted general in 1870, field marshal in 1883, and colonel of the Royal Horse Guards and gold-stick-in-waiting to the queen in 1885 From 1874 he was governor of the Royal Hospital, Chelsea, until his death there on March 28, 1895

GRANT, ROBERT (1814–1892), British astronomer, was born at Grantown, Scotland, on June 17, 1814 He became interested in astronomy at an early age and after working in a counting house in London he conceived the idea of writing a history of physical astronomy *The History of Physical Astronomy from the Earliest Ages to the Middle of the Nineteenth Century* was published as a whole in 1852 The book at once took a leading place in astronomical literature In 1859 Grant succeeded J P Nichol as professor of astronomy in the university of Glasgow His principal work at Glasgow consisted in determining the places of a large number of stars with the Ertel transit-circle of the observatory The results, extending over 21 years, are contained in the *Glasgow Catalogue of 6,415 Stars,* published in 1883 This was followed in 1892 by the *Second Glasgow Catalogue of 2,156 Stars,* published only a few weeks after his death (Oct 24, 1892)

GRANT, ULYSSES SIMPSON (1822–1885), American soldier and 18th president of the United States, was born at Point Pleasant (Ohio), on April 27, 1822 He was a descendant of Matthew Grant, a Scotsman, who settled in Dorchester (Mass) in 1630 His earlier years were spent in helping his father, Jesse R Grant, upon his farm in Ohio In 1839 he was appointed to the military academy at West Point, and it was then that his name assumed the form by which it is generally known He was christened Hiram, with Ulysses for a middle name As he was usually called by his middle name, the congressman who recommended him for West Point supposed it to be his first name, and added thereto the name of his mother's family, Simpson Grant was the best horseman of his class, and took a respectable place in mathematics, but at his graduation in 1843 he ranked only 21st in a class of 39 In Sept 1845 he went with his regiment to join the forces of Gen Taylor in Mexico; there he took part in the battles of Palo Alto, Resaca de la Palma, and Monterey, and, after his transfer to Gen Scott's army, which he joined in March 1847, served at Vera Cruz, Cerro Gordo, Churubusco, Molino del Rey, and at the storming of Chapultepec He was breveted 1st lieutenant for gallantry at Molino del Rey and captain for gallantry at Chapultepec In Aug 1848, after the close of the war, he married Julia T Dent (1826–1902), and was for a while stationed in California and Oregon, but in 1854 he resigned his commission His reputation had suffered from allegations of intemperate drinking which, whether well founded or not, certainly impaired his usefulness as a soldier For the next six years he lived in St Louis (Mo), earning a scanty subsistence by farming and dealings in real estate In 1860 he removed to Galena (Ill) and became a clerk in his father's leather store At that time his earning capacity seems not to have exceeded $800 a year, and he was regarded by his friends as a broken and disappointed man He was living at Galena at the outbreak of hostilities between the North and South (J F)



THE LOG CABIN NEAR ST LOUIS, MO., WHERE ULYSSES S GRANT LIVED DURING HIS FARMING DAYS

Grant's Civil War Career.—To the "call to arms" of 1861 Grant promptly responded After some delay he was commissioned colonel of the 21st Illinois regiment and soon afterwards brigadier-general He was assigned to a territorial command on the Mississippi, and first won distinction by his energy in seizing, on his own responsibility, the important point of Paducah (Ky), situated at the confluence of the two great waterways of the Tennessee and the Ohio (Sept 6, 1861). On Nov 7 he fought his first battle as a commander, that of Belmont (Mo), which, though failing any material result, certainly showed him to be a capable and skilful leader Early in 1862 he was entrusted by Gen H W Halleck with the command of a large force to clear the lower reaches of the Cumberland and the Tennessee, and, whatever criticism may be passed on the general strategy of the campaign, Grant himself, by his able and energetic work, thoroughly deserved the credit of his brilliant success of Fort Donelson, where 15,000 Confederates were forced to capitulate Grant and his division commanders were promoted to the rank of major-general U S Volunteers soon afterwards, but Grant's own fortunes suffered a temporary eclipse owing to a disagreement with Halleck When, after being virtually under arrest, he rejoined his army, it was concentrated about Savannah on the Tennessee, preparing for a campaign towards Corinth (Miss) On April 6, 1862, a furious assault on Grant's camps brought on the battle of Shiloh (*q v*) After two days' desperate fighting the Confederates withdrew before the combined attack of the army of the Tennessee under Grant and the army of the Ohio under Buell But the army of the Tennessee had been on the verge of annihilation on the evening of the first day, and Grant's leadership throughout was by no means equal to the emergency, though he displayed his usual personal bravery and resolution In the grand advance of Halleck's armies which followed Shiloh, Grant was relieved of all important duties by his assignment as second in command of the whole force, and was thought by the army at large to be in disgrace But Halleck soon went to Washington as general-in-chief, and Grant took command of his old army and of Rosecrans' army of the Mississippi Two victories (Iuka and Corinth) were won in the autumn of 1862, but the credit of both fell to Rosecrans, who commanded in the field, and the nadir of Grant's military fortunes was reached when the first advance on Vicksburg (*q v*), planned on an unsound basis, and complicated by a series of political intrigues (which had also caused the adoption of the original scheme), collapsed after the minor reverses of Holly Springs and Chickasaw Bayou (Dec 1862)

It is fair to assume that Grant would have followed other unsuccessful generals into retirement, had he not shown that, whatever his mistakes or failures, and whether he was or was not temperate in his habits, he possessed the iron determination and energy which in the eyes of Lincoln and Stanton and of the whole northern people, was the first requisite of their generals (President Lincoln was Grant's most unwavering supporter Many amusing stories are told of his replies to various deputations which waited upon him to ask for Grant's removal On one occasion he asked the critics to ascertain the brand of whisky favoured by Grant, so that he could send kegs of it to the other generals) He remained then with his army near Vicksburg, trying one vain plan after another, until after months of almost hopeless work his perseverance was rewarded—a success directly consequent upon a strange and bizarre campaign of ten weeks, in which his daring and vigour were more conspicuous than ever before On July 4, 1863, the great fortress surrendered with 29,491 men, this being one of the most important victories won by the Union arms in the whole war Grant was at once made a major-general in the regular army A few months later the great reverse of

Chickamauga created an alarm in the North commensurate with the elation that had been felt at the double victory of Vicksburg and Gettysburg, and Grant was at once ordered to Chattanooga, to decide the fate of the army of the Cumberland in a second battle, Four armies were placed under his command, and three of these concentrated at Chattanooga On Nov. 25, 1863, a great three-days' battle ended with the crushing defeat of the Confederates, who from this day had no foothold in the centre and west

After this, in preparation for a grand combined effort of all the Union forces, Grant was placed in supreme command and the rank of lieutenant-general revived for him (March 1864) Grant's headquarters henceforth accompanied the army of the Potomac, and the lieutenant-general directed the campaign in Virginia. This, with Grant's driving energy infused into the best army that the Union possessed, resolved itself into a series, almost uninterrupted, of terrible battles Tactically the Confederates were almost always victorious, strategically, Grant, disposing of greatly superior forces, pressed back Lee and the army of northern Virginia to the lines of Richmond and Petersburg, while above all, in pursuance of his explicit policy of "attrition," the Federal leader used his men with a merciless energy that has few, if any, parallels in modern history At Cold Harbor 6,000 men fell in one useless assault lasting an hour, and after two months the Union armies lay before Richmond and Petersburg indeed, but had lost no fewer than 72,000 men But Grant was unshaken in his determination "I purpose to fight it out on this line, if it takes all summer," was his message from the battlefield of Spottsylvania to the chief of staff at Washington Through many weary months he never relaxed his hold on Lee's army, and, in spite of repeated partial reverses, that would have been defeats for his predecessors, he gradually wore down his gallant adversary. The terrible cost of these operations did not check him, only on one occasion of grave peril were any troops sent from his lines to serve elsewhere, and he drew to himself the bulk of the men whom the Union government was recruiting by thousands for the final effort Meanwhile, all the other campaigns had been closely supervised by Grant, preoccupied though he was with the operations against his own adversary At a critical moment he actually left the Virginian armies to their own commanders, and started to take personal command in a threatened quarter, and throughout he was in close touch with Sherman and Thomas, who conducted the campaigns on the south-east and the centre That he succeeded in the efficient exercise of the chief command of armies of a total strength of over one million men, operating many hundreds of miles apart from each other, while at the same time he watched and manoeuvred against a great captain and a veteran army in one field of the war, must be the greatest proof of Grant's powers as a general In the end complete success rewarded the sacrifices and efforts of the Federals in every theatre of war, in Virginia, where Grant was in personal control, the merciless policy of attrition wore down Lee's army until a mere remnant was left for the final surrender

Grant had thus brought the great struggle to an end, and was universally regarded as the saviour of the Union A careful study of the history of the war bears out the popular view There were soldiers more accomplished, as was McClellan, more brilliant, as was Rosecrans; and more exact, as was Buell, but it would be difficult to prove that these generals, or indeed any others in the service, could have accomplished the task which Grant brought to complete success Nor must it be supposed that Grant learned little from three years' campaigning in high command There is less in common than is often supposed between the buoyant energy that led Grant to Shiloh and the grim plodding determination that led him to Vicksburg and to Appomattox Shiloh revealed to Grant the intensity of the struggle, and after that battle, appreciating to the full the material and moral factors with which he had to deal, he gradually trained his military character on those lines which alone could conduce to ultimate success Singleness of purpose, and relentless vigour in the execution of the purpose, were the qualities necessary to the conduct of the vast enterprise of subduing the Confederacy Grant possessed or acquired both to such a degree that he proved fully equal to the emergency. If in technical finesse he was surpassed by many of his predecessors and his subordinates, he had the most important qualities of a great captain, courage that rose higher with each obstacle, and the clear judgment to distinguish the essential from the minor issues in war

For a fuller account *see* AMERICAN CIVIL WAR. (C. F. A.)

Grant's Presidency.—After the assassination of President Lincoln a disposition was shown by his successor, Andrew Johnson, to deal severely with the Confederate leaders, and it was understood that indictments for treason were to be brought against Gen Lee and others Grant, however, insisted that the U S Government was bound by the terms accorded to Lee and his army at Appomattox. He went so far as to threaten to resign his commission if the President disregarded his protest This energetic action on Grant's part saved the United States from a foul stain upon its escutcheon In July 1866 the grade of general was created, for the first time since the organization of the government, and Grant was promoted to that position. In the following year he became involved in the deadly quarrel between President Johnson and Congress To tie the President's hands Congress had passed the Tenure of Office Act, forbidding the President to remove any cabinet officer without the consent of the Senate; but in Aug 1867 President Johnson suspended Secretary Stanton and appointed Grant secretary of war *ad interim* until the pleasure of the Senate should be ascertained Grant accepted the appointment under protest, and held it until the following January, when the Senate refused to confirm the President's action, and Secretary Stanton resumed his office President Johnson was much disgusted at the readiness with which Grant turned over the office to Stanton, and a bitter controversy ensued between Johnson and Grant Hitherto Grant had taken little part in politics. The only vote which he had ever cast for a presidential candidate was in 1856 for James Buchanan, and leading Democrats, so late as the beginning of 1868, hoped to make him their candidate in the election of that year, but the effect of the controversy with President Johnson was to bring Grant forward as the candidate of the Republican Party At the convention in Chicago on May 20, 1868, he was unanimously nominated on the first ballot The Democratic Party nominated the one available Democrat who had the smallest chance of beating him—Horatio Seymour, lately governor of New York, an excellent statesman, but at that time hopeless as a candidate because of his attitude during the war The result of the contest was at no time in doubt; Grant received 214 electoral votes and Seymour 80

The most important domestic event of Grant's first term as President was the adoption of the 15th amendment to the Constitution on March 30, 1870, providing that suffrage throughout the United States should not be restricted on account of race, colour, or previous condition of servitude The most important event in foreign policy was the treaty with Great Britain of May 8, 1871, commonly known as the Treaty of Washington, whereby several controversies between the United States and Great Britain, including the bitter questions as to damage inflicted upon the United States by the "Alabama" and other Confederate cruisers built and equipped in England, were referred to arbitration In 1869 the government of Santo Domingo (or the Dominican republic) expressed a wish for annexation by the United States, and such a step was favoured by Grant, but a treaty negotiated with this end in view failed to obtain the requisite two-thirds vote in the Senate In May 1872 something was done towards alleviating the odious reconstruction laws for dragooning the South, which had been passed by Congress in spite of the vetoes of President Johnson The Amnesty Bill restored civil rights to all persons in the South, save from 300 to 500 who had held high positions under the Confederacy As early as 1870 President Grant recommended measures of civil service reform, and succeeded in obtaining an act authorizing him to appoint a civil service commission. A commission was created, but owing to the hostility of the politicians in Congress it accomplished little During the 50 years since Crawford's Tenure of Office Act was passed in 1820, the country had been growing more and more familiar with the spec-

tacle of corruption in high places. The evil rose to alarming proportions during Grant's presidency, partly because of the immense extension of the civil service, partly because of the growing tendency to alliance between spoilsmen and the persons benefited by protective tariffs, and partly because public attention was still so much absorbed in Southern affairs that little energy was left for curbing rascality in the North The scandals, indeed, were rife in Washington and affected persons in close relations with the President Grant was ill-fitted for coping with the difficulties of such a situation Along with certain high intellectual powers he had a simplicity of nature charming in itself but often calculated to render him the easy prey of sharpers He found it almost impossible to believe that anything could be wrong in persons to whom he had given his friendship, and on several occasions such friends proved themselves unworthy of him The feeling was widely prevalent in the spring of 1872 that the interests of pure government in the United States demanded that President Grant should not be elected to a second term This feeling led a number of high-minded gentlemen to form themselves into an organization under the name of Liberal Republicans They held a convention at Cincinnati in May with the intention of nominating for the presidency Charles Francis Adams, who had ably represented the United States at the court of St James during the Civil War The convention was, however, captured by politicians who converted it into a farce by nominating Horace Greeley, editor of the New York *Tribune,* who represented almost anything rather than the object for which the convention had been called The Democrats had despaired of electing a candidate and hoped to achieve success by adopting the Cincinnati nominee, should he prove to be an eligible person The event showed that while their defeat in 1868 had taught them despondency, it had not taught them wisdom, it was still in their power to make a gallant fight by nominating a person for whom Republican reformers could vote But with almost incredible fatuity, they adopted Greeley as their candidate As a result Grant was re-elected by an overwhelming majority

The most important event of his second term was his veto of the Inflation Bill in 1874 followed by the passage of the Resumption Act in the following year The country was still labouring under the curse of an inconvertible paper currency originating with the Legal Tender Act of 1862 There was a considerable party in favour of debasing the currency indefinitely by inflation, and a bill with that object was passed by Congress in April 1874 It was promptly vetoed by President Grant, and two months later he wrote a very sensible letter to Senator J P Jones of Nevada advocating a speedy return to specie payments The passage of the Resumption Act in Jan 1875 was largely due to his consistent advocacy, and for these measures he deserves as high credit as for his victories in the field. In spite of these great services, popular dissatisfaction with the Republican Party rapidly increased during the years 1874–76. The causes were twofold firstly, there was great dissatisfaction with the troubles in the Southern states, owing to the harsh reconstruction laws and the robberies committed by the carpet-bag governments which those laws kept in power; secondly, the scandals at Washington, comprising wholesale frauds on the public revenue, awakened lively disgust In some cases the culprits were so near to President Grant that many persons found it difficult to avoid the suspicion that he was himself implicated, and never perhaps was his hold upon popular favour so slight as in the summer and autumn of 1876

Later Life.—After the close of his presidency in the spring of 1877 Grant started on a journey round the world, accompanied by his wife and one son He was received with distinguished honours in England and on the continent, whence he made his way to India, China and Japan After his return in Sept 1880 he went back to his old home in Galena (Ill) A faction among the managers of the Republican Party attempted to secure his nomination for a third term as president, and in the convention at Chicago in June 1880 he received a vote exceeding 300 during 36 consecutive ballots Nevertheless, his opponents made such effective use of the popular prejudice against third terms that the scheme was defeated and Garfield was named in his stead In Aug 1881 Gen. Grant bought a house in the city of New York His income was insufficient for the proper support of his family, and accordingly he had become partner in a banking house in which one of his sons was interested The name of the firm was Grant and Ward The ex-president invested in it all his available property, but paid no attention to the management of the business. His facility in giving his confidence to unworthy people was now to be visited with dire calamity In 1884 the firm became bankrupt, and it was discovered that two of the partners had been perpetrating systematic and gigantic frauds This blow left Gen Grant penniless, just at the time when he was beginning to suffer acutely from the disease which finally caused his death Down to this time he had never made any pretensions to literary talent, but on being approached by the *Century Magazine* with a request for some articles he undertook the work in order to keep the wolf from the door It proved a congenial task, and led to the writing of his *Personal Memoirs,* a frank, modest, and charming book, which ranks among the best military biographies The sales earned for the general and his family something like half a million dollars The circumstances in which it was written made it an act of heroism comparable with any that Grant ever showed as a soldier During most of the time he was suffering tortures from cancer in the throat, and it was only four days before his death that he finished the manuscript. In the spring of 1885 Congress passed a bill creating him a general on the retired list, and in the summer he was removed to a cottage at Mt M'Gregor, near Saratoga, where he passed the last five weeks of his life, and where he died on July 23, 1885 His body was placed in a tomb monument in Riverside drive, in New York city, overlooking the Hudson river

Grant showed many admirable and lovable traits. There was a charming side to his trustful simplicity. He abounded in kindliness and generosity, and if there was anything especially difficult for him to endure, it was the sight of human suffering, as was shown on the night at Shiloh, where he lay out of doors in the icy rain rather than stay in a comfortable room where the surgeons were at work His good sense was strong, as well as his sense of justice, and these qualities stood him in good service as president, especially in his triumphant fight against the greenback monster Altogether, in spite of some shortcomings, Grant was a massive, noble and lovable personality, well fit to be remembered as one of the heroes of a great nation (J F.)

BIBLIOGRAPHY.—Adam Badeu's *Military History of U. S Grant* (1867–81) and *Grant in Peace* (Hartford, 1887) are appreciative but lacking in discrimination, William Conant Church's *Ulysses S Grant and the Period of National Preservation and Reconstruction* (1897) is a good succinct account, Hamlin Garland's *Ulysses S Grant, His Life and Character* (1898) gives especial attention to the personal traits of Grant and abounds in anecdote *See* also Grant's *Personal Memoirs* (1885–86), J R Young, *Around the World with General Grant* (1880), J G Wilson, *Life and Public Services of U S Grant* (1886), James Ford Rhodes, *History of the United States,* vols iii–vii (1896–1906), Horace Porter, *Campaigning with Grant* (1897), James K Hosmer, *Appeal to Arms and Outcome of the Civil War* (1907), John Eaton, *Grant, Lincoln, and the Freedmen* (1907), and various works mentioned in the articles AMERICAN CIVIL WAR, WILDERNESS, etc

GRANT, in law, the transfer of property by an instrument in writing, termed a deed of grant According to the old rule of common law, the immediate freehold in corporeal hereditaments lay in livery (*see* FEOFFMENT), whereas incorporeal hereditaments, such as a reversion, remainder, advowson, etc , lay in grant, that is, passed by the delivery of the deed of conveyance or grant without further ceremony The distinction between property lying in livery and in grant is now abolished, the Real Property Act 1845 providing that all corporeal tenements and hereditaments shall be transferable as well by grant as by livery What in many other countries is termed a "concession" is in England usually called a "grant"

GRANTH, the sacred "book" of the Sikhs (*q v*) It is a notable compilation of later Indian protestant writings, inculcating monotheism, yet not excluding praise of the goddess Durga (*q v*), denouncing caste privileges, concremation of widows and female infanticide, the use of hemp and alcohol (though the lat-

ter prohibition is disregarded), and any indulgence in tobacco. It consists of two parts, the Ādi Granth or "Original Book," and the Dasam Pādshāhī dā Granth, or "Book of the Tenth Reign," *i e*, of the 10th Gurū, Govind Singh This latter is accepted by all Sikhs Its difficulties of interpretation have hindered Sikh progress and expansion. Written in a special Sikh script (*Gurmukhi*) without separation of words in various dialects and even partly in Persian its earliest manuscripts have perished. It still awaits definitive exegesis

See M A Macauliffe, *The Sikh Religion; its Gurus, Sacred Writings and Authors*, 6 vols (Oxford, 1909); Ernst Trumpp, *The Adi Granth or Holy Scriptures of the Sikhs* (London, 1877).

GRANTHAM, THOMAS ROBINSON, 1ST BARON (*c.* 1695–1770), English diplomatist and politician, a younger son of Sir William Robinson, Bart (1655–1736) of Newby, Yorkshire, was educated at Trinity college, Cambridge He gained his earliest diplomatic experience in Paris and then went to Vienna, where he was English ambassador from 1730 to 1748 During 1741 he failed to make peace between the empress Maria Theresa and Frederick the Great, and in 1748 he represented his country at the congress of Aix-la-Chapelle He sat in parliament for Christchurch from 1749 to 1761, and was appointed a secretary of State and leader of the House of Commons by the prime minister, the duke of Newcastle On this occasion Pitt made the famous remark to Fox: "the duke might as well have sent us his jackboot to lead us" In Nov 1755 he resigned, and in April 1761 was created Baron Grantham. He held other minor offices He died in London on Sept. 30, 1770

GRANTHAM, SIR WILLIAM (1835–1911), English judge, was born at Lewes, on Oct 23, 1835 After a successful career at the bar and as a Conservative member of parliament (1874–85), he was appointed in 1885 judge of the Queen's Bench division of the High Court He never concealed his own political views, and after 1906, when he was on the rota of judges for election petitions, his decisions were sharply criticized as biased against the Liberal party, notably in the Great Yarmouth case, which led to a motion of censure in the House of Commons in July 1906. Grantham was a great criminal lawyer, and in the Adolf Beck trial he was one of the first to suspect the mistake as to the prisoner's identity He died in London on Nov 30, 1911

GRANTHAM, municipal borough, Lincolnshire, England; situated on the river Witham Pop (1921) 18,902. It is an important junction of the L N E railway, 105 m N by W from London, with branch lines to Nottingham, Lincoln and Boston; while there is communication with Nottingham and the Trent by the Grantham canal Although there is no authentic evidence of Roman occupation, Grantham (Graham, Granham in Domesday Book) from its situation on the Ermine Street, is supposed to have been a Roman station It was possibly a borough in the Saxon period, and by the time of the Domesday Survey it was a royal borough with 111 burgesses Charters of liberties, existing now only in the confirmation charter of 1377, were granted by various kings From the first the town was governed by a bailiff appointed by the lord of the manor, but by the end of the 14th century the office of alderman had come into existence Finally government under a mayor and alderman was granted by Edward IV. in 1463, and Grantham became a corporate town Among later charters, that of James II., given in 1685, changed the title to that of government by a mayor and six aldermen, but this was afterwards reversed and the old order resumed Grantham was first represented in parliament in 1467, and returned two members; but by the Redistribution act of 1885 the number was reduced to one, now it has lost its member Richard III in 1483 granted a Wednesday market and two fairs yearly, namely on the feast of St Nicholas the Bishop, and the two following days, and on Passion Sunday and the day following At the present day the market is held on Saturday, and fairs are held on the Monday, Tuesday and Wednesday following the fifth Sunday in Lent, a cherry fair on July 11 and two stock fairs on Oct. 26 and Dec 17 The parish church of St Wulfram exhibits all the Gothic styles, but is mainly Early English and Decorated The western tower and spire, about 280 ft in height, are of early Decorated workmanship. There is a double Decorated crypt beneath the lady chapel Two libraries, respectively of the 16th and 17th centuries, are preserved in the church. The King Edward VI grammar school is a late Perpendicular building The Angel hotel is a hostelry of the 15th century, with a gateway of earlier date. A conduit dating from 1597 stands in the wide market-place. The chief industries are malting and the manufacture of agricultural implements. It has also iron foundries The borough falls within the South Kesteven or Stamford division of the county. Grantham was created a suffragan bishopric in the diocese of Lincoln in 1905.

GRANTIA, a genus of the lesser calcareous sponges. It contains several species, of comparatively small size, including *compressa*, the purse sponge, native to the coast of Great Britain. *See* SPONGE.

GRANTLEY, FLETCHER NORTON, 1ST BARON (1716–1789), English politician, the eldest son of Thomas Norton of Grantley, Yorkshire, was born on June 23, 1716. He became a barrister in 1739, becoming a K C in 1754, and afterwards attorney-general for the county palatine of Lancaster In 1756 he was elected member of parliament for Appleby and represented Wigan from 1761–68 He was knighted in 1762, and after holding various public offices was chosen Speaker of the House of Commons in 1770 In 1777, when presenting the bill for the increase of the civil list to the king, he aroused criticism by his speech; but the Speaker was supported by Fox and by the city of London, and received the thanks of the House of Commons George, however, did not forget his plain words, and after the general election of 1780, the prime minister, Lord North, and his followers declined to support the re-election of the retiring Speaker In 1782 he was made a peer as Baron Grantley of Markenfield He died in London on Jan 1, 1789

See H Walpole, *Memoirs of the Reign of George III.*, ed. by G. F. R Barker (1894), Sir N. W Wraxall, *Historical and Posthumous Memoirs*, ed by H B. Wheatley (1884), and J. A Manning, *Lives of the Speakers* (1850).

GRANTOWN-ON-SPEY, police burgh, Moray, Scotland. Pop (1921) 1,622 It lies on the left bank of the Spey, 23¼ m. south of Forres by the L N E R, with a station on the L M S R. Speyside line connecting Craigellachie with Boat of Garten It was founded in 1776 by Sir James Grant of Grant, and became the chief seat of that ancient family, who had lived on their adjoining estate of Freuchie (Gaelic, *fraochach*, "heathery") since the beginning of the 15th century, and hence were usually described as the lairds of Freuchie The town, built of grey granite, and delightfully situated in the midst of beautiful woods, is a holiday resort

GRANULITE (Lat *granulum*, a little grain), a name used by petrographers to designate two distinct classes of rocks According to the terminology of the French school it signifies a granite in which both kinds of mica (muscovite and biotite) occur, and corresponds to the German *Granit*, or to the English "muscovite–biotite–granite" This application has not been accepted generally To the German petrologists "granulite" means a more or less banded fine-grained metamorphic rock, consisting mainly of quartz and felspar in very small irregular crystals, and containing usually also a fair number of minute rounded pale-red garnets Among English and American geologists the term is generally employed in this sense The granulites are very closely allied to the gneisses, as they consist of nearly the same minerals, but they are finer grained, have usually less perfect foliation, are more frequently garnetiferous, and have some special features of microscopic structure. In the rocks of this group the minerals, as seen in a microscopic slide, occur as small rounded grains forming a mosaic closely fitted together The individual crystals have never perfect form, and indeed rarely any traces of it In some granulites they interlock, with irregular borders; in others they have been drawn out and flattened into tapering lenticles by crushing. In most cases they are somewhat rounded with smaller grains between the larger This is especially true of the quartz and felspar which are the predominant minerals Both muscovite and biotite may be present and vary considerably in abundance;

very commonly they have their flat sides parallel and give the rock a rudimentary schistosity, and they may be aggregated into bands—in which case the granulites are indistinguishable from certain varieties of gneiss The garnets are very generally larger than the above-mentioned ingredients, and easily visible as pink spots on the broken surfaces of the rock They usually are filled with enclosed grains of the other minerals

The felspar of the granulites is mostly orthoclase or microperthite, microcline, oligoclase and albite are also common Basic felspars occur only rarely Among accessory minerals, in addition to apatite, zircon and iron oxides, the following may be mentioned. hornblende (not common), riebeckite (rare), epidote and zoisite, calcite, sphene, andalusite, sillimanite, kyanite, hercynite (a green spinel), rutile, orthite and tourmaline

On account of the minuteness with which it has been described and the important controversies on points of theoretical geology which have arisen regarding it, the granulite district of Saxony (around Rosswein, Penig, etc) may be considered the typical region for rocks of this group Very similar granulites occur in Austria near Krems (in the Wald-Viertel) J G Lehmann propounded the hypothesis that the present state of the Saxon granulites was due principally to crushing acting on them in a solid condition, grinding them down and breaking up their minerals, while the pressure to which they were subjected welded them together into coherent rock It is now believed, however, that they are comparatively recent and include sedimentary rocks, partly of Palaeozoic age, and intrusive masses which may be nearly massive or may have gneissose, veined or granulitic structures These have been developed largely by the injection of semi-consolidated highly viscous intrusions, and the varieties of texture are original or were produced very shortly after the crystallization of the rocks

The Saxon and Austrian granulites are apparently for the most part igneous and correspond in composition to granites and porphyries There are, however, many granulites which undoubtedly were originally sediments (arkoses, grits and sandstones) A large part of the highlands of Scotland consists of paragranulites of this kind, which have received the group name of "Moine gneisses"

Along with the typical acid granulites above described, in Saxony, India, Scotland and other countries there occur dark-coloured basic granulites ("trap granulites") These are fine-grained rocks, not usually banded, nearly black in colour with small red spots of garnet Their essential minerals are pyroxene, plagioclase and garnet, chemically they resemble the gabbros Green augite and hypersthene form a considerable part of these rocks, they may contain also biotite, hornblende and quartz Around the garnets there is often a radial grouping of small grains of pyroxene and hornblende in a clear matrix of felspar, these "centric" structures are frequent in granulites

GRANVELLA, ANTOINE PERRENOT, Cardinal de (1517–1586), one of the ablest and most influential of the princes of the Church during the great political and ecclesiastical movements which immediately followed the appearance of Protestantism in Europe, was born on Aug 20, 1517, at Besançon. After studying at Padua and at Louvain, he held a canonry at Besançon and in 1540 was promoted to the bishopric of Arras Through the influence of his father, Nicolas Perrenot de Granvella (1484–1550), chancellor of the empire under Charles V , he was entrusted with many delicate pieces of public business, in the execution of which he developed a rare talent for diplomacy, and at the same time acquired an intimate acquaintance with the currents of European politics. Specially noteworthy was his settlement of the peace terms after the defeat of the league of Schmalkalden at Muhlberg in 1547. As secretary of State (1550) he attended Charles in the war with Maurice, elector of Saxony, accompanied him in the flight from Innsbruck, and afterwards drew up the Treaty of Passau (Aug 1552). In 1553, he conducted the negotiations for the marriage of Mary of England and Philip II of Spain, to whom, in 1555, he transferred his services One of the Spanish commissioners at the peace of Cateau Cambrésis (1559), on Philip's withdrawal from the Netherlands, he was appointed prime minister to the regent, Margaret of Parma

In 1560 Granvella was made archbishop of Malines and in 1561 cardinal, but his policy of repression aroused the hostility of the people and by the advice of Philip he retired to Franche Comté in 1564 Recalled in 1570 to Rome, he helped to arrange the alliance between the Papacy, Venice and Spain against the Turks and in the same year became viceroy of Naples In 1575 Philip II appointed him president of the council for Italian affairs Among the more delicate negotiations of his later years were those of 1580, whose object was the union of the crowns of Spain and Portugal, and those of 1584, which proved a check to France by the marriage of the Spanish infanta Catherine to Charles Emmanuel, duke of Savoy He died of a lingering disease at Madrid on Sept 21, 1586

See *Papiers d'État du Cardinal de Granvelle, d'après les manuscrits de la bibliothèque de Besançon*, ed C Weiss (Paris, 1841–52, 9 vols), *Correspondance du Cardinal de Granvelle, 1565–1586*, ed E Poullet (*et* C Piot) (Bruxelles, 1877–96, 12 vols); [L Courchetet d'Esnans], *Histoire du Cardinal de Granvelle* . . . (Paris, 1761), M Philippson, *Ein Ministerium unter Philipp II* . . . (Berlin, 1895)

GRANVILLE, GRANVILLE GEORGE LEVESON-GOWER, 2nd Earl (1815–1891), English statesman, eldest son of the 1st Earl Granville (1773–1846), by his marriage with Lady Harriet, daughter of the duke of Devonshire, was born in London on May 11, 1815 On leaving Oxford young Lord Leveson went to Paris for a short time under his father, and in 1836 was returned to parliament in the Whig interest for Morpeth For a short time he was under-secretary for foreign affairs in Lord Melbourne's ministry In 1840 he married Lady Acton From 1841 till his father's death in 1846, when he succeeded to the title, he sat for Lichfield In the House of Lords he signalized himself as a Free Trader, and Lord John Russell made him master of the buckhounds (1846) He became vice-president of the Board of Trade in 1848, and was one of the promoters of the great exhibition of 1851 In that year, having already been admitted to the cabinet, he succeeded Palmerston at the foreign office until Lord John Russell's defeat in 1852; and when Lord Aberdeen formed his Government at the end of the year, he became first president of the council, and then chancellor of the duchy of Lancaster (1854) Under Lord Palmerston (1855) he was president of the council He was chancellor of the London university for 35 years, he advocated the admission of women, and also the teaching of modern languages From 1855 Lord Granville led the Liberals in the Upper House, both in office, and, after Palmerston's resignation in 1858, in opposition He went in 1856 as head of the British mission to the tsar's coronation in Moscow In June 1859 the queen, embarrassed by the rival ambitions of Palmerston and Russell, sent for him to form a ministry, but he was unable to do so, and Palmerston again became prime minister, with Lord John as foreign secretary and Granville as president of the council

From 1866 to 1868 he was in opposition, but in Dec 1868 he became colonial secretary in Gladstone's first ministry His tact was invaluable to the Government in carrying the Irish Church and Land bills through the House of Lords On June 27, 1870, on Lord Clarendon's death, he was transferred to the foreign office Lord Granville's name is mainly associated with his career as foreign secretary (1870–74 and 1880–85) Personally he was patient and polite, but his courteous and pacific methods were somewhat inadequate in dealing with the new situation then arising in Europe and outside it, and foreign Governments had little scruple in creating embarrassments for Great Britain, and relying on the disinclination of the Liberal leaders to take strong measures The Franco-German War of 1870 broke out within a few days of Lord Granville's quoting in the House of Lords (July 11) the curiously unprophetic opinion of the permanent under-secretary (Hammond) that "he had never known so great a lull in foreign affairs" Russia took advantage of the situation to denounce the Black Sea clauses of the Treaty of Paris, and Lord Granville's protest was ineffectual In 1871 an intermediate zone between Asiatic Russia and Afghanistan was agreed on between him and Shuválov, but in 1873 Russia took possession of Khiva, within the neutral zone, and Lord Granville had to accept the aggression

When the Conservatives came into power in 1874, his part for

the next six years was to criticize Disraeli's "spirited" foreign policy, and to defend his own more pliant methods He returned to the foreign office in 1880, only to find an anti-British spirit developing in German policy which the temporizing methods of the Liberal leaders were generally powerless to deal with. Lord Granville failed to realize in time the importance of the Angra Pequeña question in 1883–84, and he was forced to yield to Bismarck over it Whether in Egypt, Afghanistan or equatorial and south-west Africa, British foreign policy was dominated by suavity rather than by the strength which commands respect. Granville was a faithful supporter of Gladstone all through his life, and during the troubled period (1880–85) the prime minister constantly turned to him When Gladstone took up Home Rule for Ireland, Lord Granville adhered to his chief (1886), and gave way to Lord Rosebery when the latter was preferred to the foreign office He went to the Colonial Office for six months, and in July 1886 retired from public life He died in London on March 31, 1891, being succeeded in the title by his son, born in 1872

See Lord E. Fitzmaurice, *Life of Lord Granville* (1905); also other memoirs of the time, notably Morley's *Life of Gladstone.*

GRANVILLE, JOHN CARTERET, Earl (1690–1763), English statesman, known as Lord Carteret, was born on April 22, 1690, the son of George, 1st Lord Carteret, and great grandson of the Elizabethan admiral, Sir Richard Grenville He succeeded his father in 1695 as 2nd baron Carteret He was educated at Westminster, and at Christ Church, Oxford, and acquired a wide knowledge of modern languages and literatures, being almost the only Englishman of his time who knew German. He took his seat in the Lords on May 25, 1711 An adherent of the Hanoverian dynasty, the friend of Stanhope and Sunderland, he took a share in defeating the Jacobite conspiracy of Bolingbroke on the death of Queen Anne, and supported the Septennial Act. His interests were, however, rather in foreign than in domestic policy. Early in 1719 he was appointed ambassador to Sweden, a post which he held for two years with great success He gained an exceptional knowledge of European and, in particular, of German affairs.

Named secretary of State for the southern department on his return to London, he came into conflict with Townshend and Sir Robert Walpole Walpole, who resented his ability to speak German with the king, arranged for him to succeed the duke of Grafton as lord lieutenant of Ireland, when the violent agitation in Ireland against Wood's halfpence (*see* Swift, Jonathan), made a new appointment necessary He was in Dublin from Oct. 23, 1724 until 1730 He had to deal with the opposition to Wood's halfpence, and to counteract the effect of Swift's *Drapier's Letters.* It is doubtful whether he could have reconciled his private friendship with Swift with his duty to the Crown if Wood's patent had not been withdrawn. When he returned to London in 1730 Walpole was firmly established as master of the House of Commons, and as the trusted minister of George II., and he took no share in public affairs until the fall of Walpole in 1742. Carteret is credited with having paid the expenses of the first edition of *Don Quixote* to please Queen Caroline, but he lost her favour through becoming entangled in the scandalous family quarrel between Frederick, prince of Wales, and his parents. His sympathies were with Maria Theresa in the War of the Austrian Succession, on the ground that the fall of the house of Austria would increase the power of France

George II. welcomed these views, and made him secretary of State in 1742, a post which he held until 1744, accompanying the king to Germany in 1743 He succeeded in promoting an agreement between Maria Theresa and Frederick His support of the king's policy was denounced as subservient to Hanover, but a few years later Pitt adopted an identical policy, and confessed that whatever he knew he had learnt from Carteret In 1751 he became president of the council, and was still liked and trusted by the king, but had little active share in the government

In 1756 Newcastle asked him to become prime minister as the alternative to Pitt, but Granville, understanding why the offer was made, declined, and supported Pitt. When in Oct 1761 Pitt threatened to resign unless his advice to declare war on Spain was accepted, Granville replied that "the opinion of the majority (of the cabinet) must decide." He resisted Pitt's claim to be considered as a "sole minister," or in the modern phrase "prime minister" Granville remained in office as president until his death in London on Jan. 22, 1763. The title descended to his son Robert, who died without issue in 1776, when the earldom became extinct

A somewhat partisan life of Granville was published by A. Ballantyne, *Lord Carteret, a Political Biography* (1887). His correspondence is in the British Museum

GRANVILLE, a town of Cumberland county, New South Wales, 13 m by rail W of Sydney It became a municipality in 1885 Pop (1925) 16,110 It is an important railway junction and manufacturing town, producing agricultural implements, tweed, pipes, tiles and bricks; there are also tanneries, flour-mills, and kerosene and meat export works

GRANVILLE, a fortified sea-port and bathing-resort of north-western France, in the department of Manche, at the mouth of the Bosq, 85 m S by W of Cherbourg by rail Pop (1926) 10,075 The upper town stands on a promontory and is surrounded by ramparts; the lower town and harbour lie below it. The barracks and the church of Notre Dame are in the upper town The port consists of a large tidal harbour, two floating basins and a dry dock Deep sea fishing, including the cod-fishing off Newfoundland, and oyster-fishing are carried on It has much trade with St Pierre and Miquelon The principal exports are eggs, vegetables and fish, armaments to the colonies, salted fish, lard, butter Coal, timber and chemical manures are imported The industries include ship-building, fish-salting, the manufacture of cod-liver oil, the preserving of vegetables, dyeing, metal-founding, rope-making and the manufacture of chemical manures It is the port of Normandy for British goods

GRANVILLE, a village of Licking county, O, U S A, 27m. E by N of Columbus; served by the New York Central railway The population in 1920 was 1,440 The village has a setting of great natural beauty, in a fertile valley, surrounded by hills, and has many aspects of a New England college town It is the seat of Denison university, founded in 1831 by the Ohio Baptist Education Society

GRANVILLE-BARKER, HARLEY GRANVILLE (1877–), British playwright, was born in London on Nov 25, 1877 At the age of 13 he was sent to the Theatre Royal, Margate, then a combination of stock company, theatre and dramatic school He first appeared in London in the following year, at the Comedy theatre, under Charles Hawtrey His first play, written in 1893, was produced by amateurs From 1895 onwards he acted in a variety of plays, in Shakespeare with Ben Greet, and, with William Poel, in *Richard II* and Marlowe's *Edward II* In 1899, his play *The Weather-hen* (written in collaboration with Herbert Thomas) was produced in London In 1900 he became interested in the newly formed Stage Society, first as actor, then as producer, and his own play, *The Marrying of Ann Leete,* was produced by the society in 1901 In 1903 he collaborated with William Archer in the framing of *A Scheme and Estimates for a National Theatre* In 1904 he joined J E Vedrenne in the management of the Court theatre, London There, during three years he produced, and at first acted, in a variety of plays by Ibsen, Bernard Shaw, St John Hankin, John Galsworthy, John Masefield, Maurice Hewlett, Gilbert Murray (translations from Euripides) and his own *The Voysey Inheritance* (1905) His management at the Court may be said to have been the beginning of the great vogue of the plays of Bernard Shaw His services to the English theatre in producing many other plays which would have had little chance of production by the commercial stage of that day were very great In 1906 he wrote the charming Pierrot play, *Prunella,* in collaboration with Laurence Housman A later play, *Waste* (1906) was banned by the censor, but was privately performed by the Stage Society *The Madras House* (1909) was produced by the Frohman Repertory company at the Duke of York's theatre in 1910, and a revised version of it was revived in 1925.

By 1910 he had given up acting, but until 1914 produced plays

in London, including two by Shakespeare upon a platform stage with "conventional" decoration. He was as great an innovator in stage décor as he had been in the production of new plays Again his experiments were the forerunners of a movement which has since had greater developments After the World War he prepared an important series of translations, in collaboration with Helen Granville-Barker, of Spanish plays, the most successful of which on the English stage, was *The Kingdom of God,* by G. Martinez Sierra. He published various other works, including *The Exemplary Theatre* (1922), dramatic criticism, also translations of several foreign authors

GRAPE, the fruit of the vine (*q.v.*) For the projectile called "grape" or "grape-shot."

GRAPEFRUIT, the common name for the globular or oblate fruit of *Citrus decumana,* a tree closely related to the orange and lemon (*qq.v.*) The pear-shaped varieties of this fruit are known as shaddocks. The grapefruit often grows in bunches (whence the name) and the individual fruits are usually from 4 in. to 6 in. in diameter The rind is yellow, the pulp, which has an acid, slightly bitter flavour, resembles that of a lemon in appearance It is cultivated in the West Indies and the United States, where it has long been used as a breakfast and dessert fruit, but more and more extensively since about 1900, when its cultivation was introduced into Florida and California More recently it has become increasingly consumed in Europe, in the United Kingdom between 1920 and 1924 the imports multiplied sixfold Florida is the principal source, her production in 1923–24 being about eight million boxes, as against 1,061,500 in 1909 California ranks second, with a production in 1924 of about 600,000 boxes. Of the fruit consumed in the United Kingdom 72% comes from the United States, 3% from other foreign countries, and the remaining 25% from British Dominions, chiefly the West Indies and South Africa.

For the cultivation of this fruit, *see* FRUIT FARMING.

GRAPE-HYACINTH, the name given to certain species of *Muscari,* a genus of the lily family (Liliaceae), comprising about 40 species, natives chiefly of the Mediterranean region They are small bulbous plants with narrow fleshy basal leaves and small usually blue urn-shaped or globose flowers, nodding or pendulous in a more or less dense cluster terminating a single flowering stem (scape) The common grape-hyacinth (*M botryoides*), called also grape-flower, baby's-breath and blue-bells, widely cultivated in gardens, is native to southern Europe and western Asia and has run wild in meadows and thickets in the eastern United States It has narrow erect leaves, about as long as the flower-stalk, which usually grows from 4 in. to 12 in. high, bearing at the top about 12 globose blue, or in some varieties white, faintly-scented flowers, about ⅛ in. long, crowded in a cluster. The starch grape-hyacinth (*M racemosum*), native to Europe and found in sandy fields in England and Scotland, has become naturalized from gardens in the eastern United States It grows about a foot high, and bears very narrow, almost cylindrical, recurved leaves and numerous starchy-scented, urn-shaped blue flowers in a dense raceme. Various other species are more or less cultivated



BY COURTESY OF WILD FLOWER PRESERVATION SOCIETY

GRAPE HYACINTH (MUSCARI RACEMOSUM), A BLUE FLOWERED HERB, FOUND IN EARLY SPRING IN SOUTHERN EUROPE AND THE NORTHEASTERN UNITED STATES

GRAPE-SUGAR: *see* GLUCOSE, CARBOHYDRATES and SUGAR

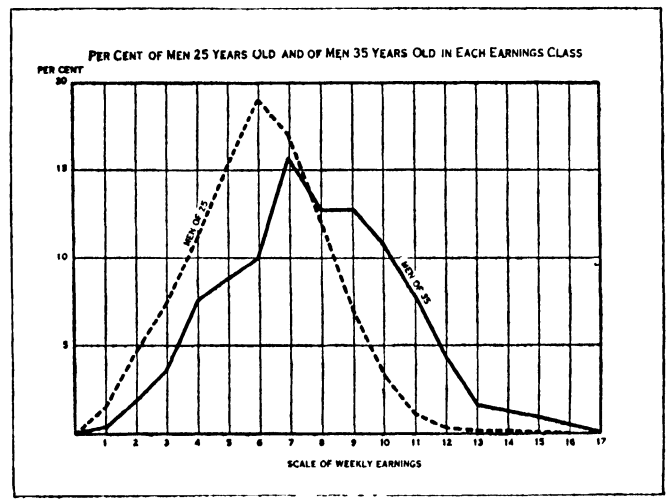
GRAPHIC METHODS IN MATHEMATICS. It is often found helpful to devise some scheme to show to the eye the relations between the different quantities involved in certain mathematical and statistical problems In the simplest cases, the purpose of such "graphic methods" is merely to present the results of mathematical or statistical analysis For instance, in the *Statistical Atlas of the United States,* the census statisticians use various graphic devices to make readily available to others important results such as the average number of persons per square mile in various States or counties

The selection from a mass of statistical work of the results that are to be shown graphically, and the determination of the best statistical device for each case, are tasks which require both close familiarity with the details of the work and a broad view of the problems in which the results may be significant and of the mental attitude of those who will use the results Graphic presentation, if it is attempted at all, should be regarded as the culmination of a statistical study and not as an incidental diversion

Graphic Methods As an Aid to Thinking.—In some cases graphic methods are much more than a vehicle for conveying information Without their aid it is difficult to formulate the ideas which underlie many investigations of complicated quantitative relations, or to carry through the various steps of the investigation The ordinary graph, obtained by plotting on coordinate paper various values of one quantity against corresponding values of another quantity, has become so familiar that we sometimes use it without realizing it For instance, consider the following (hypothetical) description of the relation between average wages and term of service in a certain company:

"On the average, wages rise, though at a decreasing rate, until about the tenth or twelfth year of service, and then flatten out, except for workmen appointed to supervisory positions Salaries, on the other hand, continue to rise at a pretty uniform rate until the twentieth or twenty-fifth year of service, after which the averages are based on too few cases to establish a trend"

While no graph is mentioned specifically, this statement would hardly be made except with the graph of earnings as a function



AN EXAMPLE OF GRAPHICAL METHODS SHOWING HOW STATISTICAL DATA ARE SO REPRESENTED THAT THE COMPARISON BETWEEN TWO RELATED VALUES CAN BE SEEN AT A GLANCE

PERCENTAGE DISTRIBUTION

Earnings scale	Men of 25	Men of 35	Earnings scale	Men of 25	Men of 35
1	1.5	0 4	9	6 9	12 7
2	4 6	1.8	10	3 2	10 7
3	7 4	3 6	11	1 1	7 7
4	11 1	7 5	12	0.3	4 3
5	15 3	8 8	13	0 2	1.6
6	19 0	10 0	14	0 2	1.2
7	17 0	15 6	15	0 1	0 9
8	12.1	12 7	16		0 5

of years of service definitely pictured in the mind of the writer, and would not be understood except with the same graph pictured in the mind of the reader

As a second illustration of the use of graphic devices as an aid to thought, consider the graphs of frequency distributions, as constructed by statisticians The accompanying diagram, for instance, compares the percentage distribution according to weekly earnings of male wage-earners 25 years old and of those 35 years old, in a certain factory After inspection of these two frequency polygons, statements like the following may be made

(1) The earnings of different individuals of the same age differ considerably, therefore an average for any group is of little value

as an indication of the number below any particular standard of pecuniary well-being

(2) Relatively high earnings are more common among men of 35 than among men of 25; therefore a single distribution by earnings of men of all ages is inadequate to measure the extent to which earnings are large enough for needs, which obviously vary with age

(3) The earnings of men of 35 more frequently vary considerably from the most typical amount than do those of men of 25 There is no point on the scale at which as large a percentage of 35 year old men are concentrated as of 25 year old men at "6" or "7" on the scale

As these statements show, a diagram of this type provides a basis for beginning to think about the problems of variation which are the subject matter of statistical science In such cases the graph is an instrument whereby a real idea can be definitely formulated, made clear to others, and used for guidance in the solution of problems

Securing Approximate Numerical Results Rapidly.—On the basis of a limited number of paired values of the quantities x and y, obtained either by substitution in a formula or by observation of phenomena, a graph may be constructed by drawing a smooth curve through the points representing these paired values From the graph we may then read other pairs of values, thus avoiding additional observations or substitutions in the formula In many cases this process of graphic interpolation is much shorter than the processes which it replaces, though usually not as accurate

A variation of this scheme is to construct a scale on the basis of the given pairs of values Distances on this scale from an indicated starting-point are measured off proportional to the various values of y, and each such point on the scale is labelled with the value of x corresponding to the value of y This scale can then be used in further calculations, by estimating the values of x corresponding to points between those labelled If, for instance, y is the logarithm of x, the well-known properties of logarithms make it possible to perform multiplication or division by mechanical addition or subtraction on the logarithmic scale, or, better still, on two such scales combined in a slide rule (*See* CALCULATING MACHINES)

To show graphically a relationship among three quantities, as, for instance, that connecting the pressure, volume and temperature of a gas, we assign a series of values to one of the three quantities and plot on the same sheet the graphs of the resulting formulas connecting the other two quantities, each such graph being labelled to indicate the value of the first quantity to which it corresponds This method may be varied by using logarithmic or other scales in constructing the field on which the graphs are plotted The purpose in such cases is to facilitate plotting by reducing the graphs to straight lines or at least to simple curves

When a three-variable relationship has thus been plotted in a series of "contour lines," it is a simple and rapid process to read off approximately the value of one quantity corresponding to any specified values of the other two The process is often more simple and rapid if a nomographic or alinement chart is constructed (*see* NOMOGRAPHY) and that method can also take care of relationships involving four or more variables

While in general the aim of graphic methods of this type is merely to do simply and rapidly what could otherwise be done at the cost of more time and labour by arithmetic, algebra or measurement, in some cases the alternatives are so laborious as to be prohibitive For instance, graphic analysis makes clear the nature of the solution of certain differential equations which cannot be solved in terms of elementary functions In certain cases, moreover, mechanical methods whose basis is mainly graphic provide many of the numerical results which are the real reason for desiring to solve the differential equation

Limitations of Graphic Methods.—The unquestionable value of graphic methods if properly handled has been sometimes obscured by cases in which they have not accomplished the purpose intended as well as other methods, or more skilful use of graphic methods, would have done If a proposed method of presenting the results of a statistical investigation does not make the results clearer to the audience than if the results had been presented merely in words or in a table, the method should be discarded or improved If a proposed scheme for graphic computation is less accurate than is necessary or less rapid in actual use than other methods, the true friend of graphic methods will be the first to turn to some other mode of computation

A serious difficulty with graphic computations is the existence in most charts of regions in which the results have a larger margin of error than is acceptable If, for instance, a point is to be located by the intersection of two arcs, the location is accurate if the arcs are nearly perpendicular, but if they run in about the same direction, a slight error in one of the radii or one of the centres will shift the point of intersection to a much greater extent This difficulty can sometimes be avoided by using a second chart modified by change of scale or otherwise so as to shift the region of inaccuracy The careful maker and user of charts always bears in mind this possibility of serious error, and determines the probable size of such errors, either by experiment or by analysis of his methods and formulas (*See* PROBABILITY AND ERROR; STATISTICS)

See J Lipka, *Graphical and Mechanical Computation* (New York, 1918), R W Burgess, *Introduction to the Mathematics of Statistics* (Boston, 1927) (R W B)

GRAPHITE, a mineral species consisting of the element carbon crystallized in the rhombohedral system Chemically, it is thus identical with the cubic mineral diamond, but between the two there are very wide differences in physical characters Graphite is black and opaque, whilst diamond is colourless and transparent; it is one of the softest (H = 1) of minerals, and diamond the hardest of all, it is a good conductor of electricity, whilst diamond is a bad conductor The specific gravity is 2 2, that of diamond is 3 5 Further, unlike diamond, it never occurs as distinctly developed crystals, but only as imperfect six-sided plates and scales There is a perfect cleavage parallel to the surface of the scales, and the cleavage flakes are flexible but not elastic The material is greasy to the touch, and soils everything with which it comes into contact The lustre is bright and metallic In its external characters graphite is thus strikingly similar to molybdenite

The name graphite, given by A G Werner in 1789, is from the Greek γράφειν, "to write," because the mineral is used for making pencils Earlier names, still in common use, are plumbago and black-lead, but since the mineral contains no lead these names are singularly inappropriate Plumbago (Lat *plumbum,* lead) was originally used for an artificial product obtained from lead ore, and afterwards for the ore (galena) itself, it was confused both with graphite and with molybdenite The true chemical nature of graphite was determined by K W Scheele in 1779

Graphite occurs mainly in the older crystalline rocks—gneiss, granulite, schist and crystalline limestone—and also sometimes in granite, it is found as isolated scales embedded in these rocks, or as large irregular masses or filling veins It has also been observed as a product of contact-metamorphism in carbonaceous clay-slates near their contact with granite, and where igneous rocks have been intruded into beds of coal, in these cases the mineral has clearly been derived from organic matter The graphite found in granite and in veins in gneiss, as well as that contained in meteoric irons, cannot have had such an origin As an artificial product, graphite is well known as dark lustrous scales in grey pig-iron, and in the "kish" of iron furnaces; it is also produced artificially on a large scale, together with carborundum, in the electric furnace (*see* below) The graphite veins in the older crystalline rocks are probably akin to metalliferous veins and the material derived from deep-seated sources; the decomposition of metallic carbides by water and the reduction of hydrocarbon vapours have been suggested as possible modes of origin Such veins often attain a thickness of several feet, and sometimes possess a columnar structure perpendicular to the enclosing walls, they are met with in the crystalline limestones and other Laurentian rocks of New York and Canada, in the gneisses of the Austrian Alps and the granulites of Ceylon Other localities which have yielded the mineral in large amount are the Alibert mine in

Irkutsk, Siberia, the Borrowdale mine in Cumberland and the Santa Maria mines of Sonora, Mexico

Graphite is used for the manufacture of pencils, dry lubricants, grate polish, paints, crucibles and for foundry facings The material as mined usually does not contain more than 20 to 50% of graphite the ore has therefore to be crushed and the graphite floated off in water from the heavier impurities Even the purest forms contain a small percentage of volatile matter and ash The Cumberland graphite, which is especially suitable for pencils, contains about 12% of impurities. (L J S)

Artificial Manufacture.—The alteration of carbon at high temperatures into a material resembling graphite has long been known In 1893 Girard and Street patented a furnace and a process by which this transformation could be effected Carbon powder compressed into a rod was slowly passed through a tube in which it was subjected to the action of one or more electric arcs E G Acheson, in 1896, patented an application of his carborundum process to graphite manufacture, and in 1899 the International Acheson Graphite Co was formed, employing electric current from the Niagara Falls Two procedures are adopted (1) graphitization of moulded carbons, (2) graphitization of anthracite *en masse* The former includes electrodes, lamp carbons, etc Coke, or some other form of amorphous carbon, is mixed with a little tar, and the required article moulded in a press or by a die The articles are stacked transversely in a furnace, each being packed in granular coke and covered with carborundum At first the current is 3,000 amperes at 220 volts, increasing to 9,000 amperes at 20 volts after 20 hours In graphitizing *en masse* large lumps of anthracite are treated in the electric furnace A soft, unctuous form results on treating carbon with ash or silica in special furnaces, and this gives the so-called "deflocculated" variety when treated with gallotannic acid These two modifications are valuable lubricants The massive graphite is very easily machined and is widely used for electrodes, dynamo brushes, lead pencils and the like

See "Graphite," *Imperial Mineral Resources Bureau* (London, 1923), F Cirkel, *Graphite* (Ottawa, 1907) (W G M)

GRAPHS: *see* Statistics and Graphs

GRAPPA, MONTE, a mountain or rather mountainous group between the rivers Brenta and Piave (Italy), which was the scene of extremely heavy fighting during the World War (*q v*) between November 1917 and October 1918

GRAPTOLITES, a group of organisms now extinct, from the fossil remains of which it is impossible to state with certainty what they were, though it is usually considered that they were Coelenterata (*q v*) The remains are found, often in great abundance, in Palaeozoic rocks They begin in the Cambrian strata and die out in the Devonian They occur for the most part as flattened carbonized films in shales or mudstones which were deposited in the Palaeozoic seas, but sometimes they occur in limestone, in which case the skeleton may retain its original nature This was composed of chitinous (horny) material, and in the case of specimens embedded in limestone the matrix can be dissolved away, leaving it in a suitable condition for examination

The general appearance of graptolites is that of rods or twigs which may be branched or simple, or of leaf-like or cone-like structures One or both margins of each twig are regularly toothed or serrate These remains represent the common skeleton of a colony of small animals which were linked together by a stalk, and each tooth along the notched edge of the skeleton marks the site of a small skeletal cup which during life contained one individual of the colony The general effect of a graptolite skeleton is similar to that of some of the modern hydroids (*see* Hydrozoa), but the two structures are not fully comparable and there is no conclusive reason for supposing that the graptolites were hydroids

In a graptolite such as *Dimorphograptus* (fig 1, A) the skeleton consists of a small helmet-like structure (the *sicula*), from the apex of which there extends a long hollow thread (the *nema*) On either side of this thread, and enclosing it, lies the main part of the skeleton, consisting of a row of cups (*thecae*) on each side, linked up by a common canal In the part nearest to the sicula, however, there is only one row of cups The sicula is the skeleton of the individual which originally founded the colony, and the later individuals inhabiting the thecae were produced from this by budding, it is a hollow cone consisting of a delicate apical portion continuous with the nema, and of a stronger proximal part which is prolonged into a spine pointing in the opposite direction from the nema A sicula with the first few thecae of the colony of a similar form is shown enlarged in fig 1, B

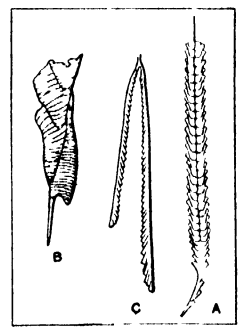
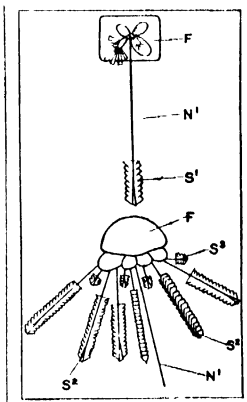


FIG 1.—THE STRUCTURE OF GRAPTOLITES AS DEDUCED FROM SKELETAL REMAINS FOUND IN THE PALAEOZOIC ROCKS

A Portion of a graptolite with a double two of thesae (*Dimorphograptus*), the sicula here is at the lower end of the figure B A much enlarged sicula of *Monograptus* C *Didymograptus*, the sicula is at the upper end of the figure, where the two branches meet

Other graptolites differ from *Dimorphograptus* in a variety of ways The general form of the colony may be quite unlike that of the one illustrated The degree and mode of branching also varies, as well as the shape and arrangement of the thecae and the manner in which they are related to the sicula In *Didymograptus*, for instance (fig 1, C), there are two branches united at the sicula-end, with a single row of thecae on each, and the mouth of the sicula points in the same direction as do those of the thecae Certain graptolites have been found in which a number of stems bearing siculae and thecae radiate from a central body to which they are attached A complex system such as this was founded by a single sicula from which at first grew a single theca-bearing stem, this was attached at the end farther from the sicula to a little square plate which after a time became a vesicle and probably served as a float for the colony (fig 2, A) Round the end of the first stem, where it was attached to the float, grew short stalks, each of which was enclosed in a protective capsule and which produced a number of siculae, some of these became free from the stalk and went away to found new colonies, others grew *in situ* into theca-bearing stems and in this manner gave the parent system its radial structure (fig 2)



FROM SWINNERTON, 'PALAEONTOLOGY' (EDWARD, ARNOLD & CO.)

FIG 2.—TWO STAGES IN FORMATION OF COMPLEX GRAPTOLITE SYSTEM

F float, N¹ stem of first sicula, S¹ first sicula; S², S² siculae of successive generations

It is impossible to deal in so short an article with the evolution of the graptolites, but it may be stated that a good deal is known about the main changes which took place during the history of the group From branched forms there arose by reduction unbranched kinds, the direction of the outgrowth of thecae from the sicula was originally that of *Didymograptus*, and became converted by degrees into the state of affairs found in *Dimorphograptus*, the shape and relation to one another of the thecae showed progressive changes in various stocks, and so on The knowledge which has been gained of the direction of evolution in graptolites collected from series of strata of known succession has proved extremely useful in determining the succession of deposits which contain a similar series of graptolites whose succession was not known

We do not know what habit of life was adopted by the graptolites, many of them appear to have been pelagic organisms but others may have been attached to foreign surfaces in one way or another

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GRASLITZ: *see* Kraslice

GRASMERE, village, urban district, and lake of Westmorland, in the heart of the English Lake District Pop (1921) 1,173 The village lies near the head of the lake, on the river Rothay and the Keswick-Ambleside road, 12½ m from Keswick

and 4 from Ambleside. The scenery is very beautiful; the valley of Grasmere and Rydal Water is well wooded, while on its eastern flank there rises boldly the range of hills which includes Rydal Fell, Fairfield and Seat Sandal, and, farther north, Helvellyn. On the west side are Loughrigg Fell and Silver How. The village has become a favourite centre for tourists, but preserves its picturesque and sequestered appearance. In a house still standing William Wordsworth lived from 1799 to 1808, and it was subsequently occupied by Thomas de Quincey and by Hartley Coleridge Wordsworth's tomb, and also that of Coleridge, are in the churchyard of the ancient church of St. Oswald, which contains a memorial to Wordsworth with an inscription by John Keble. A festival, procession and general holiday are held on Aug 5 This festival of the Rushbearing is of ancient origin Grasmere is also noted for an athletic meeting in August.

The lake of Grasmere is just under 1 m in length, and has an extreme breadth of 766 yards. A ridge divides the basin from north to south, and forms an island about the middle

GRASS AND GRASSLAND. Since the grasses (*q v*) constitute one of the most widespread of flowering plants on most farms, the land not actually cultivated will either be in grass or will revert naturally to grass in time if left alone. This pasture land has always been an important part of the economy of the farm; but with the advent of "cheap corn" its importance has been increased, and much more attention has been given to the study of the different species of grass, together with their characteristics and the improvement of a pasture generally, as well as to the "laying down" of arable land to grass where tillage farming has not paid Since the World War many of the scientific institutions connected with agricultural research (*q v*) have therefore been engaged in experimenting with, and developing, individual pasture plants or pastures as a whole The improvement of pasture lands has been followed by a corresponding increase of live stock of all kinds, coupled with a reduction in the working expenses as compared with arable farming

GREAT BRITAIN

Even on wholly arable farms there are usually certain courses in the rotation of crops devoted to grass (or a corresponding leguminous crop, such as clover) Thus the Norfolk four-course rotation is corn, roots, corn, clover, the Berwick five-course is corn, roots, corn, grass, grass, the Ulster eight-course, corn, flax, roots, corn, flax, grass, grass, grass; and so on, to the point where the grass remains down for five years, or is left indefinitely

Permanent grass may be grazed by live stock and classed as pasture pure and simple, or it may be cut for hay In the latter case it is usually classed as "meadow" land, and often forms an alluvial tract alongside a stream, but as grass is often grazed and hayed in alternate years, the distinction is not a hard and fast one Two classes of pasturage, however, temporary and permanent, may be distinguished But the latter again consists of two kinds, the permanent grass natural to land that has never been cultivated, and the pasture that has been laid down artificially on land previously arable and allowed to remain and improve itself in the course of time Thus, the existence of ridge and furrow on many old pastures in Great Britain shows that they were cultivated at one time

Often a newly laid down pasture will decline markedly in thickness and quality about the fifth and sixth year, and then begin to thicken and improve year by year afterwards This is usually attributed to the fact that the unsuitable varieties die out, and the "naturally" suitable varieties only come in gradually This trouble can be largely prevented, however, by a judicious selection of seed, and by subsequently manuring with phosphatic manures, with farmyard or other bulky "topdressings," or by feeding sheep with cake and corn over the field.

Grasses and Clovers.—All the grasses proper belong to the natural order *Gramineae*, to which order also belong all the "corn" plants cultivated throughout the world, also many others, such as bamboo, sugar-cane, millet, rice, etc, etc, which yield food for mankind Of the grasses which constitute pastures and hayfields, over 100 species are classified by botanists, with many varieties in addition, but the majority of these, though often forming a part of natural pastures, are worthless or inferior for farming purposes The grasses of good quality which should form a "sole" in an old pasture and provide the bulk of the forage on a newly laid down piece of grass are only about a dozen in number (*see* below), and of these there are only some six species of the very first importance and indispensable in a "prescription" of grass seeds intended for laying away land in temporary or permanent pasture. Dr W. Fream caused a botanical examination to be made of several of the most celebrated pastures of England, and, contrary to expectation, found that their chief constituents were ordinary perennial rye-grass and white clover. Many other grasses and legumes were present, but these two formed an overwhelming proportion of the plants.

In ordinary usage the term grass, pasturage, hay, etc., includes many varieties of clover and other members of the natural order *Leguminosae* (*q v.*) as well as other "herbs of the field," which, though not strictly "grasses," are always found in a grass field, and are included in mixtures of seeds for pasture and meadows The following is a list of the most desirable or valuable agricultural grasses and clovers, which are either actually sown or, in the case of old pastures, encouraged to grow by draining, liming, manuring and so on —

Grasses

Alopecurus pratensis	Meadow foxtail
Anthoxanthum odoratum	Sweet vernal grass
Arrhenatherum avenaceum	Tall oat-grass
Avena flavescens	Golden oat-grass
Cynosurus cristatus	Crested dogstail
Dactylis glomerata	Cocksfoot
Festuca duriuscula	Hard fescue.
Festuca elatior	Tall fescue.
Festuca ovina	Sheep's fescue
Festuca pratensis	Meadow fescue.
Lolium italicum	Italian rye-grass
Phleum pratense	Timothy or catstail
Poa pratensis	Smooth meadow-grass
Poa trivialis	Rough meadow-grass

Clovers, etc

Medicago lupulina	Trefoil or "Nonsuch."
Medicago sativa	Lucerne (Alfalfa).
Trifolium hybridum	Alsike clover
„ pratense	Broad red clover.
„ pratense, perenne	Perennial clover.
„ incarnatum	Crimson clover or "Trifolium."
„ procumbens	Yellow Hop-trefoil
„ repens	White or Dutch clover.
Achillea millefolium	Yarrow or Milfoil
Anthyllis vulneraria	Kidney vetch
Lotus major	Greater Birdsfoot Trefoil.
Lotus corniculatus	Lesser „ „
Carum petroselinum	Field parsley
Plantago lanceolata	Plantain
Cichorium intybus	Chicory
Poterium officinale	Burnet

The predominance of any particular species is largely determined by climatic circumstances, the nature of the soil and the treatment it receives In Great Britain, in limestone regions sheep's fescue has been found to predominate; on wet clay soil the dog's bent (*Agrostis canina*) is common; continuous manuring with nitrogenous manures kills out the leguminous plants and stimulates such grasses as cocksfoot; manuring with phosphates stimulates the clovers and other legumes, and so on.

The Best Grasses.—As to the best kinds of grasses to sow in making a pasture out of arable land, experiments at Cambridge, England, have demonstrated that of the many varieties offered by seedsmen only a very few are of any permanent value A complex mixture of tested seeds was sown, and after five years an examination of the pasture showed that only a few varieties survived and made the "sole" for either grazing or forage. These varieties in the order of their importance were.—

Cocksfoot	26
Perennial rye-grass	16
Meadow fescue	13
Hard fescue	9
Crested dogstail	8

Timothy	6
White clover	4
Meadow foxtail	2

The figures represent approximate percentages

Before laying down grass it is well to examine the species already growing round the hedges and adjacent fields An inspection of this sort will show that the Cambridge experiments are very conclusive, and that the above species are the only ones to be depended on Occasionally some other variety will be prominent, but if so there will be a special local reason for this On the other hand, many farmers when sowing down to grass like to have a good bulk of forage for the first year or two, and therefore include several of the clovers, lucerne, Italian rye-grass, evergreen rye-grass, etc , knowing that these will die out in the course of years and leave the ground to the more permanent species

There are also several mixtures of "seeds" (the name given in agriculture to grass seed mixtures) which have been adopted with success in laying down permanent pastures in some localities

	Young	De Laune	Leicester	Elliot	Cambridge average	General purpose mixture
Cocksfoot		8	4	8	8	4
Perennial rye-grass			2		6	10
Meadow fescue		6	2		5	
Hard fescue		1	1	2	3	
Crested dogstail	3	2		1	3	
Timothy		3	1		2	2
Meadow foxtail		10			1	1
Tall fescue		3	1	3½		2
Tall oat-grass			1	3		
Italian rye-grass			2			5
Smooth meadow-grass				1		
Rough meadow-grass		1		1		
Golden oat-grass			¼	1		
Sheep's fescue		1				
Broad red clover		1				2
Perennial red clover		1		1½		2
Alsike		1	1½	1		2
Lucerne (alfalfa)						8
White clover	4	1	1	2	2	2
Kidney vetch	6			2½		
Sheep's parsley				1		
Yarrow	1	1	¼	1		
Burnet	8			8		
Chicory	4			2½		
Plantain	4					
Total lb per acre	30	40	17	40	30	40

Arthur Young more than 100 years ago made out a mixture to suit chalky hillsides; Faunce de Laune (Sussex) in more recent times was the first to study grasses and advocated leaving out rye-grass of all kinds; Lord Leicester adopted a cheap mixture suitable for poor land with success; Mr Elliot (Kelso) introduced many deep-rooted "herbs" in his mixture with good results Typical examples of such mixtures are given above

Temporary Pastures.—These are commonly resorted to for rotation purposes, and in these the bulky fast-growing and short-lived grasses and clovers are given the preference Three examples of temporary mixtures are given below:—

	One year	Two years	Three or four years
Italian rye-grass	14	10	6
Cocksfoot	2	4	6
Timothy	.	2	3
Broad red clover	8	5	3
Alsike	3	2	2
Trefoil	3	2	2
Perennial rye-grass		5	10
Meadow fescue		2	2
Perennial red clover		2	2
White clover		1	2
Meadow foxtail		1	2
Total lb per acre	30	36	40

Where only a one-year hay is required, broad red clover is often grown, either alone or mixed with a little Italian rye-grass, while other forage crops, like trefoil and trefolium, are often grown alone.

In recent investigations wild White clover—botanically similar to ordinary White Dutch clover (which is usually included in grass seed mixtures)—has come very much to the front, and now a small amount (from half to a whole pound) of seed per acre is often included in those mixtures intended to remain down for several years It improves the feeding "quality" of pastures very much, does not die out in a year or two, and enriches the soil with nitrogenous compounds, so that if and when the grass land is ploughed up for corn growing again after a few years, the fertility is greatly improved Several other varieties of clover are also being experimented with besides those mentioned in the above prescriptions, such as Montgomeryshire late flowering red clover, Cornish "marl-grass," subterranean clover and so on, while many grasses are also being further developed.

Fertilizers.—Apart from the selection and improvement of the individual plants which compose a pasture or hay field there is the general treatment by manuring The grazing of land for generations by live stock, and the continuous selling off of beef, mutton, wool, milk, etc , reduces the fertility of the soil, and so in most cases a return in the shape of manure is desirable The older and more usual way of renovating the fertility of grasslands was to feed the cattle or sheep thereon with an allowance of feeding cakes or corn of some sort This enriched their manure and so helped to keep up the fertility of the land, but it has now been repeatedly demonstrated that judicious chemical manuring of either an old or a new grass field can increase the crop yield immensely (*See* FERTILIZERS and FEEDING STUFFS)

The most suitable chemicals are those of a phosphatic nature such as basic slag, North African phosphate, bone superphosphate, etc The effect of these has been most satisfactory in the great majority of cases, when applied at the rate of from four to ten cwt per acre, and repeated at intervals of, say, five years On the lighter class of soils an addition of a potassic manure has often helped to get good results. In the Rothamsted experiments continuous manuring with "mineral manures" (no nitrogen) on an old meadow has reduced the grasses from 71 to 64% of the whole, while at the same time it has increased the *Leguminosae* from 7% to 24% On the other hand, continuous use of nitrogenous manure in addition to "minerals" has raised the grasses to 94% of the total and reduced the legumes to less than 1%.

Besides manuring so as to increase the yield of food, and thus enable more live stock to be carried, there have been introduced better methods of grazing It has been found that if a pasture is allowed to run to seed there is a loss in food economy, the stalks and seeds being of inferior value, to prevent the development of these the land should be heavily stocked so as to keep the grass grazed well down, and thus fresh leafy growth is encouraged instead of seed stalks. An old pasture is liable to show rough growth in spots which the animals do not readily eat over, such parts are improved by cutting over with a mowing machine, while extra phosphatic top-dressing should be applied thereto

Rotation Grazing.—A rotation of grazing is also an improved method, whereby the stock is moved from field to field, so that each field is hard grazed in turn and then shut up till a fresh lot of leaves spring up Some investigators in this line have divided up their fields into small paddocks to be grazed in rotation, while an intensive form of this principle has long been practised in the Channel Islands, Denmark, and to a less extent in some other European countries. This consists in tethering the animals to be grazed singly to pegs or corkscrew pins fixed in the ground, with an allowance to each of several yards of rope or chain attached to a neck-band Each animal eats off a circular patch of grass very closely, and is then moved on to a fresh spot It involves a large amount of personal attention on the part of attendants as compared with ordinary grazing, but on the other hand the growth of the grass is controlled and made the most of

In Great Britain a heavy clay soil is usually preferred for

pasture, both because it takes most kindly to grass and because the expense of cultivating it makes it unprofitable as arable land when the price of corn is low On light soil the plant frequently suffers from drought in summer, the want of moisture preventing it from obtaining proper root-hold On such soil the use of a heavy roller is advantageous, and indeed on any soil except heavy clay frequent rolling is beneficial to the grass, as it promotes the capillary action of the soil-particles and the consequent ascension of ground water In addition the grass on the surface helps to keep the moisture from being wasted by the sun's heat. Frequent harrowing on heavy clay soil is also beneficial

The graminaceous crops of western Europe generally are similar to those enumerated Elsewhere in Europe are found certain grasses, such as Hungarian brome, which are suitable for introduction into the British Isles The grasses of the American prairies also include many plants not met with in Great Britain. Some half-dozen species are common to both countries. Kentucky "blue-grass" is the British *Poa pratensis;* couch grass (*Triticum repens*) grows plentifully without its underground runners, bent (*Agrostis vulgaris*) forms the famous "red-top," and so on But the American buffalo-grass, the Canadian buffalo-grass, the "bunch" grasses, "squirrel-tail" and many others which have no equivalents in the British Isles, form a large part of the prairie pasturage There is not a single species of true clover found on the prairies, though cultivated varieties can be introduced

The separate articles on HAY, LUCERNE (Alfalfa), CLOVER and CLOVER CULTIVATION, etc , may be consulted as well as ROTATION OF CROPS, CULTIVATION, WEED DESTRUCTION, etc For grass cultivation of lawns and playing greens, *see* GREENS

(P McC)

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UNITED STATES

In the United States, the region from 95° W to the foothills of the Rocky mountains was originally occupied by native grasses This almost treeless area which extends northward to Saskatchewan and Alberta is still occupied by native grasses, except where it has been placed under cultivation. The eastern part of this belt, including Iowa and Illinois, has an annual rainfall of 20 to 30 in and is largely cultivated; tall native grasses are replaced by others, mostly European The most extensive of the smaller areas of natural grassland are between the Rocky mountains and Pacific coast ranges In arctic northern Canada and Alaska the grazing lands or tundra, mostly of mosses and lichens, with a few hardy summer grasses and woody plants, are useful only for reindeer and wild animals

In South America are several well defined, extensive grass areas In the central plateau are two large natural grasslands, the Orinoco *llanos* (Venezuela) and the Argentine *pampas* In the higher sections of eastern and southern Brazil is considerable grassland between forests Many introduced species have somewhat replaced the native grasses

Mexico and Central America have no well defined extensive grasslands

Meadows and Hay Plants.—In humid regions the meadows or hay fields are largely seeded to tame grasses or mixtures of grasses and legumes Mixtures ordinarily yield better and more palatable hay than pure cultures and they are preferred because production is more uniform and permanent with both short and long lived plants, loss through insects, disease and climate is less, inclusion of some low-growing, turf-forming grasses with the taller species results in much better pasture if the aftermath is grazed or if the meadow is converted into a pasture, legumes stimulate growth and probably increase the protein content of the grasses

The number of seed mixtures for meadows is legion Generally, however, complex mixtures are not popular in America and consequently there is less justification for complexity in mixtures for meadows than for pastures Where hay is the crop and plants of varying habits are represented in the mixture they must mature at approximately the same time. Reliable mixtures (1) the standard for north-east United States and south-east Canada, timothy and red clover, sometimes with alsike clover and redtop added For low, wet lands, redtop and alsike alone, (2) in the southern part of the above region where timothy does not succeed, particularly on dry uplands, orchard grass, tall oat grass and alsike are best; (3) in the semiarid or subhumid regions farther west, brome grass (*Bromus inermis*) and slender wheat grass (*Agropyron tenerum*) are most reliable, and where alfalfa thrives it should be included

Hay Plants.—Timothy is a good hay plant, but nearly all timothy and clover hay are from rotations The most common of these is corn, oats, wheat, followed by two years of timothy and clover, these being sown in the wheat The usual rate of seeding is timothy, 12 lb ; red clover, 8 pounds When alsike and redtop are added the quantities are 2 and 4 lb , respectively.

In the Gulf States the principal hay is Johnson grass (*Sorghum halepense*). On rich, black soils it usually grows spontaneously, excluding other plants Because of the difficulty of eradicating it, it is rarely seeded intentionally Mixtures of Johnson grass and clover or other legumes are impractical except when the meadow is plowed up to stimulate a renewed growth.

In the central West and on irrigated lands in the more arid western States, alfalfa is the chief and often the only hay crop. It is also the main one in Argentine Where alfalfa succeeds well there is no other hay plant so productive and generally desirable It is very palatable and nutritious and several cuttings may be made yearly. Seeding should be on well prepared soil at 15 to 25 lb per acre

On the Pacific coast and in some interior localities cereal crops (wheat, oats, barley and rye) are often cut for hay. Certain annual grasses and legumes are also important Among these are millets, sorghum, Sudan grass, cowpeas, soybeans, vetches and field peas. Of the hay harvested in the United States in 1919, 26% was timothy, 19% alfalfa, 17% clovers, 16% native or wild plants, 5% sorghums and Sudan grass, all other hay plants produced 17% Since 1919 timothy has declined and alfalfa has increased in importance

Fertilizers.—The use of fertilizers on meadows in the humid region is undoubtedly warranted, although where hay is part of a general rotation the grain crops are usually fertilized In this way the grass benefits only from the residual effect The average yield of meadows in north-east United States and south-east Canada is about 1 3 tons per acre With fertilizers, yields of 2 5 to 4 tons per acre have been maintained for years Nitrogen fertilizers alone encourage grasses at the expense of legumes and should rarely be used indefinitely on a mixed meadow without phosphate and potash Brooks recommends for hay meadows. nitrate of soda, 150 to 250 lb ; basic slag meal, 300 to 400 lb , high grade sulphate of potash, 75 to 100 pounds On peat and certain sandy soils potash is particularly effective On clay or loam of moderate fertility where clover is in the mixture, phosphate of some kind is almost essential For alfalfa, soil acidity is corrected by lime.

Pastures and Pasture Plants.—Pastures are land areas covered with grass and other plants for grazing Until the last decade American agricultural agencies devoted little study to them In the United States about 55% of all land is used for grazing Of this 1,055,000,000 ac , only a little less than one-tenth is arable land in rotation or permanent pastures like those of the British Isles and western Europe The remainder is arid grassland and desert shrub-land too dry for cultivation, or forest and cut-over or burned-over land not suited for pastures until improved Probably 50% of the sustenance of American live stock is obtained from pastures Generally American pasture feed costs approximately one-eighth as much as that from harvested crops Pastures are valuable also on hillside lands in preventing soil erosion True grasslands comprise improved and natural pastures (called ranges when extensive) The acreage of natural pastures is about ten times that of the tame, but their unit carrying capacity is only one-fifth as great They are mostly in the western half of the United States, excluding, however, the Pacific slope. In the

semiarid or Great Plains region are the "short grasses," the most important of which are buffalo (*Buchloe dactyloides*), and grama grasses (*Bouteloua sp.*) in the north and the grama grasses and mesquite (*Hilaria sp*) in the south Mixed with these are taller needle grasses (*Aristida sp*), and some bluestem (*Andropogon sp*), and wheat-grass (*Agropyron sp*). Farther west in the more arid sections are bunch grasses, mostly wheat-grass, fescue and brome with some salt grasses in alkaline areas Humid south-eastern States still have native grasses, although practically all grassland in the eastern or humid section is made up of introduced grasses These natural pastures in the south-eastern States are mostly cut-over or burned-over forest lands now carpeted with the broom sedges (*Andropogon sp*) and panic and wire grasses

In 1925 about one-third of the arable land was in permanent pasture Probably ¼ to ½ of a farm of average size favourable to live stock could be profitably devoted to permanent pasture

Grasses.—The following discussion of pasture plants and seed mixtures applies to the humid regions Natural pastures in arid and semi-arid regions remain practically unimproved Probably 75% of pasture herbage is grasses (In common usage any fine-stemmed hay or pasturage plant such as clover, alfalfa, lespedeza and vetch, is called grass This, however, cannot be justified) In America north of Mexico there are some 1,500 species of true grasses Many of these are in natural pastures, but only a few are important, and in the improved pastures less than a dozen grasses are generally found These are in the order of their importance Kentucky bluegrass, Bermuda grass, timothy, red-top, Rhode Island bent, carpet grass, Canada bluegrass, orchard grass, Johnson grass and crab grass On well drained, fertile Northern soils, Kentucky bluegrass and white clover are predominant On wet soils in the interior, redtop and alsike clover are preferred to bluegrass and white clover Redtop and the other species of *Agrostis*, such as Rhode Island bent and creeping bent are also prominent on less fertile New England coastal soils Orchard grass thrives on drier and shaded soils, and in parts of Virginia is valued above Kentucky bluegrass and redtop South of Virginia, Bermuda grass is the premier pasture grass on uplands and on silt and clay coastal soils, while carpet grass is the best for moist sandy soils Both usually grow with lespedeza, or Japan clover Canada bluegrass grows mostly in southern Canada and northern United States on poorer soils Kentucky bluegrass is valued most on limestone soils which are also rich in phosphates, as in Kentucky

Legumes.—Include clovers, alfalfa, melilot, lespedeza, yellow trefoil, etc The most important of these for pasture are white, red and alsike clover and lespedeza These are almost always mixed with one or more grasses for grazing The first three are largely confined to the northern half of the region, although white clover thrives on better soil types even near the Gulf of Mexico Lespedeza (*Lespedeza striata*) is an annual which, however, reseeds itself and thus serves as a perennial Although introduced, it is abundant in uncultivated fields of all the southern States west to Texas and adds immeasurably to the summer pastures Bur clover and yellow trefoil, both species of Medicago, are useful southern winter legumes Alfalfa in pure stands is often pastured, especially with hogs, but it is not good for cattle and horses as it often causes bloat (hoven) Melilot or sweet clover is gaining favour as temporary pasture

Piper roughly estimates the relative value of the various pasture grasses and legumes as follows —Kentucky bluegrass, 35, white clover, 10, Bermuda grass, 8, timothy, 7, redtop, 7, red clover, 4, alfalfa, 4; Rhode Island bent, 4, carpet grass, 3, Alsike clover, 3, Canada bluegrass, 3, orchard grass, 2; Johnson grass, 2; Lespedeza, 2; crab grass, 2, all others, 2 While most of these are European there are several grasses considered of first importance in English pastures, such as Italian and perennial rye grasses which are seldom found in America

Pasture Mixtures.—Quick growing but less permanent grasses are often added to furnish pasturage while slower growing grasses are forming a turf The complex mixtures often recommended in England are not profitable in America Some mixtures that have been found satisfactory under various climatic and soil conditions for humid grasslands are as follows (the northern section includes that part of the United States north of the south boundaries of Virginia and Tennessee) —

	Northern section				Southern section	
	Well drained, fertile soils	Poor, upland soils	Heavy, wet soils in the interior	Sandy soils along the coast	Clay and silt soils	Moist, sandy or sandy loam soils
	Lb	Lb	Lb	Lb	Lb	Lb
Kentucky bluegrass	10					
Redtop	4	5	8	6		
Timothy	6		6			
Orchard grass (cocksfoot)	4	6				
Canada bluegrass		12				
Italian rye-grass	4		4			
Perennial rye-grass	4					
Meadow fescue			6			
Sheep's fescue		4		10		
Red fescue				6		
Meadow foxtail			4			
Bermuda grass					5	
Carpet grass						6-8
Dallis grass					4	4
White clover	2	3	2		2	2
Red clover	2			4		
Alsike clover			4	2		
Lespedeza or Japan clover					16	16
Yellow trefoil or black medic					5	
Total pounds per acre	36	30	34	28	32	28 30

In the Kentucky bluegrass region pasture will finally consist almost entirely of bluegrass, redtop, and white clover, with a sprinkling of orchard grass The timothy, Italian and perennial rye-grasses are added solely to provide abundant pasturage the first year The same gradual transformation will take place where Canada bluegrass is seeded, and on the sandy soils the fescues are likely to predominate In the South, Bermuda grass often excludes all other grasses and legumes on the heavy soils as does carpet grass on moist, sandy soils Lespedeza persists here more than either white clover or yellow trefoil Pastures of these grasses and lespedeza only are unproductive in winter and spring Therefore winter growing legumes like white clover and yellow trefoil must be encouraged Bur clover should be added, or grown in a supplementary pasture

Temporary pastures are more often of annual grasses and legumes than of perennials Sometimes the aftermath of a meadow (hayfield) is grazed for one or two months and the winter grains, wheat, rye and oats, are pastured a short time in late fall and winter Vetch and oat mixtures make excellent early spring pasture, and peanuts, cowpeas and soy beans are useful in summer wherever they will grow Among annual and biennial plants which make good temporary pasture are melilot (sweet clover), Sudan grass, and bur clover Sweet clover and Sudan grass are much grown in the Central West and are very productive Bur clover in the Gulf States is extremely useful because it is productive and nutritious in late winter and early spring

Fertilizers.—Feeding cotton-seed cake or grain in the pasture improves the grass, but it is well to scatter the manure yearly with a spike-tooth or drag harrow This method is inadequate and commercial fertilizers benefit pastures greatly and in most cases increase yields The element phosphorus is most often beneficial, and superphosphate (acid phosphate), rock phosphate or basic slag may be used Superphosphate at 100–300 lb per acre as a top-dressing gives the best results Nitrogen (nitrate of soda or sulphate of ammonia) at 100–150 lb per acre is effective Except on sandy soils muriate or sulphate of potash is rarely profitable, used with phosphate and nitrogen, however, it

seems often to increase yields. Phosphate fertilizers, especially with lime, markedly encourage legumes; while nitrogen stimulates grasses chiefly and usually decreases legumes in the herbage. Nitrate of soda, or sulphate of ammonia without phosphate, or both phosphate and potash at the same time or during the growing season are rarely to be recommended. (*See* FERTILIZERS and FEEDING STUFFS)

Systems of Grazing.—If enough animals are not available to prevent the grass from sending up culms or seed stalks the pasture should be mowed to encourage a new growth of fresh leaves Mowing also helps to control weeds and brush Top-dressing with phosphates or nitrogen after mowing will hasten recovery Pastures of turf-forming grasses like Kentucky bluegrass and carpet grass are injured more by light grazing than by heavy In the latter case the weedy grasses and other undesirable plants are kept down and the better grasses occupy all the soil Rotation grazing combined with frequent fertilizing, so effective in Germany and England, has not been tested in America. A comparison of alternate and continuous grazing on bluegrass pastures in Virginia showed very little advantage in the alternate grazing of two pastures In the West deferred and rotation grazing improves the natural bunch-grass pastures

Pasture Soils.—Like cultivated crops the grasses thrive best on the better soils Certain soils in Kentucky with an unusually high percentage of available phosphoric acid and calcium make fine pastures It is said that this bluegrass produces better horses and cattle than elsewhere Light sandy soils are perhaps the poorest for pasture, although good pastures are possible there with the development of such grasses as Southern carpet grass The ordinary pasture plants usually suffer from summer drought on sandy soils, and chemical fertilizers leach out quickly

See HAY, LUCERNE (Alfalfa), CLOVER; CLOVER CULTIVATION, ROTATION OF CROPS; CULTIVATION, WEED DESTRUCTION, GREENS

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GRASSE, FRANÇOIS JOSEPH PAUL, MARQUIS DE GRASSETILLY, COMTE DE (1722–1788), French sailor, was born at Bar (Alpes Maritimes) In 1734 he took service on the galleys of the order of Malta, and in 1740 entered the French service He took part in the American War of Independence, and fought at Dominica and Saint Lucia (1780), and Tobago (1781) He was defeated by Admiral Hood at St. Kitts, and in April 1782, defeated and taken prisoner by Admiral Rodney On his return to France, he published a *Mémoire justificatif*, and was acquitted by a court-martial (1784).

See Alexandre de Grasse, *Notice bibliographique sur l'amiral comte de Grasse d'après les documents inédits* (1840), G Lacour-Gayet, *La Marine militaire de la France sous le règne de Louis XV* (1902).

GRASSE, capital of an arrondissement, department of Alpes Maritimes (till 1860 in that of Var), France, 12½ m by rail N N W of Cannes Pop (1926) 12,241 From 1244 (when the see was transferred hither from Antibes) to 1790 it was an episcopal see, but was then included in the diocese of Fréjus till 1860, when the region was annexed to the newly formed department of the Alpes Maritimes It has a 12th century cathedral, now a simple parish church, and an ancient tower, of uncertain date, near the town hall, formerly the bishop's palace (13th century). The library contains the muniments of the abbey of Lérins, on the island of St Honorat opposite Cannes In the chapel of the old hospital are three pictures by Rubens Grasse is built in an amphitheatre at a height of 1,066 ft, on a south slope facing the Mediterranean It possesses a mild and salubrious climate, and is well supplied with water That used for the purpose of the factories comes from the fine spring of Foux But the drinking water used in the higher portions of the town flows, by a conduit, from the Foulon stream Grasse is particularly celebrated for its perfumery. Oranges and roses are cultivated abundantly in the neighbourhood. It is stated that the preparation of attar of roses (which costs nearly £100 per 2 lb) requires alone nearly 7,000,000 roses a year. It manufactures wax, soap and the finest quality olive oil There are a sub-prefecture and a tribunal of commerce.

GRASSES, a group of plants possessing certain characters in common and constituting a family (Gramineae) of the class Monocotyledons. It is one of the largest and most widespread and, from an economic point of view, the most important family of flowering plants No plant is correctly termed a grass which is not a member of this family, but the word is in common language also used, generally in combination, for many plants of widely different affinities which possess some resemblance (often slight) in foliage to true grasses; *e g*, knot-grass (*Polygonum aviculare*), cotton-grass (*Eriophorum*), rib-grass (*Plantago*), scorpion-grass (*Myosotis*), blue-eyed grass (*Sisyrinchium*), sea-grass (*Zostera*) The grass-tree of Australia (*Xanthorrhoea*) is a remarkable plant, allied to the rushes in the form of its flower, but with a tall, unbranched, soft-woody, palm-like trunk, bearing a crown of long, narrow, grass-like leaves and stalked heads of small, densely-crowded flowers In agriculture the word has an extended signification to include the various fodder-plants, chiefly leguminous, often called "artificial grasses."

The first attempts at a classification of plants recognized and separated a group of *Gramina*, and this, though bounded by nothing more definite than habit and general appearance, contained the Gramineae of modern botanists The older group, however, even with such systematists as Ray (1703), Scheuchzer (1719), and Micheli (1729), embraced in addition the Cyperaceae (Sedge family), Juncaceae (Rush family), and some other monocotyledons with inconspicuous flowers Singularly enough, the sexual system of Linnaeus (1735) served to mark off more distinctly the true grasses from these allies, since very nearly all of the former then known fell under his Triandria Digynia, whilst the latter found themselves under his other classes and orders.

Structure.—The general type of true grasses is familiar in the cultivated cereals of temperate climates—wheat, barley, rye, oats, and in the smaller plants which make up pastures and meadows and form a principal factor of the turf of natural downs Less familiar are the grains of warmer climates—rice, maize, millet and sorgho, or the sugar-cane Farther removed are the bamboos of the tropics, the columnar stems of which reach to the height of forest trees All are, however, formed on a common plan

Root.—Most cereals and many other grasses are annual, and possess a tuft of very numerous slender root-fibres, much branched and of great length The majority of the members of the family are of longer duration, and have the roots also fibrous, but fewer, thicker and less branched In such cases they are very generally given off from just above each node (often in a circle) of the lower part of the stem or rhizome, perforating the leaf-sheaths. In some bamboos they are very numerous from the lower nodes of the erect culms, and pass downwards to the soil, whilst those from the upper nodes shrivel up and form circles of spiny fibres

Stem.—The underground stem or rootstock (rhizome) of perennial grasses is usually well developed, and often forms very long creeping or subterranean rhizomes, with elongated internodes and sheathing scales; the widely-creeping, slender rhizomes in Marram-grass (*Ammophila*), *Agropyrum junceum*, *Elymus arenarius*, and other sand-loving plants render them useful as sand-binders The turf-formation, which is characteristic of open situations in cool temperate climates, results from an extensive production of short stolons, the branches and the fibrous roots developed from their nodes forming the dense "sod" The rhizome is always solid, and has the usual internal structure of the monocotyledonous stem In the cases of branching the branches break directly through the sheath of the leaf in connection with which they arise In other cases the branches grow upwards through the sheaths which they ultimately split from above, and emerging as aerial shoots give a tufted habit to the plant Good examples are the oat, cock's-foot (*Dactylis*) and other British grasses This mode of growth is the cause of the "tillering" of cereals, or the production of a large number of erect growing branches from the lower nodes of the young stem Isolated tufts or tussocks are also characteristic of steppe—and savannah—vegetation and open places generally in the warmer parts of the earth

The aerial leaf-bearing branches (culms) are a characteristic feature of grasses They are generally numerous, erect, cylindrical (rarely flattened) and conspicuously jointed, with evident nodes The nodes are solid, a strong plate of tissue passing across the stem, but the internodes are commonly hollow, although examples of completely solid stems are not uncommon (*e g*, maize, many species of *Andropogon*, sugar-cane) The swollen nodes are a characteristic feature. In wheat, barley and most of the British native grasses they are a development, not of the culm, but of the base of the leaf-sheath. The function of the nodes is to raise again stems which have become bent down; they are composed of highly turgescent tissue, the cells of which, under the influence of gravity, elongate on the side next the earth when the culm is placed in a horizontal or oblique position, and thus raise the culm again to an erect position. The internodes continue to grow in length, especially the upper ones, for some time; the increase takes place in a zone at the extreme base, just above the node The exterior of the culms is more or less concealed by the leaf-sheaths; it is usually smooth and often highly polished, the epidermal cells containing an amount of silica sufficient to leave after burning a distinct skeleton of their structure *Tabasheer* is a white substance mainly composed of silica, found in the joints of several bamboos A few of the lower internodes may become enlarged and subglobular, forming nutriment-stores, and grasses so characterized are termed "bulbous" (*Arrhenatherum, Poa bulbosa,* etc.) In internal structure grass-culms, save in being hollow, conform to that usual in monocotyledons; the vascular bundles run parallel in the internodes, but a horizontal interlacement occurs at the nodes In grasses of temperate climates branching is rare at the upper nodes of the culm, but it is characteristic of the bamboos and many tropical grasses In many bamboos they are long and spreading or drooping and copiously ramified, in others they are reduced to hooked spines One genus (*Dinochloa,* a native of the Malay archipelago) is scandent, and climbs over trees 100 ft. or more in height *Olyra latifolia,* a widely-spread tropical species, is also a climber, but on a smaller scale

Grass-culms grow with great rapidity, as is most strikingly seen in bamboos, where a height of over 100 ft is attained in from two to three months, and many species grow two, three or even more feet in twenty-four hours

Leaves—These present special characters usually sufficient for ordinal determination They are solitary at each node and arranged in two rows, the lower often crowded, forming a basal tuft They consist of two distinct portions, the sheath and the blade The sheath is often of great length, and generally completely surrounds the culm, forming a firm protection for the internode, the younger basal portion of which, including the zone of growth, remains tender for some time As a rule it is split down its whole length, thus differing from that of Cyperaceae which is almost invariably (*Eriospora* is an exception) a complete tube, in some grasses, however (species of *Poa, Bromus* and others), the edges are united The sheaths are much dilated in *Alopecurus vaginatus* and in a species of *Potamochloa,* in the latter, an East Indian aquatic grass, serving as floats At the summit of the sheath, above the origin of the blade, is the *ligule,* a usually membranous process of small size (occasionally reaching 1 in in length) erect and pressed around the culm It is rarely quite absent, but may be represented by a tuft of hairs (very conspicuous in *Pariana*) It serves to prevent rain-water, which has run down the blade, from entering the sheath *Melica uniflora* has in addition to the ligule, a green erect tongue-like process, from the line of junction of the edges of the sheath

The blade is frequently wanting or small and imperfect in the basal leaves, but in the rest is long and set on to the sheath at an angle. The usual form is familiar—sessile, more or less ribbon-shaped, tapering to a point, and entire at the edge. The chief modifications are the articulation of the deciduous blade on to the sheath, which occurs in all the Bambuseae (except *Planotia*) and in *Spartina stricta;* and the interposition of a petiole between the sheath and the blade, as in bamboos, *Leptaspis, Pharus, Pariana, Lophatherum* and others In the latter case the leaf usually becomes oval, ovate or even cordate or sagittate, but these forms are found in sessile leaves also (*Olyra, Panicum*) The venation is strictly parallel, the midrib usually strong, and the other ribs more slender In *Anomochloa* there are several nearly equal ribs and in some broad-leaved grasses (*Bambuseae, Pharus, Leptaspis*) the venation becomes tessellated by transverse connecting veins The tissue is often raised above the veins, forming longitudinal ridges, generally on the upper face, the stomata are in lines in the intervening furrows The thick prominent veins in *Agropyrum* occupy the whole upper surface of the leaf Epidermal appendages are rare, the most frequent being marginal, saw-like, cartilaginous teeth, usually minute, but occasionally (*Danthonia scabra, Panicum serratum*) so large as to give the margin a serrate appearance The leaves are occasionally woolly, as in *Alopecurus lanatus* and one or two *Panicums* The blade is often twisted, frequently so much so that the upper and under faces become reversed In dry country, *e g*, sand dune, the blades of grasses are often folded on the midrib, or rolled up The rolling is effected by bands of large wedge-shaped cells—motor-cells—between the nerves, the loss of water by these cells as they dry, causes the blade to curl towards the face on which they occur The rolling up acts as a protection from too great loss of water, the exposed surface being specially protected to this end by a strong cuticle, the majority or all of the stomata occurring on the protected surface The stiffness of the blade, which becomes very marked in dry-country grasses, is due to the development of girders of thick-walled mechanical tissue which follow the course of all or the principal veins

Inflorescence—This possesses an exceptional importance in grasses, since, their floral envelopes being much reduced and the sexual organs of very great uniformity, the characters employed for classification are mainly derived from the arrangement of the flowers and their investing bracts Various interpretations have been given to these glumaceous organs and different terms employed for them by various writers It may, however, be considered as settled that the whole of the bodies known as glumes and paleae, and arranged externally to the flower, form no part of the floral envelopes, but are of the nature of bracts These are arranged so as to form *spikelets,* and each spikelet may contain one, as in *Agrostis,* two, as in *Aira,* three, or a great number of flowers, as in *Briza, Triticum;* in some species of *Eragrostis* there are nearly 60 The flowers are, as a rule, placed laterally on the axis (*rachilla*) of the spikelet, but in one-flowered spikelets they appear to be terminal, and are probably really so in *Anthoxanthum* and in two anomalous genera, *Anomochloa* and *Streptochaeta*

In immediate relation with the flower itself, and often entirely concealing it, is the *palea* or *pale* ("upper pale" of most systematists) This organ is peculiar to grasses among Glumiflorae (the series to which belong the two families Gramineae and Cyperaceae), and is almost always present, certain *Oryzeae* and *Phalarideae* being the only exceptions It is of thin membranous consistence, usually obtuse, often bifid, and possesses no central rib or nerve, but has two lateral ones, one on either side, the margins are frequently folded in at the ribs, which thus become placed at the sharp angles The pale is generally considered to represent a single bracteole, characteristic of Monocotyledons, the binerved structure being the result of the pressure of the axis of the spikelet during the development of the pale, as in *Iris* and others

The flower with its pale is sessile, and is placed in the axil of another bract in such a way that the pale is exactly opposed to it, though at a slightly higher level It is this second bract or flowering glume which has been generally called by systematists the "lower pale," and with the "upper pale" was formerly considered to form an outer floral envelope The two bracts are, however, on different axes, one secondary to the other, and cannot therefore be parts of one whorl of organs They are usually quite unlike one another, but in some genera (*e g*, most *Festuceae*) are very similar in shape and appearance

The flowering glume has generally a more or less boat-shaped form, is of firm consistence, and possesses a well-marked central

midrib and frequently several lateral ones. The midrib in a large proportion of genera extends into an appendage termed the *awn*, and the lateral veins more rarely extend beyond the glume as sharp points (e g , *Pappophorum*). The form of the flowering glume is very various, this organ being plastic and extensively modified in different genera. It frequently extends downwards a little on the rachilla, in *Leptaspis* it is formed into a closed cavity by the union of its edges, and encloses the flower, two styles projecting through the pervious summit Valuable characters for distinguishing genera are shown from the awn This presents itself variously developed from a mere subulate point to an organ several inches in length, and when complete (as in *Andropogoneae, Aveneae* and *Stipeae*) consists of two well-marked portions, a lower twisted part and a terminal straight portion, usually set in at an angle with the former, sometimes trifid and occasionally beautifully feathery. The lower part is most often suppressed, and in the large group of the *Paniceae* awns of any sort are very rarely seen. The awn may be either terminal or may come off from the back of the flowering glume. When terminal the awn has three fibro-vascular bundles, when dorsal only one, it is covered with the stomate-bearing epidermis

The flower with its palea is thus sessile in the axil of a floriferous glume, and in a few grasses (*Leersia, Coleanthus, Nardus*) the spikelet consists of nothing more, but usually (even in uniflorous spikelets) other glumes are present Of these the two placed distichously opposite each other at the base of the spikelet never bear any flower in their axils, and are known as the *empty* or *barren glumes* They are the "glumes" of most writers They very rarely differ much from one another, but one may be smaller or quite absent (*Panicum, Setaria, Paspalum, Lolium*), or both be altogether suppressed, as above noticed They are commonly firm and strong, often enclose the spikelet, and are rarely provided with long points or imperfect awns Generally speaking they do not share in the special modifications of the flowering glumes, and rarely themselves undergo modification, chiefly in hardening of portions (*Sclerachne, Mnesurus, Anthephora, Peltophorum*), so as to afford greater protection to the flowers or fruit But it is usual to find, besides the basal glumes, a few other empty ones, and these are in two- or more-flowered spikelets (*Triticum*) at the top of the rachilla (numerous in *Lophatherum*), or in uniflorous ones below and interposed between the floral glume and the basal pair

The axis of the spikelet is frequently jointed and breaks up into articulations above each flower Tufts or borders of hairs are frequently present (*Calamagrostis, Phragmites, Andropogon*), and are often so long as to surround and conceal the flowers The axis is often continued beyond the last flower or glume as a bristle or stalk.

Involucres or organs outside the spikelets also occur and are formed in various ways Thus in *Setaria, Pennisetum,* etc , the one or more circles of simple or feathery hairs represent abortive branches of the inflorescence; in *Cenchrus* these become consolidated, and the inner ones are flattened so as to form a very hard globular spiny case to the spikelets Bracts of a more general character subtending branches of the inflorescence are singularly rare in Gramineae, in marked contrast with Cyperaceae, where they are so conspicuous. The remarkable ovoid involucre of *Coix,* which becomes of stony hardness, white and polished (then known as "Job's tears," *q.v.*), is also a modified bract or leaf-sheath

Any number of spikelets may compose the inflorescence, and their arrangement is very various In the spicate forms, with sessile spikelets on the main axis, the latter is often dilated and flattened (*Paspalum*), or is more or less thickened and hollowed out (*Stenotaphrum, Rottboellia, Tripsacum*), when the spikelets are sunk and buried within the cavities Every variety of racemose and paniculate inflorescence obtains, and the number of spikelets composing those of the large kinds is often immense. Rarely the inflorescence consists of very few flowers; thus *Lygeum Spartum,* one of the esparto grasses and the most anomalous of European grasses, has but two or three large uniflorous spikelets, which are fused together at the base, and have no basal glumes but are enveloped in a large, hooded, spathe-like bract.

Flower —This is characterized by remarkable uniformity. The perianth is represented by very rudimentary, small, fleshy scales arising below the ovary, called *lodicules,* they are elongated or truncate, are sometimes fringed with hairs, and are in contact with the ovary Their usual number is two, and they are placed collaterally at the anterior side of the flower, that is, within the flowering glume. They are generally considered to represent the inner whorl of the ordinary monocotyledonous (liliaceous) perianth, the outer whorl of these being suppressed as well as the posterior member of the inner whorl This latter is present almost constantly in *Stipeae* and *Bambuseae,* which have three lodicules, and in the latter group they are occasionally more numerous In *Streptochaeta* there are six lodicules, alternately arranged in two whorls Sometimes, as in *Anthoxanthum,* they are absent In *Melica* there is one large anterior lodicule resulting presumably from the union of the two which are present in allied genera The function of the lodicules is the separation of the pale and glume to allow the protrusion of stamens and stigmas; they effect this by swelling and thus exerting pressure on the base of these two structures. Where, as in *Anthoxanthum,* there are no lodicules, pale and glume do not become laterally separated, and the stamens and stigmas protrude only at the apex of the floret Grass-flowers are usually hermaphrodite, but there are very many exceptions Thus it is common to find one or more imperfect (usually male) flowers in the same spikelet with bisexual ones, and their relative position is important in classification *Holcus* and *Arrhenatherum* are examples in English grasses; and as a rule in species of temperate regions separation of the sexes is not carried further. In warmer countries monoecious and dioecious grasses are most frequent In such cases the male and female spikelets and inflorescence may be very dissimilar, as in maize, Job's tears, *Euchlaena, Spinifex,* etc , and in some dioecious species this dissimilarity has led to the two sexes being referred to different genera In other grasses, however, with the sexes in different plants (e g , *Brizopyrum, Distichlis, Eragrostis capitata, Gynerium*), no such dimorphism obtains *Amphicarpum* is remarkable in having cleistogamic flowers borne on long radical subterranean peduncles which are fertile, whilst the conspicuous upper paniculate ones, though apparently perfect, never produce fruit Something similar occurs in *Leersia oryzoides,* where the fertile spikelets are concealed within the leaf-sheaths

Androecium —In the vast majority there are three stamens alternating with the lodicules, and therefore one anterior, *i e ,* opposite the flowering glume, the other two being posterior and in contact with the palea They are hypogynous, and have long and very delicate filaments, and large, linear or oblong two-celled anthers, dorsifixed and ultimately very versatile, deeply indented at each end, and commonly exserted and pendulous Suppression of the anterior stamen sometimes occurs, or the two posterior ones may be absent There is in some genera (*Oryza,* most *Bambuseae*) another row of three stamens, making six in all The stamens become numerous (ten to forty) in the male flowers of a few monoecious genera (*Pariana, Luziola*) In *Ochlandra* they vary from seven to thirty, and in *Gigantochloa* they are monadelphous

Gynoecium —The pistil consists of a single carpel, opposite the pale in the median plane of the spikelet. The ovary is small, rounded to elliptical, and one-celled, and contains a single slightly bent ovule sessile on the ventral suture (that is, springing from the back of the ovary); the micropyle points downwards It bears usually two lateral styles which are quite distinct or connate at the base, sometimes for a greater length; each ends in a densely hairy or feathery stigma Occasionally there is but a single style, as in *Nardus,* which corresponds to the midrib of the carpel The very long and apparently simple stigma of maize arises from the union of two. Many of the bamboos have a third, anterior, style

Comparing the flower of Gramineae with the general monocotyledonous plan as represented by Liliaceae and other families, it will be seen to differ in the absence of the outer row and

the posterior member of the inner row of the perianth-leaves, of the whole inner row of stamens, and of the two lateral carpels, whilst the remaining members of the perianth are in a rudimentary condition. But each or any of the usually missing organs are to be found normally in different genera, or as occasional developments

Pollination and Germination.—Grasses are generally wind-pollinated, though self-fertilization occurs A few species, as we have seen, are monoecious or dioecious, while many are polygamous (having unisexual as well as bisexual flowers as found in many members of the tribes *Andropogoneae* and *Paniceae*), and in these the male flower of a spikelet always blooms later than the hermaphrodite, so that its pollen can only effect cross-fertilization upon other spikelets in the same or another plant Of those with only bisexual flowers, many are strongly protogynous (the stigmas protruding before the anthers are ripe), such as *Alopecurus* and *Anthoxanthum,* but generally the anthers protrude first and discharge the greater part of their pollen before the stigmas appear The filaments elongate rapidly at flowering-time, and the lightly versatile anthers empty an abundance of finely granular, smooth pollen through a longitudinal slit Some flowers, such as rye, have lost the power of effective self-fertilization, but in most cases both forms, self- and cross-fertilization, seem to be possible Thus the species of wheat are usually self-fertilized, but cross-fertilization is possible since the glumes are open above, the stigmas project laterally, and the anthers empty only about one-third of their pollen in their own flower and the rest into the air In some cultivated races of barley, cross-fertilization is precluded, as the flowers never open

Fruit and Seed—The ovary ripens into a usually small ovoid or rounded fruit, which is entirely occupied by the single large seed, from which it is not to be distinguished, the thin pericarp of the fruit being completely united to the testa of the seed To this peculiar fruit the term *caryopsis* has been applied (more familiarly "grain"), it is commonly furrowed longitudinally down one side (usually the inner, but in *Coix* and its allies, the outer), and an additional covering is not unfrequently provided by the adherence of the persistent palea, or even also of the flowering glume ("chaff" of cereals) From this type there are a few deviations, thus in *Sporobolus,* etc, the pericarp is not united with the seed but is quite distinct, dehisces, and allows the loose seed to escape Sometimes the pericarp is hard, forming a nut, as in some genera of *Bambuseae,* while in other *Bambuseae* it becomes thick and fleshy, forming a berry often as large as an apple In *Melocanna* the berry forms an edible fruit 3 or 4 in. long, with a pointed beak of 2 in more, it is indehiscent, and the small seed germinates whilst the fruit is still attached to the tree, putting out a tuft of roots and a shoot, and not falling till the latter is 6 in long The position of the embryo is plainly visible on the front side at the base of the grain On the other, posterior, side of the grain is a more or less evident, sometimes punctiform, sometimes elongated or linear mark, the hilum, the place where the ovule was fastened to the wall of the ovary The form of the hilum is constant throughout a genus, and sometimes also in whole tribes

The testa is thin and membranous but occasionally coloured, and the embryo small, the great bulk of the seed being occupied by the hard farinaceous endosperm (albumen) on which the nutritive value of the grain depends The outermost layer of endosperm, the aleurone-layer, consists of regular cells filled with small proteid granules, the rest is made up of large polygonal cells containing numerous starch-grains in a matrix of proteid which may be continuous (horny endosperm) or granular (mealy endosperm) The embryo presents many points of interest Its position is remarkable, closely applied to the surface of the endosperm at the base of its outer side. This character is absolute for the whole order, and effectually separates Gramineae from Cyperaceae. The part in contact with the endosperm is plate-like, and is known as the *scutellum;* the surface in contact with the endosperm shows a special epithelial layer concerned in absorption of materials from the endosperm. In some grasses there is a small scale-like appendage opposite the scutellum, the *epiblast.* Three structures have been claimed as representing the cotyledon:—(1) the scutellum, connected by vascular tissue with the vascular cylinder of the main axis of the embryo which it more or less envelops, (2) the cellular outgrowth of the axis, the epiblast, small and inconspicuous as in wheat, or larger as in *Stipa;* (3) the coleoptile or germ-sheath, arising on the same side of the axis and above the scutellum, enveloping the plumule in the seed and appearing above ground as a generally colourless sheath from the apex of which the plumule ultimately breaks The development of these structures, especially in relation to the origin of the vascular bundles which supply them, favours the view that the scutellum and coleoptile are highly differentiated parts of a single cotyledon

Germination—In germination the coleorhiza lengthens, ruptures the pericarp and fixes the grain to the ground by developing numerous hairs The radicle then breaks through the coleorhiza, as do also the secondary rootlets where, as in the case of many cereals, these have been formed in the embryo The germ-sheath grows vertically upwards, its stiff apex pushing through the soil, while the plumule is hidden in its hollow interior Finally the plumule escapes, its leaves successively breaking through at the tip of the coleoptile The scutellum meanwhile feeds the developing embryo by absorbing from the endosperm The growth of the primary root is limited; sooner or later adventitious roots develop from the axis above the radicle which they ultimately exceed in growth

Means of Distribution—Various methods of scattering the grain have been adopted, in which parts of the spikelet or inflorescence are concerned Short spikes may fall from the culm as a whole; or the axis of a spike or raceme is jointed so that one spikelet falls with each joint as in many *Andropogoneae* and *Hordeae* In many-flowered spikelets the rachilla is often jointed and breaks into as many pieces as there are fruits, each piece bearing a glume and pale These arrangements are, with few exceptions, lacking in cultivated cereals though present in their wild forms, so far as these are known Such arrangements are disadvantageous for the complete gathering of the fruit, and therefore varieties in which they are not present would be preferred for cultivation The persistent bracts (glume and pale) afford an additional protection to the fruit; they protect the embryo, which is near the surface, from too rapid wetting and, when once soaked, from drying up again They also decrease the specific gravity, so that the grain is more readily carried by the wind, especially when, as in *Briza,* the glume has a large surface compared with the size of the grain, or when, as in *Holcus,* empty glumes also take part, in Canary grass (*Phalaris*) the large empty glumes bear a membranous wing on the keel

The awn which is frequently borne on the flowering glume is also a very efficient means of distribution, catching into fur of animals or plumage of birds, or as often in *Stipa* forming a long feather for wind-carriage In *Tragus* the glumes bear numerous short hooked bristles The fleshy berries of some *Bambuseae* favour distribution by animals

The awn is also of use in burying the fruit in the soil Thus in *Stipa,* species of *Avena, Heteropogon* and others the base of the glume forms a sharp point which will easily penetrate the ground, above the point are short stiff upwardly pointing hairs which oppose its withdrawal The long awn, which is bent and closely twisted below the bend, acts as a driving organ, it is very hygroscopic, the coils untwisting when damp and twisting up when dry The repeated twisting and untwisting, especially when the upper part of the awn has become fixed in the earth or caught in surrounding vegetation, drives the point deeper and deeper into the ground Such grasses often cause harm to sheep by catching in the wool and boring through the skin

A peculiar method of distribution occurs in some alpine and arctic grasses, which grow under conditions where ripening of the fruit is often uncertain The entire spikelet, or single flowers, are transformed into small-leaved shoots which fall from the axes and readily root in the ground Some species, such as *Poa stricta,* are known only in this *viviparous* condition; others, like our British species *Festuca ovina* and *Poa alpina,* become vivi-

parous under the special climatic conditions.

Classification.—Gramineae are sharply defined from all other plants The only family closely allied is Cyperaceae, and the points of difference between the two may be here brought together. The best distinctions are found in the position of the embryo in relation to the endosperm—lateral in grasses, basal in Cyperaceae—and in the possession by Gramineae of the 2-nerved palea below each flower Less absolute characters, but generally trustworthy and more easily observed, are the feathery stigmas, the always distichous arrangement of the glumes, the usual absence of more general bracts in the inflorescence, the split leaf-sheaths, and the hollow, cylindrical, jointed culms—some or all of which are wanting in all Cyperaceae The same characters will distinguish grasses from the other glumiferous orders, Restiaceae, and Eriocaulonaceae, which are besides further removed by their capsular fruit and pendulous ovules To other monocotyledonous families the resemblances are merely of adaptive or vegetative characters Some Commelinaceae and Marantaceae approach grasses in foliage, the leaves of *Allium,* etc , possess a ligule, the habit of some palms reminds one of the bamboos, and Juncaceae and a few Liliaceae possess an inconspicuous scarious perianth There are about 450 genera containing about 4,500 well-defined species About 100 species, grouped in 42 genera, occur in Great Britain According to A S Hitchcock about 1,500 species, grouped in 144 genera, are found in the United States.

The great uniformity among the very numerous species of this vast family renders its *classification* very difficult The difficulty has been increased by the confusion resulting from the multiplication of genera founded on slight characters, and from the description (in consequence of their wide distribution) of identical plants under several different genera.

No characters for main divisions can be obtained from the flower proper or fruit (with the exception of the character of the hilum), and it has therefore been found necessary to trust to characters derived from the usually less important inflorescence and bracts

The following arrangement has been proposed by Professor Eduard Hackel in his monograph on the order

A Spikelets one-flowered, rarely two-flowered as in *Zea,* falling from the pedicel entire or with certain joints of the rachis at maturity. Rachilla not produced beyond the flowers

a Hilum a point; spikelets not laterally compressed

α Fertile glume and pale hyaline, empty glumes thick, membranous to coriaceous or cartilaginous, the lowest the largest Rachis generally jointed and breaking up when mature

1 Spikelets unisexual, male and female in separate inflorescences or on different parts of the same inflorescence 1 *Maydeae*

2 Spikelets bisexual, or male and bisexual, each male standing close to a bisexual 2 *Andropogoneae*

β Fertile glume and pale cartilaginous, coriaceous or papery, empty glumes more delicate, usually herbaceous, the lowest usually smallest, Spikelets falling singly from the unjointed rachis of the spike or the ultimate branches of the panicle 3 *Paniceae*

b Hilum a line, spikelets laterally compressed 4 *Oryzeae*

B Spikelets one- to indefinite-flowered, in the one-flowered the rachilla frequently produced beyond the flower; rachilla generally jointed above the empty glumes, which remain after the fruiting glumes have fallen When more than one-flowered, distinct internodes are developed between the flowers

a. Culm herbaceous annual, leaf-blade sessile, and not jointed to the sheath

α Spikelets upon distinct pedicels and arranged in panicles or racemes

I Spikelets one-flowered.

i Empty glumes 4 5 *Phalarideae*

ii. Empty glumes 2. 6 *Agrostideae*

II. Spikelets more than one-flowered

i Fertile glumes generally shorter than the empty glumes, usually with a bent awn on the back 7 *Aveneae*

ii Fertile glumes generally longer than the empty, unawned or with a straight, terminal awn 9. *Festuceae*

β Spikelets crowded in two close rows, forming a one-sided spike or raceme with a continuous (not jointed) rachis 8 *Chlorideae*

γ Spikelets in two opposite rows forming an equal-sided spike 10 *Hordeae*

b Culm woody, at any rate at the base, leaf-blade jointed to the sheath, often with a short, slender petiole 11 *Bambuseae.*

Tribe 1 *Maydeae Zea Mays* (maize, q v , or Indian corn *Tripsacum,* 2 or 3 species in subtropical America north of the equator; *Tr dactyloides* (gama grass) extends northwards to Illinois and Connecticut; it is used for fodder and as an ornamental plant *Coix Lacryma- Jobi* (Job's tears) *q v*

Tribe 2 *Andropogoneae* (mainly tropical). The spikelets are arranged in spike-like racemes, and generally in pairs consisting of a sessile and stalked spikelet at each joint of the rachis Many are savannah grasses, in various parts of the tropics, for instance the large genus *Andropogon, Elionurus* and others. *Saccharum officinarum* (sugar-cane) *Sorghum,* an important tropical cereal known as black millet or *durra* (q v) *Imperata* is a widespread tropical genus, one species *I arundinacea* is the principal grass of the alang-alang fields in the Malay Archipelago, it is used for thatch *Vossia,* an aquatic grass, often floating, is found in western India and tropical Africa In the swampy lands of the upper Nile it forms, along with a species of *Saccharum,* huge floating grass barriers In *Andropogon Nardus,* a native of India, but also cultivated, the rhizome, leaves and especially the spikelets of which contain a volatile oil, which on distillation yields the citronella oil of commerce A closely allied species, *A Schoenanthus* (lemon-grass), yields lemon-grass oil, a variety is used by the negroes in western Africa for haemorrhage *Themeda Forskalii,* which occurs from the Mediterranean region to South Africa and Tasmania, is the kangaroo grass of Australia, where, as in South Africa, it often covers wide tracts

Tribe 3 *Paniceae* (tropical to subtropical; a few temperate), a second flower, generally male, rarely hermaphrodite, is often present below the fertile flower *Paspalum* is a large tropical genus, most abundant in America, especially on the pampas and campos, many species are good forage plants, and the grain is sometimes used for food *Panicum,* a very polymorphic genus, and one of the largest in the order, is widely spread in all warm countries, together with species of *Paspalum* they form good forage grasses in the South American savannahs and campos *Panicum Crus-galli* is a polymorphic cosmopolitan grass, which is often grown for fodder, in one form (*P frumentaceum*) it is cultivated in India for its grain *P miliaceum* is millet (*q v*), and P *altissimum,* Guinea grass *Digitaria sanguinalis* is a very widespread grass, in Bohemia it is cultivated as a food-grain; it is also the crab-grass of the southern United States, where it is used for fodder

Setaria italica, Hungarian grass, is extensively grown as a food-grain both in China and Japan, parts of India and western Asia, as well as in Europe, where its culture dates from prehistoric times; it is found in considerable quantity in the lake dwellings of the Stone age

In *Cenchrus* the bristles unite to form a tough spiny capsule; *C tribuloides* (bur-grass) and other species are troublesome weeds in North and South America, as the involucre clings to the wool of sheep and is removed with great difficulty. *Pennisetum typhoideum* is widely cultivated as a grain in tropical Africa *Spinifex,* a dioecious grass, is widespread on the coasts of Australia and eastern Asia, forming an important sand-binder The female heads are spinose with long bracts, fall entire when ripe and are carried away by wind or sea, becoming finally anchored in

the sand and falling to pieces

Tribe 4 *Oryzeae* (mainly tropical and subtropical). The spikelets are sometimes unisexual, and there are often six stamens. *Leersia* is a genus of swamp grasses, one of which *L oryzoides* occurs in the north temperate zone of both old and new worlds, and is a rare grass in Surrey, Sussex and Hampshire *Zizania aquatica* (Tuscarora or Indian rice) is a reed-like grass growing over large areas on banks of streams and lakes in North America and north-east Asia The Indians collect the grain, *Oryza sativa* (rice, *q v.*), for food *Lygeum Spartum,* with a creeping stem and stiff rush-like leaves, is common on rocky soil on the high plains bordering the western Mediterranean, and is one of the sources of esparto

Tribe 5. *Phalarideae* (a few are South African and Australasian; the others are more widely distributed, and represented in the British flora). *Phalaris arundinacea,* is a reed-grass found on the banks of British rivers and lakes, a variety with striped leaves known as ribbon-grass is grown for ornament. *P. canariensis* (Canary grass, a native of southern Europe and the Mediterranean area) is grown for bird-food and sometimes as a cereal *Anthoxanthum odoratum,* the sweet vernal grass of our flora, owes its scent to the presence of coumarin, which is also present in the closely allied genus *Hierochloe,* which occurs throughout the temperate and frigid zones

Tribe 6 *Agrostideae* (occurring in all parts of the world, a number are British). *Aristida* and *Stipa* are large and widely distributed genera, occurring especially on open plains and steppes, the conspicuously awned persistent flowering glume forms an efficient means of dispersing the grain *Stipa pennata* is a characteristic species of the Russian steppes *St spartea* (porcupine grass) and other species are plentiful on the North American prairies *St tenacissima* is the Spanish esparto grass (*q v*), known in North Africa as halfa or alfa *Phleum pratense* (timothy) is a valuable fodder grass, as also is *Alopecurus pratensis* (foxtail) *Sporobolus,* a large genus in the warmer parts of both hemispheres, but chiefly America, derives its name from the fact that the seed is ultimately expelled from the fruit *Agrostis* is a large world-wide genus, but especially developed in the north temperate zone, where it includes important meadow-grasses *Ammophila arundinacea* (*Psamma arenaria*) (Marram grass) with its long creeping stems forms a useful sand-binder on the coasts of Europe, North Africa and the Atlantic states of America

Tribe 7 *Aveneae* (seven genera are British) *Holcus lanatus* (Yorkshire fog, soft grass) is a common meadow and wayside grass with woolly or downy leaves *Aira* is a genus of delicate annuals with slender hair-like branches of the panicle *Deschampsia* and *Trisetum* occur in temperate and cold regions or on high mountains in the tropics, *T pratense* (*Avena flavescens*) with a loose panicle and yellow shining spikelets is a valuable fodder-grass *Avena fatua* is the wild oat and *A sativa* the cultivated oat (*q v*) *Arrhenatherum avenaceum,* a perennial field grass, native in Britain and central and southern Europe, is cultivated in North America

Tribe 8 *Chlorideae* (chiefly in warm countries) The only British representative is *Cynodon Dactylon* (dog's tooth, Bermuda grass) found on sandy shores in the south-west of England, it is a cosmopolitan, covering the ground in sandy soils, and forming an important forage grass in many dry climates (Bermuda grass of the southern United States, and known as durba, dub and other names in India). Species of *Chloris* are grown as ornamental grasses *Bouteloua* with numerous species (mesquite grass, grama grass) on the plains of the south-western United States, afford good grazing *Eleusine indica* is a common tropical weed, the nearly allied species *E. coracana* is a cultivated grain in the warmer parts of Asia and throughout Africa *Buchloe dactyloides* is the buffalo grass of the North American prairies, a valuable fodder

Tribe 9 *Festuceae* (tropical, temperate, arctic and alpine forms) Many are important meadow-grasses; 15 are British *Gynerium argenteum* (pampas grass) is a native of southern Brazil and Argentina *Arundo* and *Phragmites* are tall reed-grasses (*see* REED). Several species of *Triodia* cover large areas of the interior of Australia, and from their stiff, sharply pointed leaves are very troublesome *Eragrostis,* one of the larger genera of the order, is widely distributed in the warmer parts of the earth, many species are grown for ornament and *E abyssinica* is an important food-plant in Abyssinia *Koeleria cristata* is a fodder-grass *Briza media* (quaking grass) is a useful meadow-grass *Dactylis glomerata* (cock's-foot), a perennial grass with a dense panicle, common in pastures and waste places, is a useful meadow-grass It has become naturalized in North America, where it is known as orchard grass, as it will grow in shade *Cynosurus cristatus* (dog's tail) is a common pasture-grass *Poa,* a large genus widely distributed in temperate and cold countries, includes many meadow and alpine grasses, eight species are British; *P annua* is the very common weed in paths and waste places, *P pratensis* and *P trivialis* are also common grasses of meadows, banks and pastures, the former is the "June grass" or "Kentucky blue grass" of North America, *P alpina* is a mountain grass of the northern hemisphere and found also in the Arctic region The largest species of the genus is *Poa flabellata* which forms great tufts 6–7 ft high with leaves arranged like a fan *Glyceria fluitans,* manna-grass, so-called from the sweet grain, is one of the best fodder grasses for swampy meadows, the grain is an article of food in central Europe *Festuca* (fescue) is also a large and widely distributed genus, but found especially in the temperate and cold zones, it includes valuable pasture grasses, such as *F ovina* (sheep's fescue), *F. rubra;* nine species are British. The closely allied genus *Bromus* (brome grass) is also widely distributed but most abundant in the north temperate zone, *B erectus* is a useful forage grass on dry chalky soil

Tribe 10 *Hordeae* (about 19 genera, widely distributed, six are British) *Nardus stricta* (mat-weed), found on heaths and dry pastures, is a small perennial useless grass with slender rigid stem and leaves *Lolium perenne,* ray- (or by corruption rye-) grass, is common in waste places and a valuable pasture-grass; *L italicum* is the Italian ray-grass; *L temulentum* (darnel) has many of its grains infected with a fungus which is passed on from generation to generation *Secale cereale,* rye (*q v*), is cultivated mainly in northern Europe *Agropyrum repens* (couch grass) has a long creeping underground stem, and is a troublesome weed in cultivated land; the widely creeping stem of *A junceum,* found on sandy sea-shores, renders it a useful sand-binder *Triticum sativum* is wheat (*q v.*), and *Hordeum sativum,* barley (*q v*) *H murinum,* wild barley, is a common grass in waste places *Elymus arenarius* (lyme grass) occurs on sandy sea-shores in the north temperate zone and is a useful sand-binder

Tribe 11 *Bambuseae* Contains 23 genera, mainly tropical *See* BAMBOO

Distribution.—Grasses are the most universally diffused of all flowering plants There is no district in which they do not occur, and in nearly all they are a leading feature of the flora In number of species Gramineae comes considerably below Compositae and Leguminosae, the two most numerous orders of phanerogams, but in number of individual plants it probably far exceeds either, whilst from the wide extension of many of its species, the proportion of Gramineae to other orders in the various floras of the world is much higher than its number of species would lead one to expect In tropical regions, where Leguminosae is the leading order, grasses closely follow as the second, whilst in the warm and temperate regions of the northern hemisphere, in which Compositae takes the lead, Gramineae again occupies the second position

While the greatest number of species is found in the tropical zone, the number of individuals is greater in the temperate zones, where they form extended areas of turf Turf- or meadow-formation depends upon uniform rainfall Grasses also characterize steppes and savannahs, where they form scattered tufts The bamboos are a feature of tropical forest vegetation, especially in the monsoon region As the colder latitudes are entered the grasses become relatively more numerous, and are the leading family in Arctic and Antarctic regions The only countries where the order plays a distinctly subordinate part are some extra-tropical regions

of the southern hemisphere, Australia, the Cape, Chile, etc. The proportion of graminaceous species to the whole phanerogamic flora in different countries varies from nearly ¼ in the Arctic regions to about $\frac{1}{25}$ at the Cape; in the British Isles it is about $\frac{1}{12}$.

The principal climatic cause influencing the number of graminaceous species appears to be amount of moisture A remarkable feature of the distribution of grasses is its uniformity, there are no great centres for the order, as in Compositae, where a marked preponderance of endemic species exists, and the genera, except some of the smallest or monotypic ones, have usually a wide distribution

Many grasses are almost cosmopolitan, such as the common reed, *Phragmites communis*, and many range throughout the warm regions of the globe, *e g*, *Cynodon Dactylon, Eleusine indica, Imperata arundinacea, Sporobolus indicus*, etc, and such weeds of cultivation as species of *Setaria, Echinochloa* Several species of the north temperate zone, such as *Poa nemoralis, P. pratensis, Festuca ovina, F rubra* and others are absent in the tropics but reappear in the antarctic regions, others (*e g*, *Phleum alpinum*) appear in isolated positions on high mountains in the intervening tropics No tribe is confined to one hemisphere and no large genus to any one floral region, facts which indicate that the separation of the tribes goes back to very ancient times

Of specially remarkable species *Lygeum* is found on the seasand of the eastern half of the Mediterranean basin, and the minute *Coleanthus* occurs in three or four isolated spots in Europe (Norway, Bohemia, Austria, Normandy), in North-east Asia (Amur) and on the Pacific coast of North America (Oregon, Washington) Many remarkable endemic genera occur in tropical America, including *Anomochloa* of Brazil, and most of the large aquatic species with separated sexes are found in this region The only genus of flowering plants peculiar to the arctic regions is the beautiful and rare grass *Pleuropogon Sabini*, of Melville Island

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GRASSHOPPER, a name applied to insects belonging to the families *Tettigoniidae* and *Acrididae* of the order ORTHOPTERA (*q v*) They are especially remarkable for their leaping powers, due to the great development of the hind legs, and also for their stridulation which is generally, but not always, a function of the male only The *Acrididae*, or short-horned grasshoppers, have short and rather stout antennae, 3-jointed tarsi and an inconspicuous ovipositor Stridulation is produced by the rasping of a row of peg-like joints, on the inner side of the femur of each hind leg, against the hardened veins of the fore-wings, thus causing the latter to vibrate auditory organs are present on either side of the base of the abdomen Included in this family are most of the common grasshoppers of the countryside, together with the locusts and certain more highly specialized forms The eggs are laid in the ground or more rarely, in decaying wood: they are deposited in masses of 30–100 or more, each mass being enclosed in a kind of capsule formed of a hardened secretion These insects are voracious devourers of vegetation both in their young and adult stages, and the name locust is often applied to any member of this family, in its strict usage the term only refers to certain destructive species that at times greatly increase in numbers and migrate considerable distances in large swarms (*see* LOCUST) The *Tettigoniidae*, or long-horned grasshoppers, were formerly termed *Locustidae:* they have long thread-like antennae, 4-jointed tarsi and a prominent ovipositor Stridulation is produced by the rasping action of the base of the left fore-wing, where it bears a row of denticles, against a smooth area of tense membrane on the right fore-wing, and auditory organs are present on the tibiae of the fore legs. These insects are less markedly herbivorous than the *Acrididae* and some of them are carnivorous or omnivorous The eggs are not enclosed in capsules and are either laid in the ground, or in neat rows cut in stems, or on leaves, etc. Some forms are wingless and live on the ground or in caves, while the winged species mainly frequent bushes and trees. The bright green Katydids (*Phaneropterinae*) of the United States are the most notorious stridulators, and the large green *Phasgonura viridissima* occurs in the south of England, where it attracts attention from its strident call. (A. D. I)

GRASSI, GIOVANNI BATTISTA (1854–1925), Italian zoologist, was born on March 27, 1854, at Rovellasca, and died in Rome on May 4, 1925 He graduated in medicine at Pavia, and after studying zoology at Heidelberg and Wurzburg, was appointed professor of zoology at Catania in 1883, and of comparative anatomy at the University of Rome in 1895 He was made a senator in 1908 Grassi's important researches concern the life-history of intestinal worms, of protozoa and of eels, the Chaetognatha, the social life of the termites, the Phylloxera, the sporozoan malarial parasite of the mosquito and the transmission of malaria in man His chief publications are *I Chetognati* (1883), *I progenitori degli Insetti e dei Miriapodi, L'Japyx e la Campodia* (1886); *Contribuzione allo studio dei parassiti malarici* (1892, with R Faletti), *Studi di un zoologo sulla malaria* (1900), *Flagellati viventi nei Termiti* (1917)

A complete bibliography with a good account of Grassi's work is given in *Commemorazione del socio nazionale Prof. Battista Grassi* (Castello, 1927)

GRASS OF PARNASSUS, in botany, a small herbaceous plant, *Parnassia palustris* (family Saxifragaceae), found on wet moors and bogs in Great Britain but less common in the south. The white regular flower is rendered very attractive by a circlet of scales, opposite the petals, each of which bears a fringe of delicate filaments ending in a yellow knob These glisten in the sunshine and look like a drop of honey Honey is secreted by the base of each of the scales



GRASS OF PARNASSUS
At left is flower with front sepals, etc, removed to show pistil, nectaries and two of stamens, one of which has lost its anther and the other is in a position ready to shed pollen at touch on to stigma of visiting insect. On right is honey-bearing scale

There are about 25 species of *Parnassia*, found in north temperate regions, but chiefly in mountain bogs Besides *P palustris*, several other species occur in North America, mostly in the northern United States and Canada

GRASSQUIT, the name applied to small finches of the genera *Sporophila* and *Tiaris* common in tropical and sub-tropical America and the West Indies One species, *S morelleti*, officially named Sharpe's seed-eater, ranges into the United States as far as south-eastern Texas, and two others, *T bicolor* and *T canora*, the melodious grassquit, occur as stragglers The birds are about 4 in long, dull coloured and without song They feed on seeds

GRASS-TREE (*Xanthorrhoea hastilis*), a well-known Australian plant, also called black-boy It belongs to the family Liliaceae, and has the habit of an aloe, with a long spike of flowers superficially resembling that of the bulrush. A resin is obtained from the bases of the old leaves

GRASS VALLEY, a city of Nevada county, California, U S A, served by the Nevada County Narrow Gauge railroad, which connects at Colfax (15m S E) with the Southern Pacific

lines It is in a gold-mining district in the eastern part of the State, is the gateway to summer playgrounds in the Sierra Nevada and is becoming a health resort. The population in 1928 was about 5,000.

GRATIAN (FLAVIUS GRATIANUS AUGUSTUS), Roman emperor 375–383, son of Valentinian I by Severa, was born at Sirmium in Pannonia, on April 18 or May 23, 359 On Aug 24, 367, he received from his father the title of Augustus On the death of Valentinian (Nov. 17, 375) the troops in Pannonia proclaimed his infant son (by a second wife Justina) emperor under the title of Valentinian II (*q v*) Gratian acquiesced in their choice, reserving for himself the administration of the Gallic provinces, he handed over Italy, Illyria and Africa to Valentinian and his mother, who fixed their residence at Milan The division, however, was merely nominal, and the real authority remained in the hands of Gratian. The eastern portion of the empire was under the rule of his uncle Valens In May 378 Gratian completely defeated the Lentienses, the southernmost branch of the Alamanni, at Argentaria, near the site of the modern Colmar.

When Valens met his death fighting against the Goths near Adrianople on Aug. 9 in the same year, the government of the eastern empire devolved upon Gratian, but feeling himself unable to resist unaided the incursions of the barbarians, he ceded it to Theodosius (Jan 379) With Theodosius he cleared the Balkans of barbarians Gratian governed at first with energy and success, but gradually he sank into indolence, occupied himself chiefly with hunting, and became a tool in the hands of the Frankish general Merobaudes and bishop Ambrose By taking into his personal service a body of Alani, and appearing in public in the dress of a Scythian warrior, he aroused the contempt and resentment of his Roman troops A Roman named Maximus raised the standard of revolt in Britain, and invaded Gaul with a large army, upon which Gratian, who was then in Paris, being deserted by his troops, fled to Lyons, where, through the treachery of the governor, he was delivered over to one of the rebel generals and assassinated on Aug 25, 383

During the reign of Gratian orthodox Christianity for the first time became dominant throughout the empire. In dealing with pagans and heretics Gratian, who during his later years was greatly influenced by Ambrose, bishop of Milan, exhibited severity and injustice at variance with his usual character He prohibited heathen worship at Rome, refused to wear the insignia of the pontifex maximus as unbefitting a Christian, removed the altar of Victory from the senate-house at Rome, in spite of the remonstrance of the pagan members of the senate, and confiscated its revenues, forbade legacies of real property to the Vestals, and abolished other privileges belonging to them and to the pontiffs

For Gratian's treatment of the heretics the church histories of the period should be consulted.

See Ammianus Marcellinus xxvii–xxxi ; Aurelius Victor, *Epit* 47; Zosimus iv vi , Ausonius (Gratian's tutor) especially the *Gratiarum actio pro consulatu*, Symmachus x epp 2 and 61, Ambrose, *De fide*, prolegomena to *Epistolae* 11, 17, 21 *Consolatio de obitu Valentiniani*, H. Richter, *Das westromische Reich, besonders unter den Kaisern Gratian, Valentinian II und Maximus* (1865), A de Broglie, *L'Église et l'empire romain au IVe siècle* (4th ed , 1882) ; H Schiller, *Geschichte der romischen Kaiserzeit* (1883–86), iii , iv 31–33 , Gibbon, *Decline and Fall*, ch 27; R Gumpoltsberger, *Kaiser Gratian* (1879) ; T Hodgkin, *Italy and her Invaders* (1892), vol. i., J Wordsworth in Smith's *Dictionary of Christian Biography*

GRATIANUS, FRANCISCUS, compiler of the *Concordia discordantium canonum* or *Decretum Gratiani*, and founder of the science of canon law, was born about the end of the 11th century, and at an early age entered the Camaldulian monastery of Classe near Ravenna, whence he afterwards removed to that of San Felice in Bologna, where he prepared the *Concordia*, which on internal evidence seems to have been completed before 1150 He is said to have been bishop of Chiusi.

For the *Decretum Gratiani* and its history *see* CANON LAW The best edition is that of Friedberg (*Corpus juris canonici*, Leipzig, 1879) Compare Schultze, *Zur Geschichte der Litteratur uber das Decret Gratians* (1870), *Die Glosse zum Decret Gratians* (1872), and *Geschichte der Quellen und Litteratur des kanonischen Rechts* (3 vols., Stuttgart, 1875)

GRATTAN, HENRY (1746–1820), Irish statesman, son of James Grattan, for many years recorder of Dublin, was born in Dublin on July 3, 1746 At Trinity college, Dublin, he began a lifelong devotion to classical literature and especially to the great orators of antiquity He was called to the Irish bar in 1772, but never seriously practised. Like Flood he cultivated his natural genius for eloquence by study of good models, including Bolingbroke and Junius Flood influenced Grattan's political aims, and it was through no design on Grattan's part that when Lord Charlemont brought him into the Irish parliament in 1775, in the very session in which Flood damaged his popularity by accepting office, Grattan quickly superseded his friend in the leadership of the national party. His speeches were packed with epigram, and expressed with rare felicity of phrase, his terse and telling sentences were richer in profound aphorisms and maxims of political philosophy than those of any other statesman save Burke; he possessed the orator's incomparable gift of conveying his own enthusiasm to his audience and convincing them of the loftiness of his aims

The principal object of the national party was to set the Irish parliament free from constitutional bondage to the English privy council. The menacing attitude of the Volunteer Convention at Dungannon greatly influenced the decision of the government in 1782 to resist the agitation no longer It was through ranks of volunteers drawn up outside the parliament house in Dublin that Grattan passed on April 16, 1782, to move a declaration of the independence of the Irish parliament "I found Ireland on her knees," Grattan exclaimed, "I watched over her with a paternal solicitude, I have traced her progress from injuries to arms, and from arms to liberty Spirit of Swift, spirit of Molyneux, your genius has prevailed! Ireland is now a nation!" After a month of negotiation the claims of Ireland were conceded The gratitude of his countrymen to Grattan found expression in a parliamentary grant of £100,000, which had to be reduced by one half before he would consent to accept it

One of the first acts of "Grattan's parliament" was to prove its loyalty to England by passing a vote for the support of 20,000 sailors for the navy Grattan himself never failed in loyalty to the crown and the English connection He desired moderate parliamentary reform, and, unlike Flood, he favoured Catholic emancipation The Irish House of Commons was still subject to the influence of corruption, which the English government had wielded through the Irish borough owners, known as the "undertakers," or more directly through the great executive officers. "Grattan's parliament" had no control over the Irish executive. The great majority of the people were excluded as Roman Catholics from the franchise, two-thirds of the members of the House of Commons were returned by small boroughs at the absolute disposal of single patrons It was to give stability and true independence to the new constitution that Grattan pressed for reform Having quarrelled with Flood over "simple repeal" Grattan also differed from him on the question of maintaining the Volunteer Convention He opposed the policy of protective duties, but supported Pitt's commercial propositions in 1785 for establishing free trade between Great Britain and Ireland, which, however, had to be abandoned

In general Grattan supported the government for a time after 1782, and in particular spoke and voted for the stringent coercive legislation rendered necessary by the Whiteboy outrages in 1785; but as the years passed without Pitt's personal favour towards parliamentary reform bearing fruit in legislation, he gravitated towards the opposition, agitated for commutation of tithes in Ireland, and supported the Whigs on the regency question in 1788. In 1792 he succeeded in carrying an Act conferring the franchise on the Roman Catholics, in 1794 in conjunction with William Ponsonby he introduced a reform bill which was even less democratic than Flood's bill of 1783 The defeat of Grattan's mild proposals helped to promote more extreme opinions, which, under French revolutionary influence, were now becoming heard in Ireland

In 1794 Lord Fitzwilliam became lord-lieutenant of Ireland. It was arranged that Grattan should bring in a Roman Catholic

emancipation bill, and that it should then receive government support. But finally it appeared that the viceroy had either misunderstood or exceeded his instructions; and on Feb 19, 1795, Fitzwilliam was recalled. The English cabinet was now determined firmly to resist the Catholic demands, with the result that Ireland rapidly drifted towards rebellion Grattan warned the Government in a series of masterly speeches of the lawless condition to which Ireland had been driven, but his words were unheeded. He retired from parliament in May 1797, and departed from his customary moderation by attacking the government in an inflammatory "Letter to the citizens of Dublin" The rebellion of 1798 was sternly and cruelly repressed. The project of a legislative union between the British and Irish parliaments was taken up in earnest by Pitt's government. Grattan from the first denounced the scheme with implacable hostility.

When in 1799 the government brought forward their bill it was defeated in the Irish House of Commons Grattan was still in retirement. His popularity had temporarily declined, and the fact that his proposals for parliamentary reform and Catholic emancipation had become the watchwords of the rebellious United Irishmen had brought upon him the bitter hostility of the governing classes. He was dismissed from the privy council, his portrait was removed from the hall of Trinity College, the Merchant Guild of Dublin struck his name off their rolls But the threatened destruction of the constitution of 1782 quickly restored its author in the affections of the Irish people On Jan 15, 1800 the Irish parliament met for its last session; on the same day Grattan secured by purchase a seat for Wicklow, and at a late hour, while the debate was proceeding, he appeared to take his seat "There was a moment's pause, an electric thrill passed through the House, and a long, wild cheer burst from the galleries" (Lecky, *Leaders of Public Opinion in Ireland*) Grattan's strength gave way when he rose to speak and he obtained leave to address the House sitting For more than two hours he kept his audience spellbound by a flood of epigram, of sustained reasoning, of eloquent appeal After prolonged debates Grattan, on May 26, spoke finally against the committal of the bill, ending with an impassioned peroration in which he declared, "I will remain anchored here with fidelity to the fortunes of my country, faithful to her freedom, faithful to her fall" (Grattan's Speeches, iv 23) These were the last words spoken by Grattan in the Irish parliament.

For the next five years Grattan took no active part in public affairs; in 1805 he became a member of the parliament of the United Kingdom He modestly took his seat on one of the back benches, till Fox brought him forward to a seat near his own, exclaiming, "This is no place for the Irish Demosthenes!" When Fox and Grenville came into power in 1806 Grattan was offered, but refused to accept, an office in the government In the following year he showed the strength of his judgment and character by supporting, in spite of consequent unpopularity in Ireland, a measure for increasing the powers of the executive to deal with Irish disorder Roman Catholic emancipation, which he continued to advocate with unflagging energy though now advanced in age, became complicated after 1808 by the question whether a veto on the appointment of Roman Catholic bishops should rest with the crown

Grattan supported the veto, but a more extreme Catholic party was now arising in Ireland under the leadership of Daniel O'Connell and Grattan's influence gradually declined He seldom spoke in parliament after 1810, the most notable exception being in 1815, when he separated himself from the Whigs and supported the final struggle against Napoleon His last speech of all, in 1819, contained a passage referring to the union he had so passionately resisted, which exhibits the statesmanship and at the same time the equable quality of Grattan's character His sentiments with regard to the policy of the union remained, he said, unchanged, but "the marriage having taken place it is now the duty, as it ought to be the inclination, of every individual to render it as fruitful, as profitable and as advantageous as possible" He died on June 6, 1820, and was buried in Westminster Abbey close to the tombs of Pitt and Fox His statue is in the outer lobby of the Houses of Parliament at Westminster Grattan had married in 1782 Henrietta Fitzgerald, a lady descended from the ancient family of Desmond, by whom he had two sons and two daughters

The most searching scrutiny of his private life only increases the respect due to the memory of Grattan as a statesman and the greatest of Irish orators Sydney Smith said with truth of Grattan soon after his death: "No government ever dismayed him. The world could not bribe him. He thought only of Ireland; lived for no other object; dedicated to her his beautiful fancy, his elegant wit, his manly courage, and all the splendour of his astonishing eloquence."[1]

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(C)

GRATTIUS [FALISCUS], Roman poet, of the age of Augustus, author of a poem on hunting (*Cynegetica*), of which 541 hexameters remain He was possibly a native of Falerii The only reference to him in any ancient writer is incidental (Ovid, *Ex Ponto*, iv. 16 33) He describes various kinds of game, methods of hunting, the best breeds of horses and dogs.

There are editions by R. Stern (1832), E Bahrens in *Poetae Latini Minores* (1, 1879) and G G Curcio in *Poeti Latini Minori* (1, 1902), with bibliography, critical edition with notes by P. J. Enk, Zutphen, 1918, *see* also H. Schenkl, *Zur Kritik des G.* (1898). There is a translation by Christopher Wase (1654).

GRÄTZ, HEINRICH (1817–1891), German-Jewish historian, was born at Xions, Posen, on Oct 31, 1817, and died at Munich on Sept 7, 1891 He received a desultory education, but spent three years at Oldenburg as assistant and pupil of S R Hirsch He matriculated in 1842 at Breslau, then the headquarters of Abraham Geiger, the leader of Jewish reform, whose attitude repelled him Gratz remained a conservative, in spite of the radical views on the Bible and tradition which made him an opponent of Hirsch He fought for freedom of thought, but not of ritual practice In 1853 he became famous by the publication of the fourth volume of his history of the Jews, in which he dealt with the Talmud In 1869 he became a professor of Breslau university His *Geschichte der Juden* (11 vols 1853–1875, Eng trs 5 vols 1889–95) is a work of genius, in spite of his somewhat biassed judgments, and in particular his lack of sympathy with

[1] Sydney Smith's *Works*, ii. 166–167.

mysticism. Grätz was also a considerable biblical critic.

A full bibliography of Gratz's works and a memoir are given in the Jewish Quarterly Review iv, 194 A full memoir was prefixed to the "index" volume of the *History* in the American re-issue of the English translation (6 vols Philadelphia, 1898).

GRAUDENZ: *see* GRUDZIANZ

GRAUN, KARL HEINRICH (1701–1759), German composer, the youngest of three brothers, all musicians, was born on May 7, 1701, at Wahrenbrück, Saxony. Graun's beautiful soprano voice secured him an appointment in the choir at Dresden At an early age he composed a number of sacred cantatas and other pieces for the church service He completed his studies under Johann Christoph Schmidt (1664–1728), and profited much by the Italian operas which were performed at Dresden under the composer Lotti He made his début as a tenor in opera at Brunswick, in a work by Schurmann, an inferior composer of the day; but not being satisfied with the arias assigned him he rewrote them, and in the result was commissioned to write a complete opera for the next season This work, *Polydorus* (1726), and five other operas, together with two settings of the *Passion,* belong to the Brunswick period In 1735 Frederick the Great, at that time crown prince of Prussia, engaged Graun for his private chapel at Rheinsberg There he remained for five years, and wrote a number of cantatas, mostly to words written by Frederick himself in French, and translated into Italian by Boltarelli On his accession to the throne in 1740, Frederick sent Graun to Italy to engage singers for a new opera to be established at Berlin Graun remained a year on his travels singing in the chief cities of Italy After his return to Berlin he was appointed conductor of the royal orchestra (*Kapellmeister*) and in this capacity he wrote 28 operas, all to Italian words, of which the last, *Merope* (1756), is perhaps the best It was however in his oratorio *Der Tod Jesu* (1755) that he revealed to the full his powers and produced a work which gained for him the highest applause In Germany indeed *Der Tod Jesu* long held a place similar to that occupied by *The Messiah* in England, being regularly performed in Holy Week for a century and a half after the composer's death The *Te Deum* written to celebrate the victory of Prague (1757) was another of Graun's sacred choral works which found great favour and showed him at his best Graun died on Aug 8, 1759, at Berlin, in the same house in which, 32 years later, Meyerbeer was born

See K Mennicke, *Hasse und die Bruder Graun als Sinfoniker* (1906), in which a thematic catalogue of Graun's works will be found

GRAVAMEN, a complaint or grievance, the ground of a legal action, and particularly the more serious part of a charge against an accused person In English the term is used chiefly in ecclesiastical cases, being the technical designation of a memorial presented from the Lower to the Upper House of Convocation, setting forth grievances to be redressed, or calling attention to breaches in church discipline

GRAVE. (1) A place dug out of the earth in which a body is laid for burial (*see* DEAD, DISPOSAL OF THE; BURIAL). The verb "to grave," is used of the making of incisions in a hard surface (*see* ENGRAVING) (2) A title, now obsolete, of a local administrative official for a township in certain parts of Yorkshire and Lincolnshire; it also appears in the form "grieve," which in Scotland and Northumberland is used for sheriff (*q v*), and for a bailiff or under-steward It is probably connected with the German *graf,* count, and thus appears as the second part of many Teutonic titles, such as landgrave, burgrave and margrave "Grieve," on the other hand, seems to be a form of O E *gerefa,* reeve; (3) To grave a ship's bottom is to clean it in a specially constructed dock, called a "graving dock."

GRAVE CREEK MOUND, a prehistoric earthwork, near Moundsville, Marshall county, West Virginia, known since 1734, as appears from the date cut in a tree growing from its summit It is the largest of the conical type of mounds in the United States, having a basal diameter of 320 feet, a height of 70 feet, and about 1,870,000 cu. ft of solid contents It is symmetrical in form and has a depression in the top In 1838 excavation disclosed a burial vault at the base and another 30 ft above, each built of logs and covered with stones The lower contained two human skeletons, the upper vault one; and with each were thousands of shell beads, mica ornaments, copper bracelets, and several stone articles, including, it was said, one with an inscription which gave rise to much discussion Subsequent investigation, however, failed to establish the authenticity of the stone or to prove that it came from the mound

GRAVEL or **PEBBLE-BEDS,** the name given to deposits of rounded or sub-angular, water-worn stones, mingled with finer material such as sand or clay The word "gravel" is adapted from the O Fr. *gravele,* mod *gravelle,* dim. of *grave,* coarse sand, seashore, Mod Fr *grève.* In petrology, the word is used in a technical sense for material of diameter greater than 2mm, material of smaller diameter being termed sand The deposits of gravel are produced by the attrition of rock-fragments by moving water —the tides, waves of the sea and lakes, and the flow of rivers Extensive beds of gravel (shingle-beaches) are formed at the present day on coasts where suitable rocks are exposed to the attack of the atmosphere and of waves In consequence of the continuous movement by shore-currents, intensified during storms, the coasts are often protected and the gravel caused to accumulate by the building of groynes, sea-walls and piers Where the pebbles are swept along to a projecting cape or into a quieter area, they may form nazes (*e g*, Orfordness, Dungeness) or long spits (Chesil Bank), or submarine banks

In many parts of Britain, Scandinavia and North America, there are marine gravels in every respect resembling those of the sea-shore, at levels considerably above high-tide These gravel terraces (or "raised-beaches") often extend for great distances and are indication that the sea at one time stood higher than it does at present

River-gravels occur most commonly in the middle and upper parts of streams where the currents are active in times of flood Ancient terraces of gravel are often found at levels considerably above those of the present rivers They mark the greater activity of the streams or are evidence of uplift of the country, whereby the rivers have been able to cut their beds to a lower level.

The pebbles of gravels resemble those of conglomerates (*q v*), which are pebble-beds cemented by calcareous, siliceous or other material (P. G H B)

GRAVELINES (Flem *Gravelinghe*), a seaport town of northern France, in the department of Nord and arrondissement of Dunkerque, near the mouth of the Aa, 15 m S W of Dunkirk on the railway to Calais Pop (1926) 1,844 The canalization of the Aa by a count of Flanders about the middle of the 12th century led to the foundation of Gravelines (*grave-linghe,* meaning "count's canal") It finally passed from the Spaniards to the French by the Treaty of the Pyrenees in 1659 It is fortified by a double circuit of ramparts and by a tidal moat

The river is canalized and opens out beneath the fortifications into a floating basin Its trade has suffered owing to the nearness of Calais and Dunkirk and the silting up of the channel to the sea It is a centre for the cod and herring fisheries Imports consist of timber from Northern Europe and coal from England, to which eggs and fruit are exported Gravelines has paper-manufactories, sugar-works, fish-curing works, salt-refineries, chicory-roasting factories, a cannery for preserved peas and vegetables, and an important timber-yard The greater part of the population of Gravelines dwells in the maritime quarter of Petit-Fort-Philippe at the mouth of the Aa, and in the village of Les Huttes (to the east of the town), which is inhabited by the fisher-folk

GRAVELOTTE, a village of Lorraine near Metz, famous as the scene of the battle of Aug 18, 1870, between the Germans under King William of Prussia and the French under Marshal Bazaine (*see* METZ and FRANCO-GERMAN WAR) The battlefield extends from the woods which border the Moselle above Metz to Roncourt, near the river Orne Other villages which played an important part in the battle of Gravelotte were Saint Privat, Amanweiler or Amanvillers and Sainte-Marie-aux-Chênes, all lying to the north of Gravelotte

GRAVES, ALFRED PERCEVAL (1846–), Irish writer, was born in Dublin on July 22, 1846, the son of the bishop of Limerick He was educated at Windermere College, and took high honours at Dublin University In 1869 he entered the Civil

Service as clerk in the Home Office; he was an inspector of schools from 1875 to 1910. He was a constant contributor of prose and verse to the *Spectator, The Athenaeum, John Bull* and *Punch,* and took a leading part in the revival of Irish letters and in the pan-Celtic movement. He was for twelve years secretary and twice president of the Irish Literary Society, and is the author of the famous ballad of "Father O'Flynn" and many other songs and ballads In collaboration with Sir C V Stanford he published *Songs of Old Ireland* (1882), *Irish Songs and Ballads* (1893), the airs of which are taken from the Petrie MSS , the airs of his *Irish Folk-Songs* (1897) were arranged by Charles Wood, with whom he also collaborated in *Songs of Erin* (1901). In addition to many editions of Erse poetry he edited and translated Welsh poems

GRAVES, ROBERT RANKE (1895–), English poet and author, the son of A P. Graves, the Irish song-writer, author of "Father O'Flynn" Robert Graves was educated at Charterhouse, and at St John's college, Cambridge During the World War he served in France with the Royal Welsh Fusiliers, and was seriously wounded on the Somme He has published since 1915 several volumes of poetry, and critical essays

His *Collected Poems* were published in 1927 His prose works include —*On English Poetry* (1921), *the Meaning of Dreams* (1924); *Poetic Unreason* (1925); *Contemporary Technique of Poetry* (1925).

GRAVES: WINES OF. The wines of Graves are those made from grapes grown in the vineyards of the Graves district of Bordeaux This district, which owes its name to its gravel soil, begins just outside Bordeaux, it extends about five and a half miles west of that city and thirteen miles to the south, along the left bank of the river Garonne

There are both red and white wines of Graves, the red being the best, although the white wines are better known than the red, under the name of Graves

The red wines of Graves are usually sold under the name of the Estate or Château where they are made The finest Graves is the wine of Château Haut-Brion, which ranks with the three first growths of the Médoc Château Haut-Brion is in the Commune, or parish of Pessac, where are situated other Châteaux famous for the excellence of their red wines, such as Château La Mission Haut-Brion, Château Pape Clément, etc. The other communes, or parishes, of the Graves district, which are renowned for the quality of their red wines are the following. Léognan, Martillac, Villenave d'Ornon and Mérignac

The red wines of Graves are softer, rounder, "fleshier," than the wines of the Médoc, and they do not last so long, nor do they possess, a very few of the best growths excepted, the same refined delicacy or "breed", their bouquet is quite distinctive

The white wines of Graves are not nearly so fine as the red they are a most useful and agreeable type of wine, neither too sweet nor too dry, and they are usually consumed when quite young, as they are not likely to improve appreciably by age They are sometimes sold under the name of their birthplace, the name of the parish, estate, château or vineyard where they were made, they are also sometimes sold under some fancy name, the name of some imaginary or historical person or place, registered as a trade-mark, but the majority of the white wines of Graves reach the public merely under the name of Graves, being blends of white wines from the Graves district from different vineyards and possibly also from different vintages (*See* WINE)

(A L S)

GRAVESEND, municipal borough, river-port and market town of Kent, England, on the Thames opposite Tilbury Fort, 22 m E by S of London by the S R Pop (1921) 37,777

In the Domesday Survey "Gravesham" is among the bishop of Bayeux's lands, and a "hythe" or landing-place is mentioned In 1401 Henry IV granted the men of Gravesend the sole right of conveying in their own vessels all persons travelling between London and Gravesend, this was confirmed by Edward IV in 1462 In 1562 a charter of incorporation by Elizabeth vested the government in two portreeves and 12 jurats, but a later charter (1568) reduced the portreeves to one Charles I. incorporated the town anew under the title of the mayor, jurats and inhabitants of Gravesend, and a further charter of liberties was granted by James II in 1687

From the early 17th century Gravesend was the chief station for East Indiamen A customs house was built in 1782 Queen Elizabeth established Gravesend as the point where the corporation of London should welcome in state eminent foreign visitors arriving by water State processions by water from Gravesend to London had previously taken place, as in 1522, when Henry VIII escorted the emperor Charles V. The Princess Alexandra was received here by the prince of Wales (King Edward VII.) three days before their marriage in 1863. "Princess" Pocahontas, who died when preparing to return home from a visit to England in 1617 was buried in the old church Gravesend extends 2 m along the river bank, occupying the slopes of Windmill Hill. The older lower town is irregular with narrow streets The town pier was erected in 1832, and the terrace pier in 1845, when local river-traffic by steamboat was specially prosperous. Vessels wait here for the tide to come up to London. It is also a yachting centre Milton parish church is a Decorated (14th cent) and Perpendicular building East of the town are the earthworks originally constructed in the reign of Charles II Gravesend, which is within the Port of London, has some import trade in coal, lime and timber, and fishing is carried on Other industries are boat-building and ironfounding Fruit and vegetables are largely grown for the London market Since 1867 Gravesend has returned a member to parliament, the borough including Northfleet to the west and the rural districts of Hoo and Strood

GRAVIES. A gravy is a sauce made from the juices and fats extracted from meats in cooking The term is also applied to the thickened liquid of stews Ordinary meat gravies are distinguished from sauces by their predominating element (osmazome), which gives them their characteristic meat flavour A plain meat gravy is the diluted juices of meat It may be made (*a*) by pouring hot water over a dripping pan, adding salt and pepper and boiling until the sediment in the pan has coloured to a brown colour, where a plain gravy is not well coloured, extra colouring may be added in the form of browned flour or of an artificial colouring made for the purpose; (*b*) by stewing shank-ends of legs of mutton or other bones, gravy beef, etc , to form a stock, (*c*) by artificial means; *i e*, gravy powders sold for the purpose Meat gravies are often thickened with flour, and milk is sometimes added Gravy is used with roast meat, game and poultry, but where meat is stuffed with forcemeat it is usual to serve a thickened gravy In certain cases it is advisable to have extra flavouring added to the gravy, such as garlic, spices, walnut or mushroom ketchup, lemon juice, etc Generally speaking, these are used for stews and inferior meats, etc , to give extra flavour For varnishing galantines, savoury rolls, etc , glaze is used This is made by reducing a good brown gravy (generally made from brown stock) until it is of sticky, glaze-like consistency

(J A S)

GRAVINA, a town and episcopal see of Apulia, Italy, in the province of Bari, 36 m S W from Bari by rail (29 m direct), 1,148 ft above sea-level. Pop (1921) 19,243 (town), 21,185 (commune) The town perhaps occupies the site of the ancient Blera, a post station on the Via Appia The cathedral is mainly of the 15th century The town is surrounded with walls and towers, and a castle of the emperor Frederick II rises above the town, which later belonged to the Orsini, dukes of Gravina, just outside it are dwellings and a church (S Michele), all of which have been hewn in the rock

GRAVING DOCK, a narrow basin, closed by gates or by a caisson, in which a vessel may be placed and from which the water may be pumped or let out, leaving the vessel supported on blocks In this way the ship is left dry and accessible for the purposes of examination, cleaning and repairs of the underwater parts of the hull In British ports the term "dry dock" is more often used than graving dock. The word "graving" was originally used to denote the cleaning of a ship's bottom by means of scraping or burning and coating with tar (*See* DOCKS)

(N G G)

GRAVITATION, in physical science is that mutual action between masses of matter by virtue of which every such mass tends toward every other with a force varying directly as the product of the masses and inversely as the square of their distances apart Although the law was first clearly and rigorously formulated by Sir Isaac Newton, the fact of the action indicated by it was more or less clearly seen by others Even Ptolemy had a vague conception of a force tending toward the centre of the earth which not only kept bodies upon its surface, but in some way upheld the order of the universe John Kepler inferred that the planets move in their orbits under some influence or force exerted by the sun, but the laws of motion were not then sufficiently developed, nor were Kepler's ideas of force sufficiently clear, to admit of a precise statement of the nature of the force C Huygens and R Hooke, contemporaries of Newton, saw that Kepler's third law implied a force tending toward the sun which, acting on the several planets, varied inversely as the square of the distance. But two requirements necessary to generalize the theory were still wanting One was to show that the law of the inverse square not only represented Kepler's third law, but his first two laws also The other was to show that the gravitation of the earth, following one and the same law with that of the sun, extended to the moon Newton's researches showed that the attraction of the earth on the moon was the same as that for bodies at the earth's surface, only reduced in the inverse square of the moon's distance from the earth's centre He also showed that the total gravitation of the earth, assumed as spherical, on external bodies, would be the same as if the earth's mass were concentrated at its centre This led at once to the statement of the law in its most general form

The law of gravitation states that two masses M_1 and M_2, distant d from each other, are pulled together each with a force GM_1M_2/d^2 where G is a constant for all kinds of matter—the *gravitation constant* The acceleration of M_2 towards M_1 or the force exerted on it by M_1 per unit of its mass is therefore GM_1/d^2

The aim of the experiments to be described here may be regarded either as the determination of the mass of the earth in grammes, most conveniently expressed by its mass ÷ its volume, that is, by its *mean density* Δ, or the determination of the *gravitation constant* G Corresponding to these two aspects of the problem there are two modes of attack Suppose that a body of mass m is suspended at the earth's surface where it is pulled with a force w vertically downwards by the earth—its weight At the same time let it be pulled with a force p by a measurable mass M which may be a mountain, or some measurable part of the earth's surface layers, or an artificially prepared mass brought near m, and let the pull of M be the same as if it were concentrated at a distance d The earth pull may be regarded as the same as if the earth were all concentrated at its centre, distant R

Then $$w = G \tfrac{4}{3}\pi R^3 \Delta m / R^2 = G \cdot \tfrac{4}{3}\pi R \Delta m \qquad (1)$$

and $$p = GMm/d^2 \qquad (2)$$

By division $$\Delta = \frac{3M}{4\pi R d^2} \frac{w}{p}$$

If then we can arrange to observe w/p we obtain Δ, the mean density of the earth

But the same observations give us G also For, putting $m = w/g$ in (2), we get

$$G = \frac{d^2}{M} \cdot \frac{p}{w} \cdot g,$$

In the second method of attack the pull p between two artificially prepared measured masses M_1, M_2, is determined when they are a distance d apart, and since $p = GM_1M_2/d^2$ we get at once $G = pd^2/M_1M_2$ But we can also deduce Δ. For putting $w = mg$ in (1) we get

$$\Delta = \frac{3}{4} \frac{g}{G} \frac{1}{\pi R}.$$

Experiments of the first class in which the pull of a known mass is compared with the pull of the earth may be termed experiments on the mean density of the earth, while experiments of the second class in which the pull between two known masses is directly measured may be termed experiments on the gravitation constant.

We shall, however, adopt a slightly different classification for the purpose of describing methods of experiment, viz .—

(1) Comparison of the earth pull on a body with the pull of a natural mass as in the Schiehallien experiment

(2) Determination of the attraction between two artificial masses as in Cavendish's experiment

(3) Comparison of the earth pull on a body with the pull of an artificial mass as in experiments with the common balance

It is interesting to note that the possibility of gravitation experiments of this kind was first considered by Newton, in both of the forms (1) and (2) In the *System of the World* (3rd ed , 1737, p 40) he calculates that the deviation by a hemispherical mountain, of the earth's density and with radius 3 m , on a plumb line at its side will be less than 2 minutes He also calculates (though with an error in his arithmetic) the acceleration towards each other of two spheres each a foot in diameter and of the earth's density, and comes to the conclusion that in either case the effect is too small for measurement In the *Principia,* bk iii , prop x , he makes a celebrated estimate that the earth's mean density is five or six times that of water Adopting this estimate, the deviation by an actual mountain or the attraction of two terrestrial spheres would be of the orders calculated, and regarded by Newton as immeasurably small

Whatever method is adopted the force to be measured is very minute This may be realized if we here anticipate the results of the experiments, which show that in round numbers $\Delta = 5\,5$ and $G = \frac{1}{15\,000,000}$ when the masses are in grammes and the distances in centimeters

1 **Comparison of the Earth Pull with That of a Natural Mass.**—*Bouguer's Experiments* —The earliest experiments were made by Pierre Bouguer about 1740, and they are recorded in his *Figure de la terre* (1749) They were of two kinds In the first he determined the length of the seconds pendulum, and thence g at different levels Thus at Quito, which may be regarded as on a table-land 1,466 toises (a toise is about 6 4 ft) above sea-level, the seconds pendulum was less by $\frac{1}{1\,331}$ than on the Isle of Inca at sea-level But if there were no matter above the sea-level, the inverse square law would make the pendulum less by $\frac{1}{1\,118}$ at the higher level The value of g then at the higher level was greater than could be accounted for by the attraction of an earth ending at sea-level by the difference $\frac{1}{1\,118} - \frac{1}{1\,331} = \frac{1}{6,988}$, and this was put down to the attraction of the plateau 1,466 toises high or the attraction of the whole earth was 6,983 times the attraction of the plateau Using the rule, now known as "Young's rule," for the attraction of the plateau, Bouguer found that the density of the earth was 4 7 times that of the plateau, a result certainly much too large

In the second kind of experiment he attempted to measure the horizontal pull of Chimborazo, a mountain about 20,000 ft high, by the deflection of a plumb-line at a station on its south side Suppose that two stations are fixed one on the side of the mountain due south of the summit, and the other on the same latitude but some distance westward away from the influence of the mountain If at the second station a star is observed to pass the meridian, for simplicity we will say directly overhead, then a plumb-line will hang down exactly parallel to the observing telescope If the mountain were away it would also hang parallel to the telescope at the first station when directed to the same star But the mountain pulls the plumb-line towards it and the star appears to the north of the zenith and evidently mountain pull/earth pull = tangent of the angle of displacement of zenith

Bouguer observed the meridian altitude of several stars at the two stations, and after making the necessary corrections he concluded that the earth was nearly 13 times as dense as the mountain, a result several times too large But the work was carried on under enormous difficulties owing to the severity of the weather, and no exactness could be expected The importance of the experiment lay in its proof that the method was possible

Maskelyne's Experiment —In 1774 Nevil Maskelyne (*Phil Trans* , 1775 p 495) made an experiment on the deflection of the

plumb-line by Schiehallien, a mountain in Perthshire, which has a short ridge nearly east and west, and sides sloping steeply on the north and south He selected two stations on the same meridian, one on the north, the other on the south slope, and by means of a zenith sector, a telescope provided with a plumb-bob, he determined at each station the meridian zenith distances of a number of stars. From a survey of the district made in the years 1774–1776 the geographical differences of latitude between the two stations was found to be 42 94 seconds, and this would have been the difference in the meridian zenith distances of the same star at the two stations in the absence of the mountain But at the north station the plumb-bob was pulled south and the zenith was deflected northwards, while at the south station the effect was reversed Hence the angle between the zeniths, or the angle between the zenith distances of the same star at the two stations was 54 2 seconds, or the double deflection of the plumb-line was 54 2–42 94, say 11 26 seconds The computation of the attraction of the mountain on the supposition that its density was that of the earth was made by Charles Hutton from the results of the survey (*Phil Trans*, 1778, p. 689) He found that the deflection should have been greater in the ratio 17,804.9,933 say 9 5, whence the density of the earth comes out at $\frac{9}{5}$ that of the mountain Hutton took the density of the mountain at 2·5, giving the mean density of the earth 4 5, a figure revised later by Playfair (*Phil Trans*, 1811, p 347)

Airy's Experiment—In 1854 Sir G B Airy (*Phil Trans*, 1856, p. 297) carried out at Harton pit near South Shields an experiment which consisted in comparing gravity at the top and at the bottom of a mine by the swings of the same pendulum, and thence finding the ratio of the pull of the intervening strata to the pull of the whole earth The principle of the method may be understood by assuming that the earth consists of concentric spherical homogeneous shells, the last of thickness h equal to the depth of the mine Let the radius of the earth to the bottom of the mine be R, and the mean density up to that point be Δ. This will not differ appreciably from the mean density of the whole. Let the density of the strata of depth h be δ Denoting the values of gravity above and below by g_a and g_b we have

$$g_b = G \cdot \tfrac{4}{3} \cdot \frac{\pi R^3 \Delta}{R^2} = G \cdot \tfrac{4}{3}\pi R \Delta$$

and

$$g_a = G \cdot \tfrac{4}{3} \cdot \frac{4 R^3 \Delta}{(R+h)^2} + G \cdot 4\pi h\delta$$

since the attraction of a shell h thick on a point just outside it is

$$G \cdot 4\pi(R+h)^2 h\delta/(R+h)^2 = G \cdot 4\pi h\delta$$

Therefore

$$g_a = G \cdot \tfrac{4}{3}\pi \cdot R \cdot \Delta \left(1 - \frac{2h}{R} + \frac{3h}{R} \cdot \frac{\delta}{\Delta}\right) \text{ nearly,}$$

whence

$$\frac{g_a}{g_b} = 1 - \frac{2h}{R} + \frac{3h}{R} \cdot \frac{\delta}{\Delta}$$

$$\frac{\Delta}{\delta} = \frac{3h}{R} \Big/ \left(-1 + \frac{2h}{R} + \frac{g_a}{g_b}\right)$$

Stations were chosen in the same vertical, one near the pit head, another 1,250 ft. below in a disused working, and a *comparison* clock was fixed at each station Two *invariable* seconds pendulums were swung, and interchanged at intervals The final result taking into account the ellipticity and rotation of the earth is $\Delta = 6\ 565$

Von Sterneck's Experiments—(*Mitth des K U K Mil Geog Inst zu Wien*, II, 1882, p 77, 1883, p. 59, VI, 1886, p 97) R von Sterneck repeated the mine experiment in 1882–1883 at the Adalbert shaft at Pribram in Bohemia and in 1885 at the Abraham shaft near Freiberg He swung two *invariable* half seconds pendulums simultaneously, one at the surface, and the other below, interchanging them at intervals Von Sterneck introduced a most important improvement by comparing the swings of the two *invariable* pendulums with the same clock which by an electric circuit gave a signal at each station each second This method eliminated clock rates and began a new era in the determination of local variations of gravity. The values which von Sterneck obtained for Δ were not consistent, but increased with the depth of the second station, probably due to local irregularities in the strata which could not be directly detected

All the experiments to determine Δ by the attraction of natural masses are open to the serious objection that we cannot determine the distribution of density in the neighbourhood with any approach to accuracy The experiments with artificial masses next

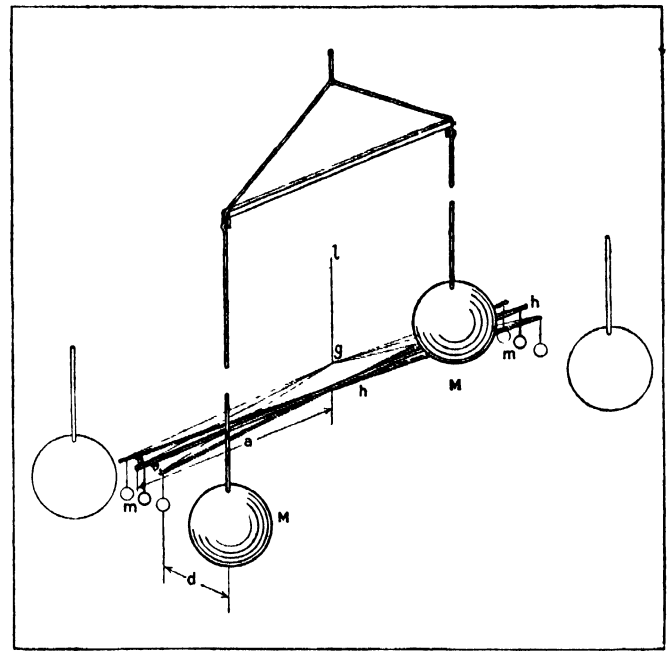

FIG 1—EXPERIMENT PROPOSED BY MICHEL, AND COMPLETED LATER BY CAVENDISH

to be described give much more consistent results, and the experiments with natural masses are now only of use in showing the existence of irregularities in the earth's superficial strata when they give results deviating largely from the accepted value

ii **Determination of the Attraction Between Two Artificial Masses.**—*Cavendish's Experiment*—(*Phil Trans*, 1798, p 469) This celebrated experiment was planned by the Rev John Michell He completed an apparatus for it but did not live to begin work with it After Michell's death the apparatus came into the possession of Henry Cavendish, who largely reconstructed it, and in 1797–1798 carried out the experiment The essential feature of it consisted in the determination of the attraction of a lead sphere 12 in in diameter on another lead sphere 2 in in diameter, the distance between the centres being about 9 in, by means of a torsion balance Fig 1 shows how the experiment was carried out A torsion rod *hh* 6 ft. long, was hung by a wire *lg* From its ends depended two lead balls *mm* each 2 in in diameter The position of the rod was determined by a scale fixed near the end of the arm, the arm itself carrying a vernier moving along the scale which was viewed by a distant telescope The torsion balance was enclosed in a case and outside this two lead spheres *MM* each 12 in. in diameter hung from an arm which could turn round an axis in the line of *gl* Suppose that first the spheres are placed so that one is at a distance *d* in front of the left hand ball *m* and the other is the same distance behind the right hand ball *m* The two will conspire to pull the balls so that the left end of the rod moves forward Now let the big spheres be moved round so that one is in front of the right ball and the other behind the left ball The pulls are reversed and the left end moves backward The angle 2θ between its two positions is (if we neglect cross attractions of right sphere on left ball and left sphere on right ball) four times as great as the deflection of the rod due to the approach of one sphere to one ball The work of Cavendish was undoubtedly very accurate for a pioneer experiment and was not really improved upon until about a century later After making various corrections the result obtained is $\Delta = 5\ 448$

Reich's Experiments.—In 1838 F. Reich published an account of a repetition of the Cavendish experiment carried out on the same general lines, though with somewhat smaller apparatus (*Versuche uber die mittlere Dichtigkeit der Erde mittelst der Drehwage*, Freiberg, 1838, "Neue. Versuche mit der Drehwage," *Leipzig Abh Math. Phys.* i, 1852 p. 383) The chief differences consisted in the methods of measuring the times of vibration and the deflection, and the changes were hardly improvements His result after revision was $\Delta = 5\ 49$. In 1852 he published an account of further work giving as result $\Delta = 5\ 58$.

Baily's Experiment.—In 1841–1842 Francis Baily made a long series of determinations by Cavendish's method and with apparatus nearly of the same dimensions (*Memoirs of the Royal Astron. Soc.* xiv.) The attracting masses were 12 in lead spheres and as attracted balls he used various masses, lead, zinc, glass, ivory, platinum, hollow brass, and finally the torsion rod alone without balls. The suspension was also varied, sometimes consisting of a single wire, sometimes being bifilar There were systematic errors running through Baily's work, which it is impossible now wholly to explain These made the resulting value of Δ show a variation with the nature of the attracted masses and a variation with the temperature His final result $\Delta = 5{\cdot}6747$ is not of value compared with later results

Boys' Experiment—Professor C V. Boys having found that it is possible to draw quartz fibres of practically any degree of fineness, of great strength and true in their elasticity, determined to repeat the Cavendish experiment, using his newly invented fibres for the suspension of the torsion rod. (*Phil. Trans* A, 1895 pt 1, p 1). He began by an inquiry as to the best dimensions for the apparatus, and concluded that these should be reduced until further reduction would make the linear quantities too small to be measured with exactness, for reduction of the dimensions enables variations in temperature and the consequent air disturbances to be reduced, and the experiment in other ways becomes more manageable Professor Boys took as the exactness to be aimed at 1 in 10,000 He further saw that reduction in length of the torsion rod with given balls is an advantage Boys avoided difficulties due to the attraction of the second attracting sphere by suspending the balls from the ends of the torsion rod at different levels and by placing the attracting masses at these different levels Fig 2 represents diagrammatically a vertical section of the arrangement. The torsion rod was a small rectangular mirror about 2 4 cm long From the sides of this mirror gold balls were hung by quartz fibres at levels differing by 15 cm The attracting masses were lead spheres, about 11 cm. in diameter and weighing about 7 4 kgm each, so arranged that the moment of the attraction was a maximum The torsion rod mirror reflected a distant scale by which the deflection could be read The time of vibration was recorded on a chronograph. The result of the experiment, probably the best yet made, was $\Delta = 5{\cdot}527$; $G = 6\ 658 \times 10^{-8}$.

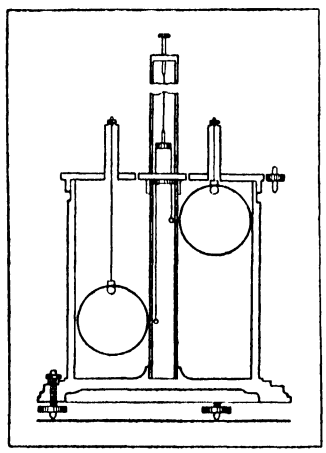

FIG 2.—SECTIONAL DIAGRAM OF PROFESSOR BOYS'S APPARATUS

Braun's Experiment—In 1896 Dr K Braun S J, gave an account of a very careful and excellent repetition of the Cavendish experiment with apparatus much smaller than that used in the older experiments, yet much larger than that used by Boys (*Denkschr. Akad. Wiss Wien. math naturw* Cl. 64, p 187, 1896.) A notable feature of the work consisted in the suspension of the torsion apparatus in a receiver exhausted to abou. 4 mm of mercury, a pressure at which convection currents almost disappear while radiometer forces have hardly begun The attracted balls weighed 54 gm each and were 25 cm apart The attracting masses were spheres of mercury each weighing 9 kgm. and brought into position outside the receiver Braun used both the deflection method and the time of vibration method suggested to Reich by Forbes The methods gave almost identical results and his final values are to three decimal places the same as those obtained by Boys

G. K Burgess's Experiment—This was a Cavendish experiment in which the torsion system was buoyed up by a float in a mercury bath (*Thèses présentées à la faculté des sciences de Paris pour obtenir le titre de docteur de l'université de Paris*, 1901) The attracted masses could thus be made large (2 kgm), and yet the suspending wire could be kept fine From the centre of the beam depended a vertical steel rod with a varnished copper hollow float at its end, entirely immersed in mercury covered with dilute sulphuric acid to remove irregularities due to varying surface tension acting on the steel rod The size of the float was adjusted so that the torsion fibre of quartz 35 cm long had only to carry a weight of 5 to 10 gm The results gave $\Delta = 5\ 55$ and $G = 6\ 64 \times 10^{-8}$.

Eotvos's Experiment—In the course of investigations on local variations of gravity by means of the torsion balance, R Eotvos devised a method for determining G somewhat like the vibration method used by Reich and Braun (*Ann der Physik und Chemie*, 1896, 59, p 354) Two pillars were built up of lead blocks 30 cm square in cross section, 60 cm high and 30 cm apart A torsion rod somewhat less than 30 cm long with small weights at the ends was enclosed in a double-walled brass case of as little depth as possible, a device which secured great steadiness through freedom from convection currents The suspension was a platinum wire about 150 cm long The torsion rod was first set in the line joining the centres of the pillars and its time of vibration was taken Then it was set with its length perpendicular to the line joining the centres and the time again taken From these times Eotvos was able to deduce the provisional value $G = 6\ 65 \times 10^{-8}$, whence $\Delta = 5{\cdot}53$.

Wilsing's Experiment—We may perhaps class with the Cavendish type an experiment made by J Wilsing, in which a vertical "double pendulum" was used in place of a horizontal torsion system (*Publ des astrophysikalischen Observ zu Potsdam*, 1887, No 22, vol vi pt ii; pt iii p 133) Two weights each 540 gm were fixed at the ends of a rod 1 metre long, supported so that it could vibrate about a vertical position Two attracting masses, cast-iron cylinders each 325 kgm, were placed, say, one in front of the top weight on the pendulum and the other behind the bottom weight, and the position of the rod was observed in the usual mirror and scale way Then the front attracting mass was dropped to the level of the lower weight and the back mass was raised to that of the upper weight, and the consequent deflection of the rod was observed The result obtained was $\Delta = 5\ 579$

III **Comparison of the Earth Pull on a Body with the Pull of an Artificial Mass by Means of the Common Balance.**—The principle of the method is as follows Suppose a sphere of mass m and weight w to be hung by a wire from one arm of a balance Let the mass of the earth be E and its radius be R Then $w = GEm/R^2$ Now introduce beneath m a sphere of mass M and let d be the distance of its centre from that of m Its pull increases the apparent weight of m say by δw Then $\delta w = GMm/d^2$ Dividing we obtain $\delta w/w = MR^2/Fd^2$, whence $E = MR^2w/d^2\delta w$ and since $g = GE/R^2$, G can be found when E is known

Von Jolly's Experiment (*Abhand der k bayer Akad der Wiss* 2 Cl xiii Bd I Abt p 157, and xiv Bd 2 Abt p 3) In the first of these papers Ph von Jolly described an experiment in which he sought to determine the decrease in weight with increase of height from the earth's surface Von Jolly fixed a balance at the top of his laboratory and from each pan depended a wire supporting another pan 5 metres below Two 1-kgm. weights were first balanced in the upper pans and then one was moved from an upper to the lower pan on the same side A gain of 1 5 mgm was observed after correction for greater weight of air displaced at the lower level The inverse square law would give a slightly greater gain and the deficiency was ascribed to the configuration of the land near the laboratory.

In the second paper a second experiment was described in which a balance was fixed at the top of a tower and provided as before with one pair of pans just below the arms and a second pair hung from these by wires 21 metres below Four glass globes were prepared equal in weight and volume, thus eliminating air corrections. Two of these were filled each with 5 kgm. of mercury and then all were sealed up The two heavy globes were then placed in the upper pans and the two light ones in the lower The two on one side were now interchanged and a gain in weight of about 31 7 mgm was observed Then a lead sphere about 1 metre diameter was built up under one of the lower pans and the experiment was repeated. Through the attraction of the lead sphere on the mass of mercury when below, the gain was greater by 0·589 mgm This result gave $\Delta = 5{\cdot}692$

Experiment of Richarz and Krigar-Menzel—In 1884 A Konig and F. Richarz proposed a similar experiment which was ultimately carried out by Richarz and O Krigar-Menzel (*Anhang zu den Abhand der k preuss Akad der Wiss zu Berlin* 1898). In this experiment a balance was supported somewhat more than 2 metres above the floor and with scale pans above and below as in von Jolly's experiment Weights each 1 kgm were placed, say, in the top right pan and the bottom left pan Then they were shifted to the bottom right and the top left, the result being, after corrections for change in density of air displaced through pressure and temperature changes, a gain in weight of 1·2453 mgm on the right due to change in level of 2 2628 metres Then a rectangular column of lead 210 cm square cross section and 200 cm high was built up under the balance between the pairs of pans On repeating the weighings there was now a decrease on the right when a kgm was moved on that side from top to bottom while another was moved on the left from bottom to top This decrease was 0 1211 mgm showing a total change due to the lead mass of $1\ 2453 + 0\ 1211 = 1\ 3664$ mgm and this is obviously four times the attraction of the lead mass on one kgm The changes in the positions of the weights were made automatically The results gave $\Delta = 5\ 05$ and $G = 6\ 685 \times 10^{-8}$

Poynting's Experiment—In 1878 J H Poynting published an account of a preliminary experiment on the same lines as that of von Jolly but on a much smaller scale, which he had made to show that the common balance was available for gravitational work (*Phil Trans*, vol 182, A, 1891, p 565) In 1891 he gave an account of the full experiment carried out with a larger balance and with much greater care The balance had a 4 ft. beam The scale pans were removed, and from the two arms were hung lead spheres each weighing about 20 kgm at a level about 120 cm below the beam The balance was supported in a case above a horizontal turn-table with axis vertically below the central knife edge, and on this turn-table was a lead sphere weighing 150 kgm the attracting mass, and at double the distance from the centre, a second balancing weight The centre of the larger sphere was 30 cm below the level of the centres of the hanging weights. The turn-table could be rotated between stops so that the attracting mass was first immediately below the hanging weight on one side, and then immediately under that on the other side After all corrections the results gave $\Delta = 5\ 493$ and $G = 6\ 698 \times 10^{-8}$.

General Remarks.—The earlier methods in which natural masses were used have disadvantages as already pointed out, which render them now quite valueless Of later methods the Cavendish appears to possess advantages over the common balance method in that it is easier to ward off temperature variations, and so avoid convection currents, and probably less difficult to determine the actual value of the attracting force For the present the values determined by Boys and Braun may be accepted as having the greatest weight and we therefore take

Mean density of the earth $= 5\ 527$
Constant of gravitation $G = 6\ 658 \times 10^{-8}$

Probably $\Delta = 5{\cdot}53$ and $G = 6\ 66 \times 10^{-8}$ are correct to 1 in 500.

The Intensity of Gravity—Measurements of the force of gravity have long been made by means of the pendulum, and prior to the middle of the 18th century, a small weight suspended by a thin thread was usually employed. The length was adjusted so that the pendulum vibrated a little faster or slower than the pendulum of a clock, and observations were made by the method of coincidences. Later, the clock pendulum itself was used for the measurement of gravity, and a pendulum of this type was used on Captain Cook's voyage round the world.

About the year 1818, Captain Henry Kater employed the invariable pendulum for determining the variation in the length of the pendulum vibrating seconds at the principal stations of the Trigonometrical Survey of Great Britain (*Phil Trans* 1819, p 337) For many years this type of pendulum was widely used, until the introduction of the half seconds pendulum.

In 1817 Kater introduced his compound reversible pendulum, which was based on the theorem of Huygens, that the centres of suspension and oscillation of a compound pendulum are reciprocal (*Phil Trans* 1818, p. 33). The pendulum was fitted with two sets of knife-edges so arranged that the period of vibration was the same about both of them When this adjustment had been made the distance between the knife edges was equal to the length of the simple pendulum of the same period The length of the seconds pendulum was then obtained by dividing by the square of the period expressed in seconds, while the absolute value of the intensity of gravity could be determined from measurements of the distance between the knife edges, and the period of vibration

A great advance in gravity apparatus occurred in 1882 when von Sterneck introduced the quarter-metre invariable pendulum which beat half-seconds, and was more readily protected from all extraneous influences than the larger and more cumbersome equipment The apparatus now usually employed comprises a set of three one-quarter-metre invariable pendulums with agate knife edges, arranged to swing on three separate agate planes, together with a dummy or temperature indicating pendulum These pendulums are swung within an evacuated air-tight double walled metal chamber

The agate planes are carefully levelled by means of two small pendulums carrying levels in their heads, and the three invariable pendulums are then mounted in the three supporting V's Light, reflected from the mirrors of the two side pendulums, is deflected through a window in the cover into the observing telescope, by means of two prisms situated near the centre, while the thermometer is visible through a second window

A flash apparatus enables coincidences to be observed between the swinging pendulum and a clock or chronometer, an electromagnet in circuit with which operates a shutter at the end of each second

The use of brass pendulums rendered a temperature correction of the greatest importance, and on account of the magnitude of this correction, stations have always been set up in a room of a building in order to reduce considerably the large temperature fluctuations that would otherwise occur

On the suggestion of Lenox-Conyngham, invar pendulums have been employed with success, and the troublesome temperature correction practically eliminated

A modification of the apparatus used by Meinesz in his determinations of gravity at sea was made in 1926 for the Cambridge School of Geodesy In this apparatus, an airtight and partially evacuated rectangular chamber encloses a support carrying three invar half-second pendulums, mounted in a row with their knife edges parallel, so that they oscillate in the same plane Each pendulum is fitted with a knife-edge of stellite, firmly wedged into the head, the central portions of which are polished to form mirrors Light proceeding from a distant lamp is reflected first to one of the outer pendulums, then to the middle one and finally to the eye or the camera The beam of light will oscillate up and down as though reflected by a hypothetical pendulum, the phase angle of which is always equal to the difference between the phase angles of the two actual pendulums This difference is undisturbed by horizontal accelerations which affect the chamber as a whole, and the instrument can thus be used in cases where a perfectly stable platform is not available Intermittent illumination is pro-

vided each second by means of a shutter operated electrically from a standard clock, and the resulting record becomes a sine curve, the amplitude and period being the same as those of the hypothetical pendulum.

Measurement of Gravity at Sea.—A number of attempts have been made to determine gravity at sea, and it is now possible to make these measurements with a degree of accuracy comparable with that obtainable on land Early in the present century Hecker (*Zentralbureau der internationalen Erdmessung*, 1903, 1908, and 1910) endeavoured to compare the pressure as given by a hypsometer, with that indicated by a mercury barometer, while in another method he observed the height of a sealed mercury barometer

Difficulties were encountered due to the ship's oscillatory motion, which gave rise to "pumping" of the mercury in the barometers and so rendered the results to some extent unreliable Trouble was also experienced with the hypsometer thermometers, probably as a result of repeated boiling for extended periods

In 1914 when the British Association visited Australia, Duffield (*Proc Roy Soc* 1916) made determinations of gravity at sea during the voyages out and home, by means of 3 apparatuses designed respectively to measure gravity, (a) by means of a gravity barometer, (b) by means of photographic registering barometers of Hecker's design, (c) by a comparison of readings of mercury and aneroid barometers of special design

Although the last named method yielded results which seemed promising, it suffered from the disadvantage of using barometers which were open to the atmosphere, and as experiments indicated unsuspected difficulties with such instruments this method was discontinued

Subsequent voyages in 1922 and 1923 enabled Duffield (*Geoph Supplement*, Roy Astron Soc 1924, p 161) to make determinations with new instruments including one designed to give a continuous record during the voyage As a result of this work Duffield concluded that in general the value of gravity decreases as the depth of the water increases

More accurate determinations of gravity at sea were made by Dr. F A. Vening Meinesz (*Geog. Journ*, June 1925, p 501), on board the submarine K II of the Royal Dutch Navy during a voyage from Holland to Batavia in 1923. The apparatus employed was the half-second invariable pendulum apparatus of the Von Sterneck type, fitted with four isochronous pendulums suspended from the same plate, and arranged to oscillate in opposite phases, two by two, in planes at right angles Their oscillations were recorded photographically, and when the apparatus was displaced from the vertical, as by the motion of the ship, the rays of light reflected from the mirrors of the two opposing pendulums were found to diverge vertically The pendulums were of brass, which led to difficulties in connection with their large temperature corrections

Gravity observations were made at 31 points and the average anomaly for all the stations is 0 012 dyne by the Bowie formula, while for 10 stations in the Indian Ocean the average anomaly is 0 009 dyne

Meinesz made further investigations in 1926 on a second submarine voyage to Java with an improved apparatus (*Geographical Journal*, 1928, p 144) This new apparatus contained 3 practically isochronous pendulums swinging in the same plane as in the Cambridge apparatus and combined in twos for the elimination of disturbances due to horizontal accelerations The principle of the method is, not to record each pendulum separately, but to get at once the difference of their angles of elongation The resulting records have the same appearance as that of a single pendulum undisturbed by horizontal accelerations The apparatus was supported in double gimbals in order to avoid sliding of the pendulums due to the pitching of the vessel, and in this way bigger angular deviations of the boat could be tolerated

As a result of this voyage, Meinesz found that over the Atlantic and Pacific Oceans, there are excesses of gravity extending over large areas, which, it has been pointed out, may be caused partially by a depression of the geoid with regard to the spheroid It is not likely however that the excess resulting from this cause will be more than a small fraction of the positive anomalies that have been found, and it is improbable that the anomalies can be wholly explained in this way

In general, the results obtained at sea give the impression of greater regularity than those obtained on land, as may be expected from the fact that the upper layer of water immediately below the instrument is homogeneous, and the disturbing masses in the solid crust are farther away from the station The gravity results obtained by Meinesz compel us to accept extensive disturbances of isostatic equilibrium, and until the value of gravity is known with reasonable accuracy over the whole surface of the earth, it will be practically impossible to decide whether these disturbances are located only in the earth's crust, or whether there are also deep-seated anomalies

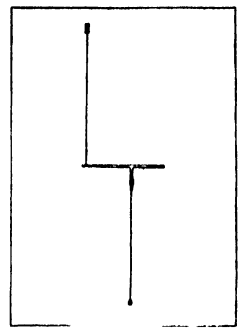

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FIG 3 —SUSPENDED SYSTEM OF AN EOTVOS TORSION BALANCE

Local Variations of Gravity.—Previous to 1888 researches on gravity were confined almost exclusively to investigations with the pendulum and the bubble level, but Eotvos (*Ann der Phys und Chem* B59, 1896, p 354) followed a new line, and endeavoured to measure the variation of the force of gravity in the vicinity of a point, or more exactly to determine the derivatives of its components As these variations are extremely small in comparison with the total force, Eotvos concluded that the method to be employed should measure the differences of gravity directly rather than the force of gravity itself, and he designed a torsion balance which was capable of determining these variations with a considerable degree of accuracy This instrument, fig 3, differs from the earlier Cavendish balance in that it consists of a light horizontal beam, which supports at its extremities two weights, at different vertical heights, the whole being carried on a very fine torsion wire and enclosed in a double or treble-walled metal case which can be rotated about a vertical axis A mirror attached to the centre of the beam enables its position to be observed by means of a scale and telescope, or by an equivalent optical system

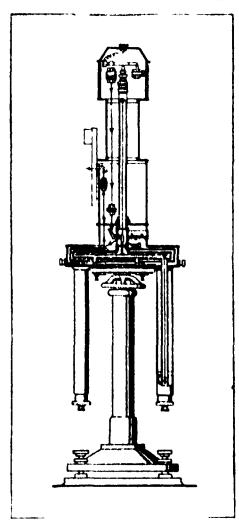

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FIG 4 —EÖTVOS TORSION BALANCE—OERTLING AUTOMATIC PHOTO-VISUAL TYPE

In the instrument made by Suss, observations are taken visually, and the instrument is rotated by hand to the next azimuth position after each reading, but in other types, *e g*, Bamberg and Oertling, fig 4, the observations are recorded photographically, and the instrument rotated into the next azimuth mechanically

In order to reduce the dimensions of the instrument, without reducing the sensitivity unduly, or employing very thin wires, Schweydar introduced a **Z**-shaped beam, having one weight rigidly fixed above and the other below the plane of the beam A reduction in the length of the torsion wire enables the height of the instrument to be reduced to 120 cm , the centre of gravity of the suspended system remaining 70 cm above the ground as in the larger model

By redesigning the beam system so as to be totally irresponsive to curvature effects, Shaw and Lancaster-Jones have introduced the gravity gradiometer, a single beam instrument by which the gradient may be determined from only three observations The suspended system consists of a series of masses arranged in plan at the apices of a regular polygon, one mass being mounted well above the beam on a rigid light support, instead of being suspended below, and the remaining masses fixed directly to the beam The height of the instrument is thus reduced considerably, while a reduction in the length of the beam to 4 5 cm results in more rapid operation and in increased compactness and portability of the instrument

If U is the potential of the gravitational force, n_α the scale reading of the beam after coming to rest in the azimuth position α, n the scale reading corresponding to no torsion on the wire, D the distance of the scale from the mirror, K the moment of inertia of the suspended system, m the mass of the lower weight suspended at a distance h below the beam, and at a horizontal distance l from the axis of suspension, τ the torsion coefficient of the suspension wire, and x, y, and z the axes horizontally along the beam, perpendicular to it, and vertically downwards respectively, it can be shown that

$$n_\alpha - n = \frac{2DK}{\tau}\left[\left(\frac{\partial^2 U}{\partial y^2} - \frac{\partial^2 U}{\partial x^2}\right)\frac{\sin 2\alpha}{2} + \frac{\partial^2 U}{\partial x\,\partial y}\cos 2\alpha\right] + \frac{2Dmhl}{\tau}\left[\frac{\partial^2 U}{\partial y\,\partial z}\cos\alpha - \frac{\partial^2 U}{\partial x\,\partial z}\sin\alpha\right]$$

which may be also written

$$n_\alpha - n = \frac{2DK}{\tau}\left[U_\Delta\frac{\sin 2\alpha}{2} + U_{xy}\cos 2\alpha\right] + \frac{2Dmhl}{\tau}\left[U_{yz}\cos\alpha - U_{xz}\sin\alpha\right]$$

In this equation the five quantities n, U_Δ, U_{xy}, U_{yz} and U_{xz} are unknown factors, so that by taking readings of n_α (the position of equilibrium of the beam) in five different azimuth settings, these factors can be determined from the resulting five equations.

By using two beams placed side by side and oriented oppositely, another unknown value of n is introduced, making six unknowns in all, but as for each setting of such a double instrument, two readings are made, one on each beam, it is possible to obtain a complete solution by taking observations in three azimuth settings of the instrument, so that the speed of operation is thus increased.

The magnitudes U_{yz} and U_{xz} are the components of the gravity "gradient" in the north and east directions respectively, and represent the increase, per unit distance in the horizontal plane in these respective directions, of the vertical component of gravity The maximum "gradient of gravity" is the resultant of these components, its value being $[(U_{yz})^2+(U_{xz})^2]^{\frac{1}{2}}$ and its direction is given by $\tan\mu = U_{yz}/U_{xz}$ The other two magnitudes U_Δ and U_{xz} give the "curvature value," or the deviation of the level surface of gravity from the spheroid. This is measured by the difference of the reciprocals of the principal radii of curvature $\frac{1}{\rho_1}$ and $\frac{1}{\rho_2}$, ρ_1 being the minimum and ρ_2 the maximum radius of curvature,

$$\frac{1}{\rho_1} - \frac{1}{\rho_2} = -\frac{U_\Delta}{g}\sec 2\lambda \quad \text{or} \quad \tan 2\lambda = -\frac{2U_{xy}}{U_\Delta}$$

where λ is the angle between the plane of principal curvature and the plane xz The instrument is extremely sensitive to certain extraneous influences, such as radiation and rapid change of temperature, and precautions are taken to provide adequate protection against these sources of disturbances The suspended beam system is surrounded by an enclosure consisting of three metallic walls, while the instrument itself is set up in a double walled hut specially designed to be light-proof and thermally insulating. The sensitivity of the instrument is such that the unit chosen for expressing the results and known as the Eotvös Unit (E), is 1×10^{-9} C G S unit, and the determination of the gradient and curvature values at any station may generally be regarded as accurate to one Eotvos unit (1E). Increased sensitivity would be readily obtainable if desired but would not be justified on account of the errors resulting from the topographical relief of the ground in the vicinity of the station.

The variation in gravity between the poles of the earth and the equator is registered by this instrument, for by Helmert's 1896 formula

$$g = 978(1\times0.0053\sin^2\phi)\ \text{C G S. units}$$

where ϕ is the latitude

From this we find that

$$U_{xz} = 8.15\sin 2\phi\times10^{-9}$$

and

$$U_\Delta = 5.15(1+\cos 2\phi)\times10^{-9}$$

both of which are measurable by the Eötvos torsion balance, and give rise to "normal" corrections which have to be introduced in every practical field survey, in order to determine the local anomalies

The choice of suitable stations is an important consideration, for objects close to the instrument have an appreciable effect on its readings, so that unless a site is chosen free from such "terrain" irregularities, their effect must be computed from data obtained by levelling radially to a distance of 100 ft Levels are taken in eight directions from the balance station, and the heights of the surface above the base of the instrument measured at certain fixed distances. The gradient correction is found to decrease far more rapidly with distance than the curvature effect, so that it is determined far more readily, the accurate computation of the curvature effect in rough or broken country being a matter of great difficulty The practice of relying on gradient values only is increasing, except in flat localities where curvatures can be employed to advantage The ground outside the 100 ft boundary, but within a radius of 1,000 ft of the station, may be sufficiently irregular to have an appreciable influence on the Eotvos values at the station, although, owing to the comparative remoteness of these irregularities from the station, their effect, known as the *topographical* effect, is usually relatively small Special corrections must also be made for such features as embankments, walls and cuttings, in the vicinity of the station When all the normal and superficial effects have been determined, and the necessary corrections made, the resultant values of U_Δ, U_{xy}, U_{xz} and U_{yz} will be due entirely to variations of structure and density below the ground, and are known as subterranean effects To enable these effects to be interpreted, they are plotted to a suitable scale on a plan of the survey, on which the isogams, or lines of equal intensity of gravity, are also plotted

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GRAY, ASA (1810–1888), American botanist, was born in Paris, Oneida county (N Y), on Nov 18, 1810 From Dr James Hadley, professor of chemistry and materia medica, he obtained his first instruction in science (1825–26) In the spring of 1827 he first began to collect and identify plants His formal education, such as it was, ended in Feb. 1831, when he graduated in medicine from the Fairfield Medical school In 1836 his first botanical textbook appeared under the title *Elements of Botany*, followed in 1839 by *Botanical Text-Book for Colleges, Schools and Private Students*, which developed into his *Structural Botany* He published later *First Lessons in Botany and Vegetable Physiology* (1857), *How Plants Grow* (1858), *Field, Forest and Garden Botany* (1869), and *How Plants Behave* (1872) These books served the purpose of developing popular interest in botanical studies His most important work, however, was his *Manual of the Botany of the Northern United States*, within its geographical limits an indispensable book for the student of American botany, the first edition of which appeared in 1848

Throughout his life Gray was a diligent writer of book reviews on natural history, and his reviews themselves often became treatises of literary and scientific value The greater part of Gray's strictly scientific labour was devoted to a *Flora* of North America, the plan of which originated with his early teacher and associate, John Torrey of New York The second volume of Torrey and Gray's *Flora* was completed in 1843; but for 40 years thereafter Gray gave up a large part of his time to the preparation of his *Synoptical Flora* (1878) Gray's enthusiastic labours in the then new field of discovery and systematization of North American

flora placed him at the head of American botanists and on a level with the most famous botanists of the world. In 1856 he published *Statistics of the Flora of the Northern United States* This paper was followed in 1859 by a memoir on the botany of Japan and its relations to that of North America, which Sir J. D. Hooker called "in point of originality and far-reaching results its author's *opus magnum.*"

From 1855 to 1875 Gray was both a keen critic and a sympathetic exponent of the Darwinian principles, having been for years in close correspondence with Darwin His religious views were those of the evangelical bodies in the Protestant Church, so that, when Darwinism was attacked as equivalent to atheism, he was in position to answer effectively the unfounded allegation that it was fatal to the doctrine of design. He openly avowed his conviction that the present species were not special creations, but rather were derived from previously existing species; and he made his avowal with frank courage, when to the clerical mind evolution meant atheism.

In 1842 Gray accepted the Fisher professorship of natural history in Harvard university. He soon brought together, chiefly by widespread exchanges, a herbarium which became the largest and most valuable in America, and a library where previously there had been none, and arranged the small garden already existing Thereafter the development of these botanical resources was part of his regular labours Everything he originated and developed has been enlarged, improved, and placed on stable foundations. He himself made large contributions to the establishment His scientific life was mainly spent in the herbarium and garden in Cambridge; but his labours there were relieved by numerous journeys to different parts of the United States and to Europe, all of which contributed to his work on the *Synoptical Flora* He received from learned societies at home and abroad abundant evidence of their profound respect for his attainments and services He died in Cambridge (Mass.), on Jan 30, 1888

His *Letters* (1893) were edited by his wife, and his *Scientific Papers* (1888) by C S Sargent. (C W E)

GRAY, DAVID (1838–1861), Scottish poet, son of a handloom weaver, was born at Merkland, near Glasgow He went to London in 1860 with Robert Buchanan with the idea of finding literary work Monckton Milnes (Lord Houghton) befriended him, and tried in vain to persuade him to return home The poet was attacked by tuberculosis, and Milnes sent him to Torquay, there he was seized by a longing for his old home, and went home to die "The Luggie," Gray's best poem, published eventually (1862) through the efforts of Sydney Dobell, is a reverie in which the scenes and events of his childhood and his early aspirations are mingled with the music of the stream which he celebrates The series of sonnets, "In the Shadows," was composed during the latter part of his illness

GRAY, ELISHA (1835–1901), American electrician, was born in Barnesville, Belmont county (O), on Aug 2, 1835 He worked as a carpenter and in a machine-shop, reading in physical science at the same time, and for five years studied at Oberlin college, where he taught for a time He then investigated the subject of telegraphy and in 1867 patented a telegraphic switch and annunciator Experimenting in the transmittal of electro-tones and of musical tones by wire, he utilized in 1874 animal tissues in his receivers, and filed, on Feb 14, 1876, a caveat for the invention of a telephone, only a few hours after the filing of an application for a patent by Alexander Graham Bell. *See* TELEPHONE

Gray's experiments won for him the decoration of the Legion of Honour at the Paris Exposition of 1878 He was for a time a manufacturer of electrical apparatus, particularly of his own inventions; and was chief electrical expert of the Western Electric Company of Chicago. At the Columbian Exposition of 1893 Gray was chairman of the International Congress of Electricians. He died at Newtonville (Mass), on Jan 21, 1901 Among his later inventions were appliances for multiplex telegraphy and the telautograph, a machine for the electric transmission of handwriting He experimented in the submarine use of electric bells

Gray wrote, besides scientific addresses and monographs, *Telegraphy and Telephony* (1878) and *Electricity and Magnetism* (1900).

GRAY, JOHN DE (d. 1214), bishop of Norwich, entered Prince John's service, and at his accession (1199) was rapidly promoted in the church till he became bishop of Norwich in September 1200 King John by attempting to force him into the primacy in 1205 started the long and fatal quarrel with Pope Innocent III. who quashed his election in favour of Langton De Gray was a hard-working royal official, using his position to enrich himself and his family In 1209 he was sent to Ireland as justiciar. He attempted to extend the English frontier northward and westward, and fought a number of campaigns on the Shannon and in Fermanagh. But in 1212 he was defeated by Art O'Maelsechlainn He assimilated the coinage of Ireland to that of England, and tried to effect a similar reform in Irish law De Gray was a good financier, and could always raise money this probably explains the favour he enjoyed from King John In 1213 he brought over from Ireland 500 knights to the great muster at Barham Downs, when Philip Augustus was threatening to invade England After John's reconciliation with Innocent he was exempted from the general pardon, and was forced to go in person to Rome to obtain it He so completely won over Innocent that the pope sent him back with papal letters recommending his election to the bishopric of Durham (1213), but he died Oct. 18, 1214, at St Jean d'Audely in Poitou on his homeward journey For the contest with the papacy over the see of Canterbury *see* LANGTON, STEPHEN

GRAY, PATRICK GRAY, 6TH BARON (d 1612), was descended from Sir Andrew Gray (*c.* 1390–1490) of Broxmouth and Foulis, who played a leading part in Scottish politics and was created a Scottish peer as Lord Gray, probably in 1445

Brought up as a Protestant, and early married to the daughter of Lord Glamis, he soon repudiated his wife and became a Roman Catholic By treachery and intrigue he gained the favour of James (afterwards king of England) which he retained throughout his life In 1584 he acted as an intermediary between James and Elizabeth, whose support he gained by promoting a plot to secure the fall of the earl of Arran Three years later he was again despatched to England, ostensibly to save Mary's life, but his representations had no weight, and her execution led to his fall from power in Scotland Though imprisoned and proved guilty of many crimes, he was saved by the king's favour, and rose to further honours In 1609 he succeeded his father as 6th Baron Gray and died in 1612. In 1585 Gray married Mary Stewart and had by her six daughters and a son Andrew (d. 1663) who succeeded him as 7th baron

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GRAY, ROBERT (1809–1872), first bishop of Cape Town and metropolitan of South Africa, was born at Bishop Wearmouth, Durham, on Oct 3, 1809, and was the son of Robert Gray, bishop of Bristol. He was educated at Eton and Oxford, and took orders in 1833 After holding various English livings, he was consecrated bishop of Cape Town in 1847 In 1853 he was appointed metropolitan of South Africa in view of the contemplated establishment of the suffragan dioceses of Graham's Town and Natal In that capacity his coercive jurisdiction was called in question in the case of Bishop Colenso (*q v*), and the judicial committee of the privy council decided against him. During his episcopate Bishop Gray effected a much-needed organization of the South African church, to which he added five new bishoprics all carved out of the original diocese of Cape Town He died on Sept 1, 1872

See H. L. Farrer, *Life of Robert Gray, Bishop of Capetown* (1876, 2nd ed., 1883).

GRAY, SIR THOMAS (d *c.* 1369), English chronicler, was present at the battle of Neville's Cross in 1346, in 1355, whilst acting as warden of Norham Castle, he was made a prisoner and during his captivity in Edinburgh Castle he studied the English chroniclers, Gildas Bede, Ranulf, Higden and others Released in

1357 he was appointed warden of the east marches towards Scotland in 1367, and he died about 1369 Gray's work, the *Scalacronica* (so called, perhaps, from the scaling ladder in the crest of the Grays), is a chronicle, written in Norman-French, of English history from the earliest times to about the year 1362. It is valuable for the account of the wars between England and Scotland, in which the author's father and the author himself took part

The *Scalacronica* was summarized by John Leland in the 16th century, the part dealing with the period from 1066 to the end, together with the prologue, was edited for the Maitland Club by J Stevenson (1836), and the part from 1274 to 1362 was translated into English by Sir Herbert Maxwell (Glasgow, 1907). In the extant manuscript, which is in Corpus Christi College, Cambridge, there is a gap extending from about 1340 to 1355, and Gray's account of this period is only known from Leland's summary

GRAY, THOMAS (1716–1771), English poet, the fifth and sole surviving child of Philip and Dorothy Gray, was born in London on Dec 26, 1716 His mother's maiden name was Antrobus, and with her sister Mary she kept a millinery shop in Cornhill The premises belonged to Philip Gray, a money-scrivener, who married Dorothy in 1706 and lived with her in the house, the sisters renting the shop from him and supporting themselves by its profits Philip Gray was selfish and brutal, and in 1735 his wife took some abortive steps to obtain a separation from him It was at his mother's expense that Gray went to Eton in 1727, where he was confided to the care of her brother, William Antrobus, one of the assistant-masters, during some part at least of his school-life

At Eton Gray's closest friends were Horace Walpole, Richard West, and Thomas Ashton, afterwards fellow of Eton, they were studious and literary, and took little part in the amusements of their fellows In 1734 Gray matriculated at Peterhouse, Cambridge, and at this time made the firmest and most constant friendship of his life with Thomas Wharton of Pembroke college On March 29, 1739, he started with Walpole for a long continental tour, for the expenses of which it is probable that his father, for once, came in some measure to his assistance In Paris, Gray cultivated a taste for the French classical dramatists, especially Racine, whom he afterwards tried to imitate in the fragmentary "Agrippina", he had already learned Italian and made translations from Dante, Guarini and Tasso In Italy he made a long sojourn, principally at Florence, but Rome, Naples and Herculaneum are also described in Gray's letters, sometimes vividly, always amusingly, and in his notes are almost catalogued At length in April 1741 Gray and Walpole set out northwards for Reggio Here they quarrelled, and with two friends, John Chute and Francis Whithed, Gray went to Venice to see the doge wed the Adriatic on Ascension Day Thence he returned home attended only by a *laquais de voyage,* visiting once more the Grande Chartreuse, where he left in the album of the brotherhood the beautiful alcaics, *O Tu severa Religio loci*

On his return in 1741, London was Gray's headquarters for more than a year, with occasional visits to Stoke Poges, to which his mother and Mary Antrobus had retired from business to live with their sister, Mrs Rogers The year 1742 was, for him, fruitful in poetic effort, of which, however, much was incomplete The "Agrippina," the *De principiis cogitandi,* the splenetic "Hymn to Ignorance" in which he contemplates his return to the university, remain fragments, but besides the two poems already mentioned, the "Ode on a Distant Prospect of Eton College" and the "Hymn to Adversity," perhaps the most faultless of his poems, were written before the close of the summer After hesitating between Trinity Hall and Peterhouse, he returned to the latter, probably as a fellow-commoner He had hitherto neglected to read for a degree, he proceeded to that of LL B in 1744 In 1745 a reconciliation with Walpole was effected through the kind offices of Chute's sister In 1748 he first came before the public, but anonymously, in Dodsley's *Miscellany,* in which appeared the Eton ode, the ode on spring, and that on the cat

There was little to break the monotony of his days till 1750, when from Stoke he sent Walpole "a thing to which he had at last put an end" The "thing" was the "Elegy" It was shown about in manuscript by his admiring friend, it was impudently pirated, and Gray had it printed by Dodsley in self-defence. The publication led to the one incident in Gray's life which has a touch of romance At Stoke house had come to live the widowed Lady Cobham, who learnt that the author of the "Elegy" was her neighbour A platonic affection sprang up between Gray and Miss Speed, her protégée; rumour, upon the death of Lady Cobham, said that they were to be married, but the lady escaped this mild destiny to become the Baroness de la Peyrière, afterwards Countess Viry, and a dangerous political *intriguante.*

In 1753 all Gray's completed poems, except the sonnet on the death of West, were published by Dodsley in a volume illustrated by Richard Bentley, the son of the master of Trinity Already in 1752 he had almost completed "The Progress of Poesy," in which, and in "The Bard," the imagery is largely furnished forth by mountain and torrent These odes were the first-fruits of the press which Walpole had set up at Strawberry Hill, and were printed together there in 1757 Though they did not attain the popularity of the "Elegy," these poems marked an epoch in the history of English poetry, and the influence of "The Bard" may be traced even in that great but very fruitful imposture, the pseudo-Ossian of Macpherson. Gray yields to the impulse of the Romantic movement, he has long been an admirer of ballad poetry, before he wrote "The Bard" he had begun to study Scandinavian literature, and the two "Norse Odes," written in 1761, were in style and metrical form strangely anticipative of Coleridge and Scott Meanwhile his Cambridge life had been vexed by the riotous fellow-commoners of Peterhouse, the authorities treated his complaints with scant respect, and he migrated to Pembroke college "I left my lodgings," he said, "because the rooms were noisy, and the people of the house dirty"

In 1758 Gray lived quietly at Stoke, in 1759 he made a very long sojourn in town, where in 1761 he witnessed the coronation of George III In his last years he visited various picturesque districts of Great Britain, exploring great houses and ruined abbeys, noting and describing in the spirit now of the poet, now of the art critic, now of the antiquary In 1762 he travelled in Yorkshire and Derbyshire, in 1764 in the Lowlands of Scotland, and thence went to Southampton and its neighbourhood In 1765 he revisited Scotland His most notable achievement in this direction was his journey among the English lakes, and even in 1770, the year before his death, he visited with his young friend Norton Nicholls "five of the most beautiful counties of the kingdom" In 1768 the duke of Grafton offered him the professorship of modern history which in 1762 he had vainly endeavoured to obtain from Bute, and in 1769 he wrote the "Installation Ode" upon the appointment of Grafton as chancellor of the university He was contemplating a journey to Switzerland to visit his youthful friend de Bonstetten when, in the summer of 1771, he was seized with a sudden illness when dining in his college hall He died on July 30, 1771, and was laid beside his beloved mother in the churchyard of Stoke Poges

Owing to his shyness and reserve he had few intimate friends, but to these his loss was irreparable His friendship with the young, after his migration to Pembroke college, is a noteworthy trait in his character, with the elderly "Levites" of the place he was less in sympathy, in the polemics of the university he was somewhat of a free lance, and lampoons of his were privately circulated with much effect In literature he was regarded as an innovator, for like Collins he revived the poetic diction of the past, and the adverse judgments of Johnson and others upon his work are in fact a defence of the current literary traditions Few men have published so little to so much effect, few have attained to fame with so little ambition His favourite maxim was "to be employed is to be happy," and in pursuance of this end he made himself one of the best Greek scholars at Cambridge in the interval between Bentley and Porson He had a fine taste in music, painting and architecture; and his correspondence includes a wide survey of European literature, with criticisms of a singularly fresh and modern cast He was a refined Epicurean in his habits, and a deist rather than a Christian in his religious beliefs, but his friend, Mrs Bonfoy, had "taught him to pray" and he was keenly alive to the dangers of a flippant scepticism.

In a beautiful alcaic stanza he pronounces the man supremely happy who in the depths of the heart is conscious of the "fount of tears," and his characteristic melancholy, except in the few hours when it was indeed black, was not a pitiable state, rather, it was one secret of the charm both of the man and of the poet

A very complete bibliography will be found in *The Poetical Works of Thomas Gray* (ed J. Bradshaw, Aldine edition, 1891) *See* also W Mason, *The Poems of Mr. Gray, to which are prefixed memoirs of his life and writings* (1775, reprinted, with additions, by T J Mathias, 1814), J Nichols, *Illustrations of the Literary History of the Eighteenth Century*, vol VI (1817–58), for the true story of Gray's migration to Pembroke college, *The Works of Thomas Gray* (ed J Mitford, 1836–43), *The Correspondence of T Gray and W Mason* (ed J Mitford, 1853), Matthew Arnold's essay on Gray in T H Ward's *The English Poets*, vol 3 (1880, 2nd ed, 5 vol, 1883–1918), Edmund Gosse, *Gray* in the Eng Men of Letters Series (1882, 2nd ed 1889), and his editions of *The Works of Thomas Gray in prose and verse* (4 vol, 1884), D C Tovey, *Gray and his Friends* (1890), and his edition of *The Letters of Thomas Gray* in Bohn's Standard Library (3 vol., 1900–12) (D C To, X)

GRAY or **GREY, WALTER DE** (d 1255), English prelate and statesman, nephew of John de Gray, bishop of Norwich, was educated at Oxford He owed his rapid preferment to the favour of King John He became the king's chancellor in 1205, and in 1210 was elected bishop of Lichfield by the chapter at the king's orders But the papal legate quashed the election He became bishop of Worcester in 1214, resigning his office of chancellor in the same year Gray was with John when the king signed Magna Carta in June 1215, in the autumn he left England on the king's business, and during his absence was forced into the archbishopric of York, owing his election to the good offices of John and of Innocent III He took action against the French invaders on the accession of Henry III and played a leading part during the young king's minority When Henry took over the Government he continued to employ de Gray, who carried out many important diplomatic missions and acted as the king's chief justiciar during Henry's absence in France (1242–1243) As archbishop of York de Gray's insistence on his right to have his cross borne erect in the southern provinces involved him in a dispute with Archbishop Stephen Langton, and he maintained his claim to the point of absenting himself from the king's second coronation in May 1220 The archbishop of Canterbury had an interview with him at Lincoln in 1222 on the subject, but no decision was reached Later the archbishop absented himself altogether from public business for a time, but in 1255 he visited London to attend a meeting of parliament, and died at Fulham on May 1, 1255 Gray was always anxious to assert his archiepiscopal authority over Scotland, and sought to assert it on the occasion of the coronation of Alexander II, but Innocent III, who desired the continued independence of the Scottish Church, intervened in favour of the Scotch claim De Gray built the south transept of the minster at York and is said to have built the west front of Ripon cathedral

GRAY, a town of eastern France, capital of an arrondissement in the department of Haute-Saône, situated on the bank of the Saône, 36 m W S W of Vesoul by rail Pop (1926) 5,837 Gray was founded in the 7th century Its fortifications were destroyed by Louis XIV It gave its name to the distinguished English family of de Gray, Gray or Grey, mentioned in Domesday as tenants in Oxfordshire

The town has a busy port Three bridges, unite it to the railway-station from which lines branch off to Auxonne, Dijon, Besançon and Culmont-Chalindrey The principal buildings are the Gothic church, restored in the style of the Renaissance with a modern portal, and the hôtel de ville, built by the Spaniards in 1568 Gray is the seat of a sub-prefect and has tribunals of first instance and of commerce, a chamber of commerce and a small museum It has large flour-mills and manufactures machinery and iron goods There is also a considerable transit traffic in goods mainly by river from the south of France and the colonies, and trade in iron, corn, provisions, vegetables, wine, wood, etc

GRAYLING, the name for fishes of the genus *Thymallus*, of the family Salmonidae, distinguished by rather large scales, a small mouth with feeble teeth, and a long dorsal fin, with 20 to 24 rays Six species are known from the rivers of Europe, Siberia and northern North America They are handsome fishes, and afford good sport to anglers They are excellent for the table (*See* SALMON AND SALMONIDAE)

GRAYS THURROCK or GRAYS, an urban district of Essex, England, on the Thames, 20 m E by S from London by the L M S railway Pop (1921) 17,359 The church of St Peter and St Paul retains some Norman work The Gray family held the manor for three centuries from 1149 Roman remains have been found in the vicinity, and some quarries contain large mammalian remains The town has trade in lime and cement

GRAZ, the capital of the Austrian province of Styria, picturesquely situated on both banks of the Mur, at the opening of this valley into the broad and fertile basin known as the Grazer Feld The town (pop, 1923, 152,706) is enclosed on three sides by forested heights of the Styrian alps, a small outlier of which, the Schlossberg, dominates the old town on the left bank of the river This height (1,545 ft and about 350 ft above the general level of the town), which can be ascended by cable tramway, was an important fortified stronghold from pre-Roman times, but since 1839 has been laid out with beautiful parks, and on its top is a bell-tower (115 ft), and a clock tower (92 ft) Fine panoramas are to be seen of the town, the Mur valley and the mountains, to the north the Schockel (4,745 ft), to the north-west the Upper Styrian alps, to the south-west the Koralps and to the south the Possruck At the foot of the Schlossberg to the west lies the river and to the east the town park with many marble and bronze monuments

In the old town cluster the principal buildings of note The 16th century Landhaus in Renaissance style, the 17th century Zeughaus or arsenal, maintained as it was 250 years ago, with its rich collection of 15th–17th century weapons, and the 19th century town hall in German Renaissance style and the 11th century castle, now used as government offices, are worthy of mention Amongst the many ecclesiastical buildings the most important is the 15th century cathedral of St Aegidius, mainly in late Gothic, though later decorations and modifications in Baroque have altered the original purity of style The interior is remarkable for its costly stained-glass windows, shrines and paintings In the vicinity is the mausoleum church in Baroque style (1614–1714)

Graz is rich in educational institutions, at the head of which is the university, founded in 1586 by the Austrian archduke Charles Francis and restored in 1827 after an interruption of 45 years It is now magnificently housed with well-equipped laboratories and a rich library and is attended by over 2,000 students There is also a technical college with more than 1,000 students, founded in 1814 by the archduke John Baptist, who also founded the Joanneum museum (1811), which has extensive collections of antiquities and natural history specimens in its old building and in the new (1890–95), collections illustrative of the development of Styrian culture

The outer suburbs of the town include the numerous factories, and this is particularly true of those on the right bank of the river, between it and the railway For its active trade three factors are responsible, viz, the local situation at the contact of mountain and fertile Tertiary downland, the position with reference to important routes from Danube to Adriatic and their branching towards the Hungarian plain, and the presence of good lignite in the vicinity (Koflach) In addition to an active trade in the cereals, fruit and wine of the hill lands, large manufactures have developed Iron and steel works, physical and optical instrument factories, brewing, milling, leather and paper and cloth industries, the preparation of chemicals, printing and lithographic trades and great railway workshops are amongst its major operations while visitors to the many interesting places and spas in the neighbourhood swell the growing volume of trade

The early history of the town is obscure and it is first definitely mentioned in a document of AD 881, after which it became the residence of the rulers of Styria Its strength and importance in the 15th and 16th centuries are exemplified by successful resistances to Hungarian (1481) and Turkish (1529, 1532) attacks Protestantism established itself early here (1530) and flourished until oppressive measures by the archduke Charles restored the authority of Rome After a long and fairly quiescent

period the town figured largely in the Napoleonic Wars, being held by the French in 1797 and again in 1805, while in 1809 the citadel on the Schlossberg was blown up by Marshal Macdonald in accordance with the terms of the peace of Vienna, only the bell-tower and clock-tower being left The development of the town was most rapid during the 19th century, when it received many civic privileges through the interest of the archduke John

See also STYRIA, G. Fels, *Graz und seine Umgebung* (Graz, 1898), J. Solch, *Das Grazer Hugelland* (Vienna, 1921).

GRAZIER. One who grazes or pastures and rears cattle for the market. (*See* AGRICULTURE: GRASS AND GRASSLAND, CATTLE)

GRAZZINI, ANTONIO FRANCESCO (1503–1583), Italian author, was born at Florence on March 22, 1503 In 1540 he was one of the founders of the Academy of the Humid (degli Umidi) afterwards called "della Fiorentina," and in 1582 founded, with L Salviati, the Accademia della Crusca In both societies he was known as *Il Lasca* or *Leuciscus* He died on Feb 18, 1583 Il Lasca ranks as one of the great masters of Tuscan prose His principal works are *Le Cene* (1756 mod ed by Verzone, 1890), a collection of stories in the manner of Boccaccio, and a number of prose comedies (mod ed, 1859), *La Gelosia, La Spiritata, I Parentadi, La Arenga, La Sibilla, La Pinzochera, L'Arzigogolo* These comedies were written in reaction against the classical Italian manner, but in fact Grazzini went for his subjects to the same sources as his opponents

He also edited the works of Berni In 1868 Adamo Rossi published in his *Ricerche per le biblioteche di Perugia* three "novelle" by Grazzini, from a MS of the 16th century in the "Comunale" of Perugia *See* G Gentile, *Delle comedie di A F Grazzini* (1896)

GREASEWOOD, a North American shrub (*Sarcobatus vermiculatus*) of the goosefoot family (Chenopodiaceae), and a characteristic plant of strongly alkaline and saline soils in the high plains of the Rocky Mountain region from Montana to Mexico It is a much branched, somewhat spiny shrub, 2 ft to 10 ft high, with small, fleshy, toothless and stalkless leaves. The creosote-bush (*q v*), certain species of salt bush (*q v*), and various other plants are also called greasewood

GREAT ATLANTIC AND PACIFIC TEA COMPANY, THE, an American corporation operating a large chain of food stores through the United States and Canada The first store was opened in New York city in 1859, others were quickly added, and the business extended to the principal Eastern cities, thus establishing the first of the retail chain store systems Originally the stores handled teas and coffee exclusively; later a full line of groceries was added, and later still meat markets have been established in some stores and new combination stores opened with grocery, meat and produce departments The company in 1928 operated about 15,000 stores scattered throughout the United States and Canada

The earlier stores were operated by the Great American Tea Company, but this name was soon changed to the present title The business was incorporated in 1903 in New Jersey and this corporation was in 1928 the operating company Financial or holding companies were incorporated in 1916 in New York and in 1925 in Maryland, the latter company owning the entire capital stock of the operating company The capitalization, as of Feb 28, 1928, consisted of $24,938,300 of 7% preferred stock, and of 1,150,000 shares of voting and 875,008 shares of non-voting common stock without par value carried in the balance sheet at $32,699,560 The surplus as of the same date reached the total of $27,363,102 (J A HA)

GREAT AWAKENING: *see* REVIVALS, RELIGIOUS

GREAT BARRIER REEF, north-eastern Australia, the largest coastal coral reef in the world, 900 nautical miles in length, along the Queensland coast, from which it is separated by a lagoon-channel varying in width from 20 miles to 70 miles This channel is a valuable route of communication for coasting steamers The reef itself is also traversed by a number of navigable passages There are many islands in the lagoon channel and the character of the coast within the lagoon has also been held by Prof W M Davis to indicate long-continued protection from the power of the ocean waves. The reef has therefore been in existence, probably for a long time It is held by some authorities that the basis of the reef is an orographical edge now submerged and it is pointed out that land connections of Australia with New Guinea indicated by facts of biological distributions may have existed until fairly recent geological times The problems of the Great Barrier Reef are being studied (1928–9) comprehensively by a group of scientific workers Its problems will probably be illuminated in the next few years as a British scientific party arrived on the reef during 1928 for at least a year's study

See CORAL REEFS, which discusses theories of origins and gives bibliographical references

GREAT BARRINGTON, a town of Berkshire county, Mass, U S A, on the Housatonic river in the southern Berkshire hills It is served by the New York, New Haven and Hartford railroad The area is 45 sq m, and the population in 1925 was 6,405 Mountains, forests, meadows, lakes and streams make the region one of charming scenery, and there are many hotels and private summer homes in the town A number of 18th century farmhouses still stand, and quiet old villages may still be found in secluded spots. The principal manufactures are cotton yarn, bedspreads, fine writing papers and vacuum flasks The town was incorporated in 1761, and from then until 1787 it was the county seat During the Shay's Rebellion it was a centre of disaffection William Cullen Bryant, who lived here as lawyer and who was the town clerk from 1816 to 1825, embodied the Indian legend of Monument Mountain (just north of Great Barrington) in one of his poems

GREAT BASIN, THE, so named by John C Frémont, who was the first to gain an adequate conception of its character and extent, is a roughly triangular region including about 200,000 sq m in the western part of the United States, between the Wasatch mountains and the Sierra Nevada It is about 800 m long from north to south and about 500 m broad in its widest part, at its north end Most of it is in Nevada and Utah, but a large part is in California, and it includes small areas in Oregon, Idaho and Wyoming It is not, as its name might suggest, a single basin-shaped depression that gathers its waters to a common centre, but it is divided into many independent drainage basins, the water of none of which finds outlet from the region Its surface features are diverse, including flat valleys and rugged mountains with high peaks. The general level of the basin is highest near its centre, from which it descends notably toward the south Death valley and the valley that contains the Salton sea, both in southern California, lie in part below sea-level. The whole of the Great Basin has been considered a vast desert, although that term is more properly applied only to the Great Salt Lake and Carson deserts, in its northern part, and to the Mohave, Ralston and Amargosa deserts, in its south-western part It includes salty and alkaline deposits, barren mud playas into which water that falls in rainstorms gathers for short periods and stony wastes where mountain streams have formed alluvial fans at their mouths. Many of the mountains and valleys trend north and south and appear to be of a peculiar type, exhibiting what has been called basin-range or fault-block structure, a type that has long been a subject of study and discussion by geologists

The climate in widely separated parts of the Great Basin and at its greatly different altitudes ranges from nearly tropical to cool The region is dry, the average annual rainfall being about 3 in in its southern part and 10 to 12 in in its northern part The precipitation occurs mostly in short local showers, some of them so violent that they are called cloudbursts The water of these storms cuts deep arroyos but soon evaporates. Few of the mountain streams flow out upon level land, and the water of those that do soon disappears or is dissipated by evaporation In the northern part of the basin there are many permanent lakes, which, having no outlets, are saline The largest of these is Great Salt Lake (*q.v*). Among the other lakes in the northern part of the basin are Bear, Utah and Sevier lakes, and, farther west, Eagle, Pyramid, Winnemucca and Walker lakes and the Carson lakes Humboldt river, the largest stream in the Great Basin, feeds North Carson lake

On the higher levels in central Utah there are straggling forests, mainly of pine and cedar, and in northern Nevada scattered clumps of brush, among which greasewood (*Sarcobatus*) and several kinds of sage (*Artemisia*) are the most abundant. Most of the lowlands and lower mountains are treeless. Cottonwoods grow along the streams, and plants that can endure salt thrive along the margins of the bare playas In the southern part of the basin grey desert plants and species of cactus and other thorny growths are common In the spring the barren-looking land in places brings forth many beautiful and delicate flowers Agriculture is restricted to a few irrigable areas, but sheep and cattle are grazed in some places. The vegetation becomes more varied and abundant with increase of altitude. Some of the most productive metal mines in the world have been developed in this region The Mormons have planted orchards, gardens and fields of grain on the east side of Great Salt Lake The Salt Lake desert, which lies west of the lake and which Frémont visited in 1842, is still a desert, and the Great Basin as a whole is very sparsely settled

A hundred thousand years ago the climate of the basin was much moister than it is now. In the northern part there were then two large lakes, Lake Bonneville and Lake Lahontan

See G K Gilbert in *Surveys West of the One Hundredth Meridian,* vol iii , Clarence King and others, *Report of the Fortieth Parallel Survey,* G K Gilbert, "Lake Bonneville," U S Geological Survey *Monograph I* (1890), also I C Russell, "Lake Lahontan," *id*, *Monograph II*, 1885 For a history of the discussion of basin-range or fault-block structure *see* G K. Gilbert, "Studies of Basin-Range Structure," U S. Geological Survey, *Professional Paper 153* (1928) (G McL. Wo.)

GREAT BEAR LAKE, an extensive sheet of fresh water in the north-west of Canada, between 65° and 67° N , and 117° and 123° W It is of very irregular shape, has an estimated area of 11,200 sq m , a depth of 270 ft , and is upwards of 200 ft. above the sea

GREAT BEND, a city of central Kansas, U S A., on the Arkansas river and Federal highway 50N, at an altitude of 1,843 ft , the county seat of Barton county It is served by the Missouri Pacific and the Santa Fe railways The population in 1925 (State census) was 5,389 It has grain elevators and flour mills, and is a shipping point for wheat, live stock and other agricultural products The city was founded about 1870 and incorporated in 1871 It was on the old Santa Fe trail, which passed through the courthouse square. East of the city are the ruins of Fort Zarah (established 1864), from which soldiers escorted wagon trains through the dangerous stretch beyond The region west of Great Bend was the home of vast herds of buffalo, antelope and deer, and was a famous hunting ground for the Indians of the plains, and the scene of innumerable conflicts among the tribes Near Great Bend was the alleged site of the mythical city of Quivira, sought by Coronado

GREAT BRITAIN, the official title of the political unity of England, Wales and Scotland The name was formally adopted in 1707 at the date of the union of the crowns of England and Scotland, but it had been used informally by many writers for a long time previous to that date. The following article deals with those subjects which concern Great Britain as a whole, *e g*, constitution, defence, finance, and economics, etc. For those subjects which essentially concern each country separately, *e g*, geography, geology, population, religious denominations, etc , the articles ENGLAND, SCOTLAND, WALES should be consulted. (*See* also BRITISH EMPIRE; ENGLISH HISTORY; IRELAND, NORTHERN, IRISH FREE STATE; LOCAL GOVERNMENT and UNITED KINGDOM)

CONSTITUTION

The British is unique among existing Constitutions in antiquity of origin, length of endurance, continuity of growth, adaptability to circumstance and extent of influence In the course of close on nine (we might say 13) centuries of practically uninterrupted evolution, it has served in turn a feudal society, an all-but-absolute monarchy, an aristocracy, and the rule of the *bourgeoisie;* and is even now adapting itself to the service of democracy From the comparatively simple task of providing a form of government for a small, sparsely populated, backward and unimportant island, dangling off the north-west coast of Europe, it was called upon in time to develop and elaborate machinery for controlling the greatest empire that the world has ever seen, and more recently to modify that machinery to befit the senior partner in a commonwealth of free and equal nations, each of which now possesses similar institutions of its own. Its range of influence has not been limited to the Anglo-Saxon race, nor even to countries with a background of kindred law. For even nations that have grown up on a Roman foundation have been obliged to superimpose a structure of Anglo-Saxon institutions And, indeed, practically every civilized nation, and some that could hardly be called civilized, have, at one time or another, followed suit.

Much of the peculiar genius of the Constitution is attributable to the fact that it is partly "unwritten" and wholly "flexible" It is futile to search the statute book and the law reports for the details of this Constitution, since some of its most vital institutions and most of its rules of procedure are either utterly, like the cabinet, or almost, like the prime minister, unknown to the law And, although the law gradually extends its scope, it barely keeps pace with, and never overtakes, the ever fresh developments in constitutional practice. Thus the most fundamental constitutional changes may take place without the alteration of a letter of the law; instance the change in the status of the dominions as defined at the Imperial Conferences of 1911 and 1926 respectively

Moreover, even such portions of the Constitution as are defined by law are in no way specially privileged, all law, whether public or private, being subject to the authority of one and the same parliament. It cannot be said, however, that this has always been the case. In the middle ages, apart from the prescriptive rights of various grades of society, *e g* , clergy and baronage, certain enactments, *e g* , Magna Carta, were regarded as peculiarly sacrosanct, and the principles of the common law itself might be interpreted but not changed In the 17th century, the doctrine of fundamental law was used by parliament against the Crown, and in the 18th when parliament was sovereign, by the people against parliament The Acts of Union with Scotland and Ireland contained clauses which were meant to be inviolable And the United States, on their succession, embodied the doctrine in their Constitution. The everlasting problem of reconciling sovereignty with liberty was thus solved by the simple process of docking, as it were, a piece off each A century or so later, Great Britain reached an alternative solution by vesting sovereignty in the people who theoretically could now only abuse their sovereignty and their liberty at their own expense. But since the sovereignty of the people means in practice the rule of the majority, there are many who proclaim the need of safeguards against abuse of sovereignty by temporary majorities, and the argument constitutes, perhaps, the main moral sanction for the retention in some form or other of the House of Lords

Again, as a result of the rule of an uncodified common law, the ordinary tribunals will enforce any legislation affecting the Constitution, so that Government officials are amenable to the law which regulates the relations of private citizens There is, in short, or is supposed to be, no *loi administratif* But the technical disabilities of the subject in suing the Crown, the power of "subordinate legislation" conferred on Government departments, the spread of bureaucracy as a result, partly of Defence of the Realm legislation during the World War, and partly of the increased socialization of the State—all these factors contribute to that outstanding constitutional problem, namely the continual encroachment of the executive, either by using the prerogative or by the presumed exercise of statutory powers, upon the rights and liberties of the subject

The absence of a *loi administratif* on the one hand, and, on the other, the possibility in spite of this, of executive encroachment in judicial and legislative spheres, are both symptomatic of yet another characteristic of the constitution The functions of government are not segregated in watertight compartments In other words, there is no "separation of powers" On the contrary, the several departments interlace and overlap Thus the executive, as well as including the lord chancellor, the attorney-general and the solicitor-general, has seats in the legislature, the legislature dis-

misses and indirectly appoints the executive, and one portion of it is a final court of error; and the judiciary, in addition to its connection with ministry and parliament, is continually legislating by interpretation

Crown.—This interlocking of the organs of central government is due to their common origin in the *curia regis* of the Norman kings, a body which performed all the functions of government without differentiating between them It was the king's court meeting to do the king's business, and the same is true of all the descendants to which in course of time with the multiplication and elaboration of business it gave birth, although the sovereign has long since ceased to attend in person, save on formal occasions at his privy council and in his high court of parliament In Anglo-Saxon times the monarchy was elective, but the choice of the Witan was restricted to the members of one family Feudal theory after the Conquest gradually assimilated the descent of the crown to the descent of an estate in land, thus substituting an hereditary and territorial for an elective and personal basis Later on, parliament was occasionally called upon to bolster up the doubtful legality of a successful candidate to the throne, and so parliamentary became a rival to hereditary title. In spite of the additional support lent temporarily to the latter by the theory of Divine Right, it was the former that triumphed eventually at the Revolution, and the Crown is now held in hereditary succession as limited and defined in the Act of Settlement of 1701

The feudal theory according to which the king was merely the greatest of feudal lords was gradually undermined by the idea of a national king, and the improvement of the royal status may be traced in the parallel growth of the law of treason and of the theory of the prerogative The ruin of the baronage in the Wars of the Roses left the Crown for the time being without a rival, and, when a little later the Church became erastianized, Henry VIII could with justice claim to be "king, emperor and pope" in his own dominions But the national need of an autocrat passed with the century Parliament, now fully grown, took up the challenge of Divine Right, and the Stuarts, in pursuit of the shadow, lost the substance of power At the Revolution sovereignty passed to parliament William III was no dummy; but, during the subsequent reigns of a woman and two foreigners, the royal authority rapidly declined, and George III 's tardy attempt to restore it ended in disaster "Economical" reform at the end of the 18th century made the Commons, and parliamentary reform early in the 19th made the constituencies, independent of royal manipulation, and the logic of party government in tingeing all policies with partizanship finally obliged the sovereign, save at moments of crisis when the exercise of his discretion became unavoidable, to undertake no public acts except on the advice of ministers But the influence of the monarch, though difficult to estimate, should not be underrated He is kept fully informed, his advice is taken and his consent obtained to all measures, and, of course, with the growth of the empire, and more especially since the recognition of the dominions as co-equal partners with the mother country, the Crown has achieved unique significance as at once the symbol and chief constitutional safeguard of imperial union

Judiciary.—In Anglo-Saxon times the earliest forms of customary law were administered in three sets of courts —(1) national, those of the hundred and of the shire, (2) private, those of the thegns and of the lords of manors, and (3) municipal, those of the chartered boroughs After the Conquest the local courts were slowly superseded by central courts and judges whose power emanated from the king, and the infinite varieties of customary law thus gave place to, or were welded into, one common law This process was mainly achieved by extension of the use of royal writs, by introducing and extending the use of the jury (at first only employed where royal interests were concerned), by the institution and regulative influence of itinerant justices, who provided the necessary link between central and local government, and by the evolution from the *curia regis* of the three courts of common law at Westminster—Common Pleas, King's Bench and Exchequer But, since the common law only developed slowly and procedure lagged behind the needs of a progressive society, the *curia* was still called upon to mitigate and to supplement. Part of these duties devolved on the chancellor, who, originally the king's secretary, rose to be chief of the royal counsellors, mainly because from his office were issued the royal writs. For this reason, and because he could act on his own initiative, suitors increasingly addressed their petitions to him personally; and an overworked council was only too glad to delegate such duties to him Thus in the 14th century there slowly evolved a court of chancery which in the 15th achieved independence of the council Its acts were general and registered as a matter of record whereas the procedure of the council was summary and secret. For this and other reasons Chancery jurisdiction became ultimately confined to civil cases, while criminal matters continued to be dealt with by council. Thus there grew up, in spite of the jealousy of common lawyers, a body of equity rules alongside the common law, and the two were finally fused by the Judicature Act of 1873

As far as appellate jurisdiction was provided for, errors of the Common Pleas were amended by the King's Bench; errors of the Exchequer from 1357 by the Court of Exchequer Chamber, composed of the chancellor and treasurer with other expert associates; and another court, which also became known as the Exchequer Chamber, was created in 1585 to amend errors of the King's Bench Writs of error from the King's Bench and from the Exchequer Chamber, and, after 1675, appeals by way of petition for a rehearing from Chancery, could be brought to the House of Lords As a result of the Judicature Act of 1873 and subsequent supplementary acts, all the existing superior courts were consolidated into one Supreme Court of Judicature consisting of two primary divisions —(*a*) The High Court of Justice, with the subdivisions—Chancery, King's Bench, Probate, Divorce and Admiralty and (*b*) the Court of Appeal from the decisions of the judges of each of these divisions The old Chancery procedure by way of petition for a rehearing was extended to the courts of Common Law, the decisions of which could till then only be questioned by alleging error apparent on some part of the proceedings And the House of Lords became the final court of appeal from all the courts (other than ecclesiastical) of Great Britain, while the judicial committee of the privy council, as heir of the council's supplementary jurisdiction, remained the final court of appeal for the rest of the empire and from the ecclesiastical courts as well

Executive.—The *curia regis*, composed of the tenants-in-chief, royal officials and anyone else whom the king chose to summon, expanded or contracted according to the nature of its work Daily routine would be left mainly to officials, the more serious the business the larger the attendance of tenants-in-chief, and on occasions of greatest importance the officials formed a numerically insignificant technical element in a large feudal assembly The epithets employed to distinguish the larger and smaller gatherings achieved in time a technical significance until at last the larger assembly developed into the great council and the parliament, the smaller into the king's council The latter, in spite of baronial machinations, had become, by the time of Henry VII, the instrument of the Crown, and was used by the Tudors as the medium of prerogative government True offspring of an undifferentiated *curia*, its authority was not confined to the exercise of any one function Thus, though from it was to evolve the national executive, it retained also powers of legislation by ordinance and proclamation only vaguely subordinate to statute and common law, and a wide, if undefined, jurisdiction supplementary to the common law Part of the latter had devolved on Chancery, and much of the mercantile and marine business was absorbed by the court of Admiralty constituted in the middle of the 14th century; but the stupendous labour involved in the Tudor conception of conciliar government necessitated further subdivision and specialization, and thus, just as in earlier times for analogous reasons the *curia* had given birth and place to a number of descendant courts and councils, so now the king's council and its functions were split up and divided between the privy council, the courts of Star Chamber, of Requests, and of High Commission, and such local offshoots as the courts and councils of the north, and of Wales and the Marches But conciliar government, though popu-

lar and necessary for a time, aroused, and finally succumbed to, the jealousy of common lawyers and of parliament. Already in 1610, its legislative powers virtually disappeared as a result of the ruling in the *Case of Proclamations* that the latter could not create a new offence, and the Long Parliament swept away the council's jurisdiction in England. Thus, at the Restoration, of all the offspring of the king's council, there survived only the privy council, with nothing left of its former legislative authority, save the right by proclamation to admonish subjects to keep the law, or, by order in council, to fill in the details of measures enacted in general outline and principle by parliament; with its executive function already in course of usurpation by one of its own committees, out of which in time evolved the cabinet; and with its judicial powers confined to hearing appeals from places outside England. By Act of 1832 it was also constituted the final court of appeal in ecclesiastical causes. But the whole of its appellate jurisdiction, its last effective function, was transferred in the following year to a judicial committee. And the privy council, which has now nearly 300 members (the numbers increased in proportion as its importance declined), may be described as a purely formal body, meeting on purely formal occasions, to transact purely formal business.

The cabinet, which in the 17th century evolved from a committee of the privy council as the effective national executive, was composed of an inner ring of confidential advisers of the Crown. The king at first presided, but, when George I. for lack of English ceased to attend, his place was taken by a minister, usually the first lord of the treasury, who in time became known as the prime minister. The latter, normally the head of the party commanding a majority in the House of Commons, is appointed by the sovereign, with whose consent he in turn appoints the rest of the ministry and decides, though his choice is in practice narrowly restricted, which of them shall be members of the cabinet. Just as their predecessors sat originally in the parliament chamber, so now are all ministers members of one or other house of parliament, according as to whether they are peers or commoners. And they are individually and collectively responsible to Crown, prime minister and parliament.

LEGISLATURE

Parliament was originally a periodical public assembly of the *curia regis* at its fullest expansion. It was therefore competent to perform all functions of government. But the one mainly stressed was the judicial function, for law-declaring precedes law-making. Any subject might present a petition, and parliament acted as a clearing-house for such petitions, referring the suitor to the appropriate court and reserving for its own consideration in full assembly only such cases as were particularly difficult, protracted or important. In the 13th century, however, the practice of summoning occasionally and experimentally delegates, sometimes from the shires, sometimes from the boroughs, and sometimes from both simultaneously, was instituted for certain purposes. One of these was the granting of money. To the demand for money the Commons replied with a demand for the granting of the petitions they had brought with them, and the more important of these petitions they began to present, for greater backing, not individually, but collectively as a body. Thus evolved the idea that money is granted in return for the redress of grievances. And considerations of these common petitions came to occupy so much of parliament's time, that it was obliged more and more to leave the private petitions to be dealt with by council or chancery after parliament had broken up. In other words, it was abandoning the righting of individual wrongs, a judicial function, in favour of the righting of the wrongs of the nation, a legislative function. And the attendance of knights and burgesses, who were at first merely an alien element briefly interrupting the ordinary routine of an occasional parliament, came to be essential to the life of the parliament.

But theory outlasted fact, and parliament, although now definitely legislative, was still regarded as a "high court," and as such its jurisdiction was limited. It could not interfere with the common law, nor with the prescriptive rights of the baronage, and, even as late as the 18th century, judges would sometimes treat its enactments as bad judgments and refuse to enforce them, if they seemed to run counter to the principles of common law. It was Henry VIII., more than anyone else, who helped parliament to climb by precedents towards a sovereignty which it finally wrested from his successors at the Revolution of 1688. For, though despotic, he liked to preserve legal forms and, still more, to shelve responsibility. Thus even to his most unconstitutional actions, *e.g.*, the erastianization and spoliation of the Church, he made parliament his partner, and particularly did he flatter the pretensions of the Commons of whom he had no fear. He took them under his roof. And from the moment they entered St. Stephen's chapel the Commons became an integral part of parliament even in their private deliberations, instead of, as till then, only when they stood at the bar of the parliament chamber. The walls of the latter were no longer the boundaries of parliament, but only of the House of Lords which together with the House of Commons, from now on made up the parliament.

House of Lords.—In the parliament chamber sat originally the king, his counsellors, and his greater tenants-in-chief, lay and spiritual. But the sovereign is now only present on rare and formal occasions, and with the growth of the doctrine of the peerage, the presence of commoners became anomalous, so that counsellors who were neither peers nor bishops, preferred, unless incapacitated by tenure of judicial office, to seek election to the Commons. The total of ecclesiastical members, since Henry VIII. dissolved the monasteries, thereby expelling the abbots and priors, and founded five new bishoprics out of the spoils, has remained (except for the four representatives of the Irish episcopate who sat from the Union in 1800 to the Disestablishment of the Irish Church in 1869) constant at 26. But the lay peers have multiplied exceedingly. There are now nearly 700 of them, and that efficiency has not kept pace with numbers may be judged from the fact that only a small proportion ever attend the house. Nevertheless the legislative powers of the Lords remained unimpaired (except for the monopoly won by the Commons in the granting of taxation) until, in consequence of their sustained partizanship and, more immediately, of their rejection of a finance bill, the Parliament Act of 1911 disabled them from rejecting or amending any bill which the speaker certifies to be a money bill, and limited their veto on other bills to three successive sessions within two years. This act further reduced the term of life of a parliament from seven to five years. On the other hand, the jurisdiction, which parliament had more or less handed over to council and chancery, when common petitions came to occupy most of its time, was tentatively resumed when conciliar jurisdiction became unpopular. And, although the House of Lords (as the parliament chamber meantime had come to be called) failed to establish its claims as a court of first instance (save in the cases of persons impeached by the Commons and of trial of peers for treason or felony), it has become the the final court of appeal from all the courts (other than ecclesiastical) in Great Britain. In this function the Commons (not being members of the original parliament chamber) have no share, and the Lords have thus, theoretically, a monopoly of parliamentary jurisdiction to offset the monopoly of parliamentary taxation enjoyed by the Commons. But, in practice, the hearing of appeals is left to those members of the house who are past or present holders of high judicial office.

House of Commons.—The Commons grew so greatly in power as the result of Henry VIII.'s encouragement, of the presence of the privy councillors, of the increased duration of parliaments, and of the impecunious condition of the Government, that, within almost a century of achieving a house of their own, they were able to abolish the other two branches of the legislature, king and House of Lords. The latter never fully recovered from its temporary, though illegal, abolition. But much of the apparent superiority of the lower house in the 18th century must be discounted when we reflect that so many of its members were either in receipt of Government bribes or sinecures or nominees of borough proprietors, very often peers. It was only after "economical" reform had to some extent purified the house, and parliamentary reform the constituencies, that the Commons really

came to overshadow the House of Lords, which in its turn had become corrupted by wholesale creations, now that a peerage was about the only reward or bribe that Government could still offer for faithful political support Finally, the extension of the franchise by stages culminating in universal suffrage has made the house representative of practically all adults in the kingdom except the individuals who compose the House of Lords.

GUARANTEES OF LIBERTY

Franchise.—The knights of the shire from 1430 to 1832 were elected in the county courts by the forty-shilling freeholders. Representation in the counties, therefore, though arbitrary (since other forms of tenure were ignored), was not the monopoly of class or wealth. But in the boroughs no such uniformity prevailed, and, as time went by, the franchise tended to become more and more restricted For in early days popular indifference was content to leave the duty of nominating representatives to the authorities, who thus in time developed a prescriptive monopoly, and charters of incorporation, issued later on, when representation had come to be regarded as a privilege, usually conferred (or were interpreted as conferring) the exclusive right of election on the governing body

But, in condemning the old electoral system, critics usually base their calculations on the proportion of voters to population (2% in England, 2 per thousand in Scotland, at the close of the 18th century), forgetting that representation was not meant to be of population, but of communities, and that, just as the county court stood for the county, so the corporation might stand for the borough Later, it is true, other theories arose as to what *ought* to be the basis of representation, and land, property and taxation had each their champions, who had no difficulty in demonstrating the hopelessness of the system from the point of view of their respective ideals But a sounder indictment would stress the point that the system had ceased to do what it was intended to do—had ceased, in fact, to represent communities For many boroughs returning members to parliament had decayed and some had actually ceased to exist, while many large and flourishing towns remained unrepresented, and, in county and borough alike, the franchise, as a result of corruption, was no longer a political privilege so much as an extremely marketable property. It was the agitation of the American colonies and the disasters resulting from George III 's attempt at personal government that at last aroused public interest in the matter But reformers were divided on the question of compensation for expropriated borough owners, and the French Revolution and Napoleonic wars afforded an excuse for shelving the subject for another generation The Reform Act of 1832 marked the first stage in the process, continued by the Acts of 1867, 1884, 1885 and 1918, of extending the franchise to all adult males and reshaping constituencies into fairly equal electoral districts The Act of 1918 further conceded the principle of female suffrage, and the Act of 1928 carried that concession to its logical conclusion by placing women on the same footing as men

Liberty of the Subject.—The freedom of the individual, apart from the protection afforded by the franchise, is secured indirectly "by the strict maintenance of the principles that no man can be arrested or imprisoned except . under some legal warrant or authority, and . . by the provision of adequate legal means for the enforcement of this principle" The most important of such means is the writ of *habeas corpus* which enables the judiciary to review the actions of the executive, while the jury system protects the subject from judicial abuses, and the Bill of Rights reinforced by the Mutiny Act (called since 1881 the Army Act) removes the threat to liberty inherent in the existence of a standing army Freedom of discussion and freedom of the press are secured by the law of libel (and more especially by Fox's Libel Act, 1792) and amount to "the right to write or say anything which a jury, consisting of 12 shopkeepers, think it expedient should be said or written" The citizen is further protected in airing his views and grievances·—by the right to petition, secured by the Bill of Rights; by the right of public meeting, all meetings being legal until some illegal act has been committed; and by the right of association. Englishmen are proverbially, and have a right to be, proud of their liberties. But the growth of bureaucracy with the socialization of the State on the one hand, and on the other the habit of blind obedience instilled into the subject during the World War either by military training or as a result of Defence of the Realm legislation, gives some colour to the statement that in order to beat the Germans, Great Britain had to Prussianize the State

CHURCH

Religious liberty, of which the first landmark is the Toleration Act of 1689, has been gradually attained by the repeal, one after another, of the many statutes penalizing persons not of the Anglican persuasion

Until the time of Henry VIII there was no Church of England, but only two provinces of the Church Universal in England The Church had its own head, the pope, its own law, the Canon law, and each province, Canterbury and York, had its own officials, archbishops and bishops, its own assembly, Convocation, and its own courts of law This diarchy of Church and State was bound to lead to friction, more especially as the border line was vague and disputed and jurisdiction in some matters overlapped Yet ecclesiastics, more than any other section of society, influenced the shaping of the constitution They filled the chief offices of State; they were a permanent majority in the parliament chamber, for a time even representatives of the lower clergy attended the parliament, and for a century or more after the Conquest the archbishop of Canterbury had the chief say in determining the succession After the Reformation their political influence declined Few of them sat at the council board, and the disappearance of abbots and priors with the dissolution of the monasteries left them in a minority in the Lords. And yet the final settlement under Elizabeth left the organization of the Church to outward appearances much as it had always been The sovereign, it is true, was now supreme governor of the Church, but the latter continued for a time to exist parallel to, and not as a department of, the State, and it was not really until the Revolution of 1688 that the royal supremacy became nominal and parliament's authority paramount over the Church as over the State The ecclesiastical courts survived unchanged, though supervision and discipline were mainly seen to by the Court of High Commission (till its abolition in 1641) and appeals might now be carried to Chancery (after 1832 to the privy council); and each province retained its Convocation, though its meetings in future depended on the sovereign's will and it might legislate only with his consent As regards the clergy itself, the total of archbishops and bishops was raised by Henry VIII to 26 (there are now (1929) 38, but still only 26, viz, the two archbishops, the bishops of London, Durham and Winchester, and 21 others in order of seniority, have seats in the Lords, the regulars were abolished altogether with the monasteries, and the seculars were released by degrees from their vow of celibacy

The final result of the Reformation, then, may be summed up as the abolition of the dual control of Church and State, the transference to the State of complete control over the Church, and the substitution for the canon law of the king's ecclesiastical law Among later constitutional developments it is only necessary to mention.—(1) The substitution of parliamentary for royal control, as a result after the Revolution of the sovereignty of parliament and of the development of cabinet government, whereby the Crown's powers have become vested in a ministry responsible to parliament; (2) the growth of religious toleration with the result that membership of the Church has ceased to be a necessary qualification for full rights in the State; and (3) the grant of a measure of legislative autonomy to the Established Church by the National Assembly of the Church of England (Powers) Act (1919) As a result of repeated quarrels between the two Houses of Convocation, the latter was silenced in 1717 and not allowed to resume its sessions until 1852 Soon afterwards, annual Church Congresses began to be held in which laymen took part, and in 1885 a House of Laymen was formed in Canterbury, and another a little later in York, elected by the

diocesan conferences for the purpose of conferring with the respective Convocations. From 1904 to 1919, there met annually a representative Church Council composed of the three houses in the two provinces sitting together, and the Act of 1919 delegated to the newly constituted assembly of the Church, subject always to the control of Parliament, powers of legislature affecting the affairs of the Church

WALES, SCOTLAND AND IRELAND

Wales was incorporated with England in 1536, receiving the same law and being granted representation in parliament The crowns of England and Scotland were united in 1603 on the accession of James I. (and VI), and their parliaments in 1707 The resulting parliament of Great Britain was to contain 16 representative Scottish peers, elected for each parliament by the whole body of Scottish peers, and 45 (now 74) representatives of shires and boroughs Scotland, however, retained her own legal system and her own Presbyterian Church. Ireland, when united with Great Britain in 1801, contributed to the parliament of the United Kingdom 28 representative Irish peers elected for life, one archbishop and three bishops (the ecclesiastics disappeared with Irish Disestablishment in 1869), and 100 (later 105) members of the Commons However, by the Irish Free State (Agreement) Act (1922), Southern Ireland was granted dominion status, leaving only Northern Ireland to be represented in the Commons by 13 members out of the total of 615

See also COMMON LAW, PARLIAMENT, PARLIAMENTARY PROCEDURE; CABINET; PRIME MINISTER, PRIVY COUNCIL, PROCLAMATIONS, LOCAL GOVERNMENT, GOVERNMENT DEPARTMENTS, MINISTRY, ELECTORAL SYSTEMS, REFORM MOVEMENT, etc

(F L B)

DEFENCE· ARMY

Historical.—Prior to the Norman Conquest the armed force of England was essentially a national militia Every freeman was bound to bear arms for the defence of the country, or for the maintenance of order To give some organization and training to the levy, the several sheriffs had authority to call out the contingents of their shires for exercise The *fyrd,* as the levy was named, was available for home service only, and could not be moved even from its county except in the case of emergency.

Yet even in those days the necessity of some more permanent force was felt, and bodies of paid troops were maintained by the kings at their own cost Thus Canute and his successors, and even some of the great earls kept up a household force (*huscarles*) The English army at Hastings consisted of the *fyrd* and the corps of *huscarles*

The English had fought on foot, but the mailed horseman had now become the chief factor in war, and the Conqueror introduced into England the system of tenure by knight-service familiar in Normandy This was based on the unit of the feudal host, the *constabularia* of ten knights, the Conqueror granting lands in return for finding one or more of these units (in the case of great barons) or some fraction of them (in the case of lesser tenants). The obligation was to provide knights to serve, with horse and arms, for forty days in each year at their own charges This obligation could be handed on by sub-enfeoffment through a whole series of under-tenants The system being based, not on the duty of personal service, but on the obligation to supply one or more knights (or it might be only the fraction of a knight), it was early found convenient to commute this for a money payment known as "scutage" (*see* KNIGHT SERVICE and SCUTAGE). This money enabled the king to hire mercenaries, or pay such of the feudal troops as were willing to serve beyond the usual time The feudal system had not, however, abrogated the old Saxon levies, and from these arose two national institutions—the *posse comitatus,* liable to be called out by the sheriff to maintain the king's peace, and later the *militia* (*q v.*). The *posse comitatus,* or power of the county, included all males able to bear arms, peers and spiritual men excepted, and though primarily a police force it was also bound to assist in the defence of the country This levy was organized by the Assize of Arms under Henry II (1181), and subsequently under Edward I (1285) by the so-called "Statute of Winchester," which determined the numbers and description of weapons to be kept by each man according to his property, and also provided for their periodical inspection The early Plantagenets made much use of mercenaries. But the weakness of the feudal system in England was preparing, through the 12th and 13th centuries, a nation in arms absolutely unique in the middle ages. The Scottish and Welsh wars were, of course, fought by the feudal levy, but this levy was far from being the mob of unwilling peasants usual abroad, and from the *fyrd* came the English archers, whose fame was established by Edward I 's wars, and carried to the continent by Edward III Edward III realized that there was better material to be had in his own country than abroad, and the army with which he invaded France was an army of national mercenaries, or, more simply, of English soldiers The army at Creçy was composed exclusively of English, Welsh and Irish From the pay list of the army at the siege of Calais (1346) it appears that all ranks were paid, no attempt being made to force even the feudal nobles to serve abroad at their own expense These armies were raised mainly by contracts entered into "with some knight or gentleman expert in war, and of great revenue and livelihood in the country, to serve the king in war with a number of men " A certain sum was usually paid in advance, and in many cases the crown jewels and plate were given in pledge for the rest The profession of arms seems to have been profitable The pay of the soldier was high as compared with that of the ordinary labourer, and he had the prospect of a share of plunder in addition, so that it was not difficult to raise men where the commander had a good military reputation

The funds for the payment of these armies were provided partly from the royal revenues, partly from the fines paid in lieu of military service, and other fines arbitrarily imposed, and partly by grants from parliament As the soldier's contract usually ended with the war, and the king had seldom funds to renew it even if he so wished, the armies disbanded of themselves at the close of each war To secure the services of the soldier during his contract, acts were passed (18 Henry VI c 19; and 7 Henry VII c 1) inflicting penalties for desertion, and in Edward VI 's reign an act "touching the true service of captains and soldiers" was passed somewhat of the nature of a Mutiny Act

It is difficult to summarize the history of the army between the Hundred Years' War and 1642 The final failure of the English arms in France was soon followed by the Wars of the Roses, and in the long period of civil strife the only national force remaining to England was the Calais garrison Henry VIII was a soldier-king, but he shared the public feeling for the old bow and bill, and English armies which served abroad did not, it seems, win the respect of the advanced professional soldiers of the continent In 1519 the Venetian ambassador described the English forces as consisting of 150,000 men whose peculiar, though not exclusive, weapon was the long bow (Fortescue i 117) The national levy made in 1588 to resist the Armada and the threat of invasion produced about 750 lancers (heavy-armed cavalry), 2,000 light horse and 56,000 foot, beside 20,000 men employed in watching the coasts The small proportion of mounted men is very remarkable in a country in which Cromwell was before long to illustrate the full power of cavalry on the battlefield It is indeed not unfair to regard this army as a miscellaneous levy of inferior quality

It was in cavalry that England was weakest, and by three different acts it was sought to improve the breed of horses Perhaps the best organized force in England at this time was the London volunteer association which ultimately became the Honourable Artillery Company At Flodden the spirit of the old English yeomanry triumphed over the outward form of continental battalions which the Scots had adopted, and doubtless the great victory did much to retard military progress in England The chief service of Henry VIII to the British army was the formation of an artillery train, in which he took a special interest Before he died the forces came to consist of a few permanent troops (the bodyguard and the fortress artillery service), the militia or general levy, and the paid armies which were collected for a foreign war and disbanded at the conclusion of peace, and were recruited on

the same principle of indents which had served in the Hundred Years' War In the reign of Mary, the old Statute of Winchester was revised (1553), and the new act provided for a readjustment of the county contingents and in some degree for the rearmament of the militia But, from the fall of Calais up to the battle of the Dunes a century later, the intervention of British forces in foreign wars was always futile and generally disastrous During this time, however, the numerous British regiments in the service of Holland learned, in the long war of Dutch independence, the technique of war as it had developed on the continent since 1450 Thus it was that in 1642 there were many hundreds of trained and war-experienced officers and sergeants available for the armies of the king and the parliament. By this time bows and bills had long disappeared even from the militia, and the Thirty Years' War, which, even more than the Low Countries, offered a career for the adventurous man, contributed yet more trained officers and soldiers to the English and Scottish forces So closely indeed was war now studied by Englishmen that the respective adherents of the Dutch and the Swedish systems quarrelled on the eve of the battle of Edgehill

The home forces of England had, as has been said, little or nothing to revive their ancient renown Instead, they had come to be regarded as a menace to the constitution In Queen Elizabeth's time the demands of the Irish wars had led to frequent forced levies, and the occasional billeting of the troops in England also gave rise to murmurs, but the brilliancy and energy of her reign covered a great deal, and the peaceful policy of her successor removed all immediate cause of complaint But after the accession of Charles I we find the army a constant and principal source of dispute between the king and parliament Charles, wishing to support the Elector Palatine in the Thirty Years' War, raised an army of 10,000 men He was already encumbered with debts, and the parliament refused all grants, on which he had recourse to forced loans The army was sent to Spain, but returned without effecting anything, and was not disbanded, as usual, but billeted on the inhabitants The billeting was the more deeply resented as it appeared that the troops were purposely billeted on those who had resisted the loan Forced loans, billeting and martial law—all directly connected with the maintenance of the army —formed the main substance of the grievances set forth in the Petition of Right In accepting this petition, Charles gave up the right to maintain an army without consent of parliament, and when in 1639 he wished to raise one to act against the rebellious Scots, parliament was called together, and its sanction obtained, on the plea that the army was necessary for the defence of England This army again became the source of dispute between the king and parliament, and finally both sides appealed to arms

The first years of the Great Rebellion (*q v*) showed primarily the abundance of good officers produced by the wars on the continent, and in the second place the absolute inadequacy of the military system of the country It was clear, at the same time, that when the struggle was one of principles and not of dynastic politics, excellent recruits, far different from the wretched levies who had been gathered together for the Spanish war, were to be had in any reasonable number These causes combined to produce the "New Model" which, originating in Cromwell's own cavalry and the London trained bands of foot, formed of picked men and officers, severely disciplined, and organized and administered in the right way, quickly proved its superiority over all other armies in the field, and in a few years raised its general to supreme civil power Feb 15, 1645, was the birthday of the British standing army, and from its first concentration at Windsor Park dates the scarlet uniform

When Cromwell sent his veterans to take part in the wars of the continent they proved themselves a match for the best soldiers in Europe On the restoration of the monarchy in 1660 the army, now some 80,000 strong, was disbanded It had enforced the execution of Charles I, it had dissolved parliament, and England had been for years governed under a military régime Thus the most popular measure of the Restoration was the dissolution of the army Only Monk's regiment of foot (now the Coldstream Guards) survived to represent the New Model in the army of today At the same time the troops (now regiments) of household cavalry, and the regiment of foot which afterwards became the Grenadier Guards, were formed, chiefly from Royalists, though the disbanded New Model contributed many experienced recruits The permanent forces of the crown came to consist once more of the "garrisons and guards," maintained by the king from the revenue allotted to him for carrying on the government of the country The "garrisons" were commissioned to special fortresses —the Tower of London, Portsmouth, etc The "guards" comprised the sovereign's bodyguards ("the yeomen of the guard" and "gentlemen-at-arms," who had existed since the times of Henry VII and VIII), and the regiments mentioned above Even this small force, at first not exceeding 3,000 men, was looked on with jealousy by parliament, and every attempt to increase it was opposed The acquisition of Tangier and Bombay, as part of the dower of the infanta of Portugal, led to the formation of a troop of horse (now the 1st Royal Dragoons) and a regiment of infantry (the 2nd, now Queen's R W Surrey, regiment) for the protection of the former; and a regiment of infantry (afterwards transferred to the East India Company) to hold the latter (1661) These troops, not being stationed in the kingdom, created no distrust, but whenever, as on several occasions during Charles's reign, considerable armies were raised, they were mostly disbanded when the occasion ceased Several regiments, however, were added to the permanent force, including Dumbarton's regiment (the Royal Scots, nicknamed Pontius Pilate's Bodyguard)—which had a long record of service in the armies of the continent, and represented the Scots brigade of Gustavus Adolphus's army—and the 3rd Buffs, representing the English regiments of the Dutch army and through them the volunteers of 1572, and on Charles's death in 1685 the total force of "guards and garrisons" had risen to 16,500, of whom about one-half formed what we should now call the standing army.

James II , an experienced soldier and sailor, was more obstinate than his predecessor in his efforts to increase the army, and Monmouth's rebellion afforded him the opportunity A force of about 20,000 men was maintained in England, and a large camp formed at Hounslow James even proposed to disband the militia, and although the proposal was instantly rejected, he continued to add to the army till the Revolution deprived him of his throne The army which he had raised was to a great extent disbanded, the Irish soldiers especially, whom he had introduced in large numbers on account of their religion, being all sent home

The condition of the army immediately engaged the attention of parliament The Bill of Rights had definitely established that "the raising or keeping of a standing army within the kingdom, unless it be by the consent of parliament, is against the law," and past experience made them very jealous of such a force But civil war was imminent, foreign war certain, and William had only a few Dutch troops, and the remains of James's army, with which to meet the storm Parliament therefore sanctioned a standing army, trusting to the checks established by the Bill of Rights and Act of Settlement, and by placing the pay of the army under the control of the Commons An event soon showed the altered position of the army A regiment mutinied and declared for James It was surrounded and compelled to lay down its arms, but William found himself without legal power to deal with the mutineers He therefore applied to parliament, and in 1689 was passed the first Mutiny Act, which, after repeating the provisions regarding the army inserted in the Bill of Rights, and declaring the illegality of martial law, gave power to the crown to deal with the offences of mutiny and desertion by courts-martial From this event is often dated the history of the standing army as a constitutional force (but *see* Fortescue, *British Army*, i 335)

Under William the old regiments of James's army were reorganized, retaining, however, their original numbers, and three of cavalry and eleven of infantry (numbered to the 28th) were added. In 1690 parliament sanctioned a force of 62,000 men, but on peace being made in 1697 the Commons immediately passed resolutions to the effect that the land forces be reduced to 7,000 men in England and 12,000 in Ireland The War of the Spanish Succession quickly obliged Great Britain again to raise a large

army, at one time exceeding 200,000 men; but of these the greater number were foreign troops engaged for the continental war. Fortescue (*op. cit.* i. 555) estimates the British forces at home and abroad as 70,000 men at the highest figure After the peace of Utrecht the force was again reduced to 8,000 men in Great Britain and 11,000 in the plantations (*i e* colonies) and abroad From that time to the present the strength of the army has been determined by the annual votes of parliament, and though frequently the subject of warm debates in both houses, it has ceased to be a matter of dispute between the crown and parliament The following table shows the main fluctuations from that time onward—the peace years showing the average peace strength, the war years the maximum to which the forces were raised·—

Peace		*War*	
Year	*Number*	*Year*	*Number*
1750	18,857	1745	74,187
1793	17,013	1761	67,776
1822	71,790	1777	90,734
1857	156,995	1812	245,996
1866	203,404	1856	275,079

Note—Prior to 1856 the British forces serving in India are not included

During William's reign the small English army bore an honourable part in the wars against Louis XIV , and especially distinguished itself under the king at Steinkirk, Neerwinden and Namur In the great wars of Queen Anne's reign the British army under Marlborough acquired a European reputation The cavalry, which had called forth the admiration of Prince Eugene when passed in review before him after its long march across Germany (1704), especially distinguished itself in the battle of Blenheim, and Ramillies, Oudenarde and Malplaquet were added to the list of English victories But the army as usual was reduced at once, and even the cadres of old regiments were disbanded, though the alarm of Jacobite insurrections soon brought about the re-creation of many of these During the reign of the first and second Georges an artillery corps was organized, and the army further increased by five regiments of cavalry and thirty-five of infantry. Although Fontenoy (*q v*) was a day of disaster for the English arms, it did not lower their reputation, but rather added to it Six regiments of infantry won the chief glory of Prince Ferdinand's victory of Minden (*q v*) in 1759 About this time the first English regiments were sent to India, and the 39th shared in Clive's victory at Plassey During the first half of George III 's reign the army was principally occupied in America; and though the conquest of Canada may be counted with pride among its exploits, this page in its history is certainly the darkest English armies capitulated at Saratoga and at Yorktown, and the war ended by the evacuation of the revolted states of America and the acknowledgment of their independence

In the 18th century, regiments were still raised almost as in the days of the Edwards The crown contracted with a distinguished soldier, or gentleman of high position, who undertook to raise the men, receiving a certain sum as bounty-money for each recruit In some cases, in lieu of money, the contractor received the nomination of all or some of the officers, and recouped himself by selling the commissions This system—termed "raising men for rank"—was retained for many years, and originally helped to create the "purchase system" of promotion For the maintenance of the regiment the colonel received an annual sum sufficient to cover the pay of the men, and the expenses of clothing and of recruiting Sometimes, when casualties were numerous, the allowance was insufficient to meet the cost of recruiting, and special grants were made In war time the ranks were also filled by released debtors, pardoned criminals, and impressed paupers and vagrants Where the men were raised by voluntary enlistment, the period of service was a matter of contract between the colonel and the soldier, and the engagement was usually for life; but exceptional levies were enlisted for the duration of war, or for periods of three or five years As for the officers, the low rate of pay and the purchase system combined to exclude all but men of independent incomes The barrack accommodation in Great Britain at the beginning of the 18th century only sufficed for five thousand men, and though it had gradually risen to twenty thousand in 1792, a large part of the army was constantly in camps and billets—the latter causing endless complaints and difficulties

The first efforts of the army in the long war with France did not tend to raise its reputation amongst the armies of Europe The campaigns of allied armies under the duke of York in the Netherlands, in which British contingents figured largely, were uniformly unsuccessful (1793–94 and 1799), though in this respect they resembled those of almost all soldiers against the "New French" army The policy of the younger Pitt sent thousands of the best soldiers to unprofitable employment, and indeed to death, in the West Indies At home the administration was corrupt and ineffective, and the people generally shared the contemptuous feeling towards the regular army which was then prevalent in Europe But a better era began with the appointment of Frederick Augustus, duke of York, as commander-in-chief of the army He did much to improve its organization, discipline and training, and was ably seconded by commanders of distinguished ability Under Abercromby in Egypt, and under Lake, Wellesley and others in India, the British armies again attached victory to their standards Later, Napoleon's threat of invading England excited her martial spirit to the highest pitch to which it had ever attained Finally, her military glory was raised by the series of successful campaigns in the Peninsula, until it culminated in the great victory of Waterloo, and the army emerged from the war with the most solidly founded reputation of any in Europe

The great augmentations required during the war were effected partly by raising additional regiments, but principally by increasing the number of battalions, some regiments being given as many as four On the conclusion of peace these battalions were reduced, but the regiments were retained, and the army was permanently increased from about twenty thousand, the usual peace establishment before the war, to an average of eighty thousand The duke of York, on first appointment to the command, had introduced a uniform drill throughout the army, which was further modified according to Sir David Dundas's system in 1800, and, under the direction of Sir John Moore and others, a new system of training and discipline was developed, in which the mind and spirit were cultivated, not merely the muscle In the Peninsula the army was permanently organized in divisions, usually consisting of two brigades of three or four battalions each, and one or two batteries of artillery

The period which elapsed between Waterloo and the Crimean War is marked by a number of Indian and colonial wars, but by no organic changes in the army, with perhaps the single exception of the Limited Service Act of 1847, by which enlistment for ten or twelve years, with power to re-engage to complete twenty-one, was substituted for the life enlistments hitherto in force The army went to sleep on the laurels and recollections of the Peninsula The duke of Wellington, for many years commander-in-chief, was too anxious to hide it away in the colonies in order to save it from further reductions or utter extinction, to attempt any great administrative reforms The force which was sent to the Crimea in 1854 was an agglomeration of battalions, individually of fine quality, but unused to working together, without trained staff, administrative departments or army organization of any kind The lesson of the winter before Sevastopol was dearly bought, but was not thrown away From that time several war ministers and one commander-in-chief have laboured perseveringly at the thankless and difficult task of reforming army organization Foremost in the work was Sidney Herbert (Lord Herbert of Lea), the soldier's friend, who fell a sacrifice to his labours (1861), but not before he had done much for the army The whole system of administration was revised In 1854 it was inconceivably complicated and cumbersome The "secretary of state for war and colonies," sitting at the Colonial Office, had a general but vague control, practically limited to times of war The "secretary at war" was the parliamentary representative of the army The commander-in-chief was responsible to the sovereign alone in all matters connected with the discipline, command or patronage of the army, but to the secretary at war in financial matters The master-general and board of ordnance were responsible for the supply of material on requisition, but were otherwise independent, and had the

artillery and engineers under them. The commissariat department had its headquarters at the treasury, and until 1852 the militia were under the home secretary In 1854 the business of the colonies was separated from that of war, and the then secretary of state assumed control over all the other administrative officers In the following year the secretary of state was appointed secretary at war also, and the duties of the two offices amalgamated; the commissariat office was transferred to the war department; and the Board of Ordnance abolished, its functions being divided between the commander-in-chief and the secretary of state The minor departments were gradually absorbed, and the whole administration divided under two great chiefs, sitting at the war office and Horse Guards respectively In 1870 these two were welded into one, and the war office now existing was constituted

Corresponding improvements were effected in every branch The system of clothing the soldiers was altered, the contracts being taken from the colonels of regiments, who received a money allowance instead, and the clothing supplied from government manufactories The pay, food and general condition of the soldier were improved; his ordinary education and the military education of the officer were taken in hand

The Indian Mutiny of 1857, followed by the transference of the government of India, led to important changes The East India Company's white troops were amalgamated with the Queen's army, and the whole reorganized

But it is not a British habit to profit by military experience The mere fact that the difficulties of 1854 and 1857 had been surmounted ultimately led the nation and its representatives to forget their cost and waste And the nation-wide rejoinder to the French threats of 1859—the creation of the Volunteer Force—contributed to a false sense of security Thus the two obvious lessons of the German successes of 1866 and 1870—the power of a national army for offensive invasion, and the rapidity with which such an army when thoroughly organized could be moved—created the greatest sensation in England The year 1870 is, therefore, of prime importance in the history of the regular forces and the ensuing period of reform is connected indissolubly with the name of Edward, Lord Cardwell, secretary of state for war 1869–1874 In the matter of organization the result of his labours was seen in the perfectly arranged expedition to Ashanti (1874); as for recruiting, the introduction of short service and reserve enlistment together with many rearrangements of pay, etc., helped to treble the number annually enlisted as well as to build up a reserve which in the Boer War yielded 80,000 men to maintain the strength of the army in the field The localization of the army, subsequently completed by the territorial system of 1882, was commenced under Cardwell's régime, and a measure which encountered much powerful opposition at the time, the abolition of the purchase of commissions, was also effected by him (1871) The machinery of administration was improved, and autumn manoeuvres were practised on a scale hitherto unknown in England In 1871 certain powers over the militia, formerly held by lords-lieutenant, were transferred to the crown, and the auxiliary forces were placed directly under the generals commanding districts In 1881 came an important change in the infantry of the line, which was entirely remodelled in two-battalion regiments bearing territorial titles This measure (the "linked battalion" system) aroused great opposition; it was dictated chiefly by the necessity of maintaining the Indian and colonial garrisons at full strength, and was begun during Lord Cardwell's tenure of office, the principle being that each regiment should have one battalion at home and one abroad, the latter being fed by the former, which in its turn drew upon the reserve to complete it for war On these general lines the army progressed up to 1899, when the severe trials of the Boer War hastened fresh schemes of reform, leading up to Mr Haldane's "territorial" scheme (1908), which put the organization of the forces in the United Kingdom on a new basis

Cardwell had left office before one of his most important reforms had been completed, organizing the forces in the United Kingdom in larger formations so that they could be employed as a field army, of which the strength was based solely upon the number of troops serving abroad, not upon any estimate of war requirements The question of the uses to which such an army would be put was one that had never been properly determined There were two conflicting schools of thought on the subject, the Army school, which visualized the invasion of England and the primary need for a large field army to deal with such emergency, and the Navy or "Blue-water" school, which maintained that defence of the sea-communications of the United Kingdom was a need of such vital economic importance to the nation in war, that the Navy must be maintained at sufficient strength to render those communications secure. That invasion by foreign armies, given such naval strength, could be prevented by action at sea, and that the army in the United Kingdom, therefore, would not be required to deal with anything more formidable than hostile raids. The Army view was reflected in the organization of the higher formations These consisted of Army Corps, composed not only of regular forces but also of auxiliary elements under no obligation to proceed abroad One of the first steps taken by Haldane was to advocate "clear thinking" in connection with army problems, and he developed the general staff, initiated by his predecessor, Arnold Forster, to undertake this important but hitherto neglected branch of military preparation Within a few months, three principles had been laid down and officially accepted to govern the military defence of the Empire The first of these was the essential need for a navy strong enough to ensure the safety of troops crossing the seas. This was a natural outcome from Cardwell's system of cutting down oversea garrisons to a bare minimum on the assumption that the troops in the United Kingdom could be sent as reinforcements to any part of the world in times of emergency The second principle was that of local provision for military defence in all parts of the Empire, to the utmost extent to which such provision could be furnished The third was that of mutual military support in times of emergency

Instead of paper army corps, available only for home defence, the Haldane reforms provided for the organization of the troops in the United Kingdom in six infantry divisions, one cavalry division, and line of communication troops, as an "expeditionary force" (composed entirely of regulars) available for oversea service either as reinforcements for the small garrisons of different parts of the empire in the event of internal or external menace, or, if need be, as a field army capable of fulfilling treaty obligations Furthermore, the need for strong drafts of men to keep units in the field in a protracted campaign was realized In the Manchurian War of 1904–5 the Russians had made the mistake of reinforcing their field army with fresh formations, while leaving the veteran units already in the field to melt away for want of drafts to replace wastage in personnel. In order to avoid this mistake in British military policy, the militia was called upon to provide drafts of trained men in time of war for the expeditionary force, and its name was changed to the "special reserve" of the regular army.

A further point that was realized was that, whether the British Isles were, or were not, subject to the menace of invasion, they could not be left denuded of troops Material in man-power lay readily to hand in the force of yeomanry and volunteers who, from patriotic motives, had volunteered to take part in the military defence of the United Kingdom in grave emergencies and to spend such time as they could spare from their civil vocations in undergoing training for the purpose. Lacking neither in zeal nor in numbers, they lacked all else required by a field army in the way of organization and training in higher units and most of the transport, material and equipment, of which the provision comes under the term understood by the expression "mobilization" Units of the different arms and departments had sprung up haphazard, according to the preference expressed by those who had been instrumental in raising them No attention had been paid to the proportion of each arm and department needed for a grouping in such higher formations as divisions In face of opposition and criticism similar to that faced by Cardwell, Haldane, with the loyal co-operation of the units concerned, used this material to establish the territorial force, of which the first units appeared under arms in the financial year beginning in April 1908 The act which established this force provided that either the units or

the individuals serving therein might volunteer for oversea service in grave emergencies. The extent to which this appeal met with response during the years 1914–18 belongs to the story of the World War (*q v.*) By December 1914, 2,413 officers and 66,805 other ranks in the territorials were serving abroad. By April 1917 these numbers had risen respectively to 17,859 and 487,237 Up to the close of 1915, the voluntary direct enlistments in war time into the territorial force numbered 725,842. Apart from individuals who volunteered for the regular army, the yeomanry provided one complete division for oversea service, the territorial force of all arms 24 divisions

Thirty "New Army" divisions were also raised on a plan instituted by Lord Kitchener to supplement the 11 "regular" divisions employed overseas In December 1918 the British field army comprised 4 mounted and 67 infantry divisions, of which all excepting one mounted (cyclist) and 4 infantry divisions were serving outside the United Kingdom With a total establishment of 256,798, the British regular army began the World War with an actual peace strength of 247,432, an army reserve of 145,347, and "special reserve" of 63,933 The territorial force, with an establishment of 316,094, numbered 268,777, including 766 members of the officers training corps, also established by Haldane, with an establishment fixed at 1,110 Between the outbreak of war and conclusion of the armistice, England provided 4,006,158, Scotland 557,618, Wales and Monmouthshire 272,924 and Ireland 134,202 men for the British army, a total of nearly 5,000,000 for the United Kingdom The total permanent wastage in British (Isles) military personnel up to January 1919 amounted to 1,892,100, including half a million killed or died of wounds or other causes overseas, and about 37,000 in the United Kingdom

Roughly speaking the number of British troops serving in various expeditionary forces at the time of the armistice in November 1918 may be put at about 2,100,000, with 1,380,000 in the United Kingdom (excluding about 250,000 volunteers), 94,000 in India, and 11,200 as garrisons of defended ports Total about 3,600,000 Some idea of the strain brought upon the British army in the days of unrest in the world after the armistice can be gathered from a return showing that the numbers demobilized up to May 26, 1920 amounted to the vast total of 163,563 officers and 3,595,717 other ranks, altogether nearly 3,660,000, while during the same period grave military responsibilities were undertaken in North Russia (up to October 1919), in East Russia (Vladivostok), in Germany (Cologne area of occupation), in Arabia, in Trans-Caucasia (up to April 1919), in the Caucasus (up to August 1919), in Mesopotamia, Syria (up to January 1920), Palestine and East Africa, involving fighting in most of those areas, as well as in India and in Ireland, that we were still technically at war with Turkey, and actively at war with Afghanistan (May to August 1919). The tale is told elsewhere of these operations, and of the strain brought subsequently upon the army by operations in India; in attempting to hold neutral zones covering the Dardanelles and Bosporus when the Turkish Army had been allowed years to recuperate after the conclusion of an armistice in October 1918, in attempting to maintain order in Ireland, and in military activities elsewhere It was not until the training season of 1925, when 4 regular divisions and an extemporized cavalry division took part in army manoeuvres for the first time for twelve years, that normal conditions of peace organization and training again began to prevail A shortage of reserves would, however, have still rendered impossible the mobilization of even four divisions (as compared with six in 1914) Behind this small expeditionary force stood a reconstituted (1920) territorial army of 14 divisions, liable to oversea service in grave emergencies, to whom a definite promise had been made that, in such circumstances, they would go as units, and not be called upon to provide drafts for the regular army, although that force had lost the "special reserve" which formed so valuable a feature of the Haldane reforms.

Such, in broad outline, is the story of the British Army from the earliest times till the crisis of 1914–18 called upon that Army for the greatest effort in its history, and through the decade that intervened until we find it in the present day, with its numbers reduced, its responsibilities increased by the Locarno Treaties (*q v.*) and by the need to maintain order in, and to defend increased areas of territory in Asia and in Africa, with Southern Ireland, from whence came some of its finest soldiers, no longer available as a recruiting ground, and, the militia having been abolished except in name, with no other military force to share in the unpopular task of rendering aid to the civil power in time of peace The territorial army cannot be used for this purpose unless embodied by special Act of Parliament

PRESENT-DAY ARMY

Recruitment and Service.—All recruiting is voluntary, the normal engagement being for (1) long service, or (2) "short" service with the colours, the periods varying according to the arm of the service, and being made up to 12 years by service in the reserve Provision is also made for enlistments in all arms, as required, for periods of one to four years service with the colours Extension of service with the colours is allowed to all warrant officers Class I, and to lower ranks, down to corporal, fulfilling certain conditions The normal age of enlistment on an engagement for general service is between 18 and 25 years, for re-enlistments up to 30 years Re-engagements to complete 21 years Army Service are allowed under certain conditions Boys of 15 years upwards are enlisted for training in special duties and certain trades They serve for 12 years from the 18th birthday The annual total of enlistments and re-enlistments may be taken as about 28,000, representing about 135 per 100,000 of the male population Nearly 50,000 applicants for enlistment were rejected as physically unfit in 1926–27. Enlistment in the territorial army is for 4 years, with re-engagements for 1, 2, 3 or 4 years The age for enlistment or for re-enlistment is between 17 and 35 years Members of this force attend an annual training camp for from 18 to 15 days and carry out such annual drills (up to 45 for artillery) and courses, including musketry, as may be prescribed

Strength and Organization.—The average strength of the British army during the year ending on September 30, 1927 was 206,340 This number included a figure of 5,311 representing colonial corps and borrowed Indian troops Of the total, about 60,000 were serving on the Indian establishment Various miscellaneous additions raised the total strength on October 1, 1927 to 214,730 The army reserve at the same date numbered 84,540, and supplementary reserve (recently introduced, mostly of tradesmen obtained by direct entry) 15 475, the territorial army 140,009, and militia in the Channel Islands and Colonies 2,158 Grand total for the British army, regular and territorial, and reserves 457,002 The budget establishment for regular troops, excluding those in India, for 1927–28 numbered 166,500, a figure that was reduced to 153,500 in the estimates for 1928–29

The regular army in the United Kingdom is organised in 2 cavalry brigades and 4 infantry divisions, with additional units unallotted Some of the troops in the 3rd division, serving on Salisbury plain, also form part of an experimental "armoured force" of tanks, mechanized artillery, engineers and mechanically transported infantry which was formed in the summer of 1927 for training and trials with other units In addition to the above there are certain army troops consisting of artillery (including anti-aircraft), tanks, technical units, etc A point of which to take note is that the annual reliefs in units or drafts sent out from these troops in the United Kingdom in the year ending on September 30, 1927 numbered 27,540, approximately equalling the number of recruits that were raised in the same year (Service on the Rhine is counted as "home" service) In the Channel Islands there is a small force of militia, with an establishment of 2,703 and a strength (1928) of about 2,200

The territorial army is organised in 14 Divisions, one Cavalry Division, and Army Troops Excluding permanent staff, provided by the regular army, its establishment in 1928 stood at 7 706 officers and 173,754 other ranks The actual strength on January 1, 1928 was 6,824 officers and 132,323 other ranks, an increase of 64 officers and a decrease of 7,439 other ranks compared with the figures for January 1, 1927

The cadet force, of boys of school age, on October 31, 1927 con-

tained 953 companies with a total strength of 2,450 officers and 47,391 other ranks, of whom 1,134 officers and 19,126 cadets had attended an annual camp

The Officers' Training Corps, consisting of contingents from universities and schools whose offer has been accepted by the army council, contains a senior (university) division, numbering about 4,600 and a junior (schools) division numbering about 34,000 The object of this formation is to make provision for expansion in grave emergencies. The potential strength of the British army in future, as in past conflicts, is difficult to estimate without knowing the cause of the war or the extent to which it appeals to the nation By the close of 1928 it is estimated that the regular army (trained) reserve will stand at about 105,000, that of the supplementary reserve at about 18,000

Colonial Forces.—Mention has been made above of certain "Colonial Forces" included in returns of the strength of the British Army. These included the Royal Malta Artillery, the West African Regiment, the Hong Kong and Singapore Royal Artillery, and certain details, the total of all these units numbering just under 2,000 of all ranks Reference to forces for colonial defence again brings into prominence the Cardwell system, under which a mere handful of British troops is kept abroad on the assumption that reinforcement by sea in times of emergency will always be a practicable proposition, and also the accepted principle (1909) that local forces should be maintained in sufficient strength to provide for defence under normal conditions A general idea of the working of the Cardwell system may be gathered from notes given below The military forces maintained by the greater self-governing nations grouped in the British Commonwealth—Canada, Australia, New Zealand, South Africa and the Irish Free State—will be found under those countries There remain the colonies and protectorates which, for the sake of convenience, will be taken in the order in which they are arrayed in the League of Nations "*Armaments Year Book*," from which the latest information can always be obtained. Where no military forces are mentioned, none exist

Group I. (*The West Indies, the Americas and the islands in the Atlantic.*) Includes the Bahamas, Barbados, with about 260 volunteers and their reserve, a cadet corps and rifle association, Bermuda, with a militia of about 240, about 320 volunteers and a cadet corps, British Guiana, with a militia of about 1,200, now all volunteers but with a ballot in force if required, and a semi-military police of about 800; British Honduras, with about 430 volunteers and a territorial force compulsory service act in force if needed, also a police force of about 140 liable for military service, the Falkland Islands, with liability for all British male subjects from 18 to 41 years to serve in the defence force, Jamaica, with about 100 militia artillery, about 100 infantry volunteers, a few mounted scouts and a police force with military organization; the Leeward Islands (Antigua, St. Kitts-Nevis, Dominica and Montserrat), with volunteer defence forces numbering in all about 210, with rifle clubs as reserves and an armed police force of West Indian natives, Trinidad and Tobago, with about 240 volunteers, and the Windward Islands (St Lucia, Grenada and St. Vincent), with volunteer corps totalling about 160 in St. Lucia and St Vincent and a rifle club in Grenada, with police forces liable to military service and numbering about 210 in the three islands.

Group II. (*Europe*) Includes Cyprus, and Malta, where a garrison of British troops is supplemented by the Royal Malta Artillery, mentioned above, by Royal Engineer Malta militia about 95 strong, and by the Royal Malta Regiment of which the strength is being reduced to about 100.

Group III. (*Africa*) Includes (a) East Africa (*q v*) comprising Kenya Colony, Nyasaland, Uganda, Tanganyika Territory, Zanzibar Protectorate, and Somaliland, (b) West Africa, including Gambia, Gold Coast, Nigeria and Sierra Leone, and (c) South Africa, excluding the Union Territory, and comprising Basutoland, Bechuanaland Protectorate, Northern and Southern Rhodesia and Swaziland.

(a) In East Africa, apart from the King's African Rifles (*see* BRITISH EAST AFRICA) and the Somaliland Camel Corps, about 500 strong, recently embodied therein, Kenya Colony is organizing a territorial force, based on compulsory and voluntary service for Europeans and a reserve of about 500 for the K A R. Nyasaland has a volunteer reserve of about 270 and a reserve of about 600 for the K A R. Uganda has a volunteer reserve of about 100 for each district and a reserve of about 750 for the K A R.; Tanganyika has a reserve of about 500 for the K A R.; Somaliland a reserve of about 150 for the Camel Corps. All these territories and Zanzibar have armed native police forces available for military service. With the exception of the King's African Rifles the services of all the above local forces are limited to their own territories.

(b) In West Africa local defence is provided primarily by the West African Frontier Force, regular troops similar to the King's African Rifles. (*See* also NIGERIA) A reserve for this force is being established in each colony The active units in the W A F F. include, with approximate strengths, Gambia Company (150), Gold Coast Regiment (1,100), Nigeria Regiment (3,600), and Sierra Leone Battalion (400). Taken in detail, a reserve of about 100 for the W A F F is kept in Gambia, one of about 380 in the Gold Coast, besides a volunteer force composed chiefly of government officials, another of about 700 in Nigeria (*q v*); and one of about 100 in Sierra Leone All these territories have armed native police forces, which, with the Gold Coast Police, are restricted to the Gold Coast and Ashanti

(c) In South Africa, outside the Union, for which (*see* SOUTH AFRICA) there is a native police force of about 300 in Basutoland, liable to military service, and one of about 270 in Bechuanaland In Northern Rhodesia a volunteer force about 760 strong, and about 700 native police liable for military service In Southern Rhodesia a volunteer force of about 3,000, a cadet corps of about 1,200 and about 500 police In Swaziland a British rifle club of about 400, and a native police force of about 160, liable for military service anywhere in South Africa

Group IV. (*Asia, and Islands in the Indian Ocean*) This group includes British North Borneo, Ceylon, Hong Kong, the Malay Peninsula (Straits Settlements, Federated States and Unfederated States), Mauritius and the Seychelles In North Borneo there is a police force of various races, liable for military service and numbering about 780 In Ceylon a volunteer defence force of about 3,600 with a reserve of about 600, about 940 cadets, and a volunteer rifle association of about 150 members, in Hong Kong a volunteer defence force of about 330, and a European rifle association; in the Straits Settlements, volunteer corps numbering about 2,900, distributed between Singapore, Penang and Malacca, and armed police forces numbering about 3,400 For the military forces in the Malay States, numbering in all about 4,200, *see* under Malay States In Mauritius there is a volunteer force numbering about 660.

Group V (*Pacific Ocean*) Includes Fiji, where there is a defence force of about 800 and semi-military police of about 200 natives, Gilbert and Ellice Islands, with small defence forces being organized in Fanning and Ocean Islands, and about 50 armed police, and the Solomon Islands, with about 150 armed police

We find, then, that British Colonies and Protectorates, excluding those in Africa, with a total population of about 12,900,000 (2,200,000 in Group I, 600,000 in Group II, 9,800,000 in Group IV and 300,000 in Group V) maintain no regular troops for local protection, but only small handfuls of volunteers or rifle-clubs In Africa (Group III) we find in the East the King's African Rifles (about 5,700) and in the West the West African Frontier Force (about 5,400) and a few local volunteers in most of the African Colonies and Protectorates, while the total native population in this group numbers about 37,000,000

Due note will be taken of the point that in this article dealing with British Colonial Forces, no reference has been made to Egypt and the Sudan, to the mandated territories in Iraq, in Palestine, or to Aden and the Arabian hinterland These are dealt with elsewhere See also, for defence responsibilities that fall upon the British army, the information under INDIA, and, in connection with the principle of mutual defence, that given under

AUSTRALIA, CANADA, SOUTH AFRICA and NEW ZEALAND. Also NEWFOUNDLAND (no military force).

Higher Command.—The government of the British army is vested in the Crown The command is placed in the hands of the army council, who also administer the regular forces The territorial army is administered by county associations, excepting when in training camps or on actual military service. The war office includes (a) the army council; (b) departments, (c) the selection board for selection of officers for promotion to lieutenant-colonel and higher ranks, and (d) the judge-advocate-general's office The army council includes the chief of the imperial general staff, adjutant-general, quartermaster-general, master-general of the ordnance and financial secretary, with the secretary of State for war as president, parliamentary under-secretary of State as vice-president and permanent under-secretary of State as secretary

Distribution.—The British regular army at home is distributed in 6 commands (Aldershot, Eastern, Northern, Southern, Western and Scottish) and 4 District commands (London, Guernsey and Alderney, Jersey and Northern Ireland) The general distribution of the units in the three principal arms in the field army, including Household Cavalry and Foot Guards, is shown below —

	Cavalry (*Regiments*)	*Artillery* (*Batteries*)	*Infantry* (*Battalions*)
At Home	13	127	66
Colonies, etc		17	9
Rhine	1	4	7
Egypt and Sudan	3	6	8
India	5	65	45

The Territorial Army units are distributed over the military commands and districts, one or two divisions in each

Military Education.—An Imperial Defence College has recently been established in London for senior officers of all three services The Army educational establishments, the Royal Military academy, Woolwich, for artillery, engineer and signal corps cadets; the Royal Military college at Sandhurst for cadets for cavalry, infantry and the other arms, the Staff college at Camberley for the staff, and the senior officers' school at Sheerness for senior regimental officers; the school of equitation at Weedon; artillery riding establishment at Woolwich, school of artillery at Larkhill, coast artillery school at Shoeburyness, school of military engineering at Chatham, of electric lighting at Stokes Bay on the Solent, anti-aircraft defence school at Biggin Hill, Kent, school of signals at Catterick, Royal Tank corps central schools at Wool, Dorset, small arms school at Hythe, anti-gas school at Porton, near Salisbury, Royal Army Service Corps training college at Aldershot, Royal Army Ordnance Corps school of instruction at Hilsea, near Portsmouth; Royal Army Veterinary school, school of farriery, and physical training school all at Aldershot, Royal Military school of music at Kneller Hall, boys' technical school at Beachley; Royal Military school for soldiers' sons at Chelsea, and the Queen Victoria school Courses at these establishments vary in duration The course for cadets at Woolwich and Sandhurst now last for about eighteen months Those for the engineers then go to Cambridge, those for the artillery to Larkhill for further training The course at the staff college at Camberley for staff officers lasts for two years. (*See* further OFFICERS and EDUCATION, MILITARY)

Special Armament and Training Doctrine.—While the armies of continental military states can be trained for some predetermined task, in country of which every detail is known, the British army may be called upon to fight against many types of opponent over different terrain in most quarters of the globe For this reason there is a need for elasticity, both in training and in armament This elasticity is reflected in the various training manuals which lay down general principles for guidance, rather than rigid instructions Generally speaking, the principal new direction in which special armament and training is being directed is towards the employment in the field of "armoured forces" These have been rendered possible by the invention of the internal-combustion engine, and of caterpillar-track, semi-track and six-wheeled vehicles capable of cross-country movement, and of weapons capable of developing rapid-fire power while providing bullet-proof cover for the personnel. For purposes of experiment, a force containing such "armoured fighting vehicles" and others, such as artillery tractors, or dragons, and cross-country lorries for infantry which provide no cover from bullets, has been assembled at Tidworth on Salisbury Plain The main lesson learned in the training season of 1927 was that "a division of all arms of the old type could be rendered incapable of movement in proximity to a hostile armoured force in open country, over which such a force can manoeuvre " The trend of new development is in the direction of standardizing armoured fighting vehicles, of providing a mobile anti-tank weapon for all arms, including artillery, of practice in firing from vehicles in movement, of providing special anti-aircraft artillery, and of changing a proportion of cavalry regiments into armoured-car units, a plan previously adopted with yeomanry

Great Britain contains no land fortresses Portsmouth, Plymouth, Chatham and Rosyth in the Forth are provided with fixed defences, as, on a smaller scale, are certain other harbours and some of the mercantile ports "Army co-operation squadrons" are attached to army formations by the Royal Air Force, an independent body

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DEFENCE. NAVY

Historical.—For over 1,000 years the Navy of Britain has written the history of a small island people who have developed, by virtue of their power upon the sea, into the senior partner of a great Empire Details of the British Fleet of to-day are available in text books, but to obtain a true understanding of its traditions, its purpose and its strength, one must glance back through the chief historical events of the past ten centuries The earliest sea fights in which English ships took part were fought in the years AD 833 and AD 840, during the reigns of Egbert and Ethelwulf, the first kings of England The invasions of the Norsemen forced the English people to defend themselves by some form of national organization and each shire was called upon to provide ships in proportion to its size and wealth These ships were inferior to those of the vikings who held the upper hand until Alfred the Great (AD 871–901), with his powerful newly built fleet, defeated them in AD 878 Alfred's ships, which were the first "King's Ships," were swifter, steadier and higher out of the water than those of the Norsemen and some had as many as sixty oars The same means of providing a navy was employed by Alfred's successors, that is a few ships which were the private property of the king were reinforced by the ships of the shires, and later by a feudal contribution from certain privileged coastal towns

The Norman Conquest.—Up till the time of the Norman Conquest little development took place in the ships. They were large open boats, long and narrow, propelled by from 30 to 60 oars with a square sail for use when winds were favourable Further protection was obtained by arranging the shields of the soldiers along the bulwarks Such was the "Mora" in which William the Conqueror came to England in 1066 The Norman kings made no great change in the organization of their navy The king's ships, the forerunners of the national navy of today, formed the chief fighting force The coastal counties or shires were required to supply, when called upon, ships for the king's service, fully manned and equipped Bailiffs or port reeves were appointed who kept a strict account of all ships in their areas and it was their duty to see that they arrived at the rendezvous appointed by the king This system whereby the coastal towns bore some of the responsibility for the naval defence of the realm, remained in force until the 17th century A third source of supply was obtained by granting privileges to certain seaport towns, who in return, as a feudal contribution, maintained a certain number of ships, ready to supplement the king's ships Of these the Cinque Ports (*q v*) were the most important and from the 11th to the 13th centuries they played a prominent part They were always inclined to piracy amongst themselves and at the expense of other English seaport

towns. This brought about their downfall and by the time of Edward III. (1327–77) they had ceased to form part of the national sea defences.

The number of the king's ships varied from time to time In 1205, King John maintained a fleet of 50 galleys or "long ships" in various ports and William of Wrotham, Dean of Taunton, was appointed "keeper of the king's ships," the first record of any form of central administration of naval affairs During the time of the Crusades in the 12th and 13th centuries, the fighting ships, built solely for battle, still retained the form of the long, narrow, swift galley propelled by oars alone or if rigged with a mast and sail these were removed before going into action. The larger and clumsier merchant ships of this period had a permanent mast and square sail and relied upon oars as a secondary means of propulsion When prepared for war these ships were fitted with built up castles at each end from which missiles could be thrown into any ship alongside In time the ships became rounder in shape with built-in fighting castles, and relied almost entirely upon an elementary form of sail, with only one mast By the beginning of the reign of Edward III (1327–77) the fighting galley had almost disappeared from the English fleet, and the ships which defeated the French at Sluys in 1340 and the Spaniards off Winchelsea ten years later were sailing ships only

The Plantagenet Navy.—Until towards the end of the 14th Century the English Navy was successful upon the Narrow Seas and suffered no real reverse King John claimed the sovereignty of the seas after the destruction of the French Fleet at Damme in Flanders in 1213 his successors upheld the claim but Edward III was the first king to enforce it In the declining years of his reign, however, and during the troublous times of Richard II (1377–99) the navy was neglected and fell into decay Soon after Henry IV (1399–1413) came to the throne, the southern coast of England was ravaged by the French The country was distracted by internal wars and there were no king's ships to form a defence So desperate was the position that the king was forced in 1406–07 to call upon the merchant shipowners to provide ships to defend the realm This saved the situation for the time but it was not until after the accession of Henry V (1413–22) that the prestige of England was re-established upon the sea He reorganized and rebuilt his fleet, with it he drove the Genoese allies of France out of the channel and by its aid before his death became the virtual master of France

Gunpowder was invented in the beginning of the 14th century but it was not until the end of the century that guns began to be used afloat, and the first record of an English ship carrying guns is in a ship called the "Christopher of the Tower" in 1410 The guns were very small, designed as mankillers rather than to damage the structure of the ships, and they were mounted in embrasures in the forward and after castles The necessity of carrying many guns led to an increase in the size of warships and some of the ships built by Henry V were of nearly 1,000 tons

In spite of the troublous times of the Wars of the Roses, the English fleet maintained the command of the Narrow Seas and slow but steady progress was made in the construction and rig of the ships By the end of the reign of Edward IV (1461–83) the English ships had developed to the standard of those of the Mediterranean powers They carried three to four masts and a bowsprit and set as many as six sails, but the hulls, though larger and better built, did not differ in shape from the ships of a century earlier

The Tudor Navy.—The reign of Henry VII (1485–1509) marked the real beginning of England's sea power The voyages of Columbus, Vasco da Gama and the Cabots, in the last decade of the 15th century had startled the old world and turned the attention of all maritime nations towards the possibilities of overseas trade Under the influence of Henry VII the English nation ceased to be merely an island people, concerned only with coastwise traffic, and began to develop into a hardy race of seamen who took the English ships through the seas of the world The king subsidized private enterprise and trade and built great ships such as the "Regent" and "Sovereign," and he constructed the first drydock at Portsmouth These ships were armed merchantmen, capable of carrying large cargoes, and the "Regent" is said to have carried 225 small breechloading guns. At about this time great strides were made in the size and power of artillery and the heavy muzzle loading gun was invented. Henry VIII. (1509–47) took the keenest interest in his fleet and armed his ships with this new and heavy ordnance, thus introducing an entirely new factor into naval warfare The guns were so heavy that they had to be mounted on the lower or cargo decks Holes were cut in the ship's sides for the guns to fire through and so began the development of the fighting ship capable of firing broadsides to damage the hull and rigging of the enemy The ships of Henry VIII, unlike those of his father, were built exclusively as fighting ships, and soon after he came to the throne the "Mary Rose," the first of the long line of British battleships, was laid down Henry had ample funds from the plunder of the Church and he laid down 85 "kings ships," great and small Of these the "Henri Grace à Dieu" or "Great Harry" was the most magnificent and powerful ship of her time, and carried heavy ordnance on her lower decks and a large number of smaller guns in her upperworks

Henry VIII formed the first central navy office for the administration of the fleet His navy board, constituted by letters patent on April 24, 1546, consisted of a lieutenant of the admiralty, a treasurer, a comptroller, a surveyor, a clerk of the ships and other minor officials The Board was charged with the building and the upkeep of the ships and with the supply of stores, victuals and pay The Lord High Admiral (or later the commissioners for executing that office) had complete political and military control over the fleet and issued commissions to its officers, but exercised only a nominal control over the navy board This dual system of government of the navy remained in force, with the addition of various departments, until after the close of the Napoleonic Wars The records of the time are incomplete, but as far as can be ascertained, the navy at the end of the reign of Henry VIII consisted of 53 ships of a total of 11,270 tons, armed with 2,185 guns and manned by 3 000 men, more than half of whom were soldiers

The Elizabethan Navy.—During the disturbed reigns of Edward VI (1547–53) and Mary (1553–8) the navy was reduced to a bad state Edward VI did his best to develop the growing seaborne trade of the country and took the first steps towards expelling the Hansa Merchants, but the navy was neglected, and Mary, through lack of sea power, was unable to hold Calais Queen Elizabeth (1558–1603) on her accession at once took steps to restore the navy to the position it had held in the days of her father During the first twenty years of her reign, although not at war, she encouraged the exploits of Hawkins, Drake, Frobisher, Raleigh and a score of others on the Spanish Main and in other parts of the world Many improvements took place in shipbuilding and in organization When John Hawkins was placed in charge of the queen's ships in 1577 he introduced a new plan of shipbuilding by increasing the length of the ships in proportion to their beam This produced ships completely outclassing their predecessors in speed and sailing qualities and carrying more guns upon the broadside The "Revenge," the first ship completed upon the new plan was so successful that numbers of the old ships were rebuilt upon the same lines It was with ships of the new type that Drake, in his expedition to Cadiz in 1587 "singed the King of Spain's beard" Taking only four ships into the harbour he engaged and quickly defeated the whole fleet of Spanish galleons who were totally unable to withstand the broadside fire of the heavy ordnance of the English ships This battle established the "broadside battleship" as the fighting ship of the future and sounded the death knell of the oar propelled galleon that had held sway in the Mediterranean for 1,000 years

Two notable advances in organisation of the personnel marked this period In 1582 a graduated scale of pay for officers and men was, for the first time, introduced and a fund was started for the relief of sick and wounded seamen All men employed in the navy were subject to a small deduction from their pay which

was paid into the famous "Chatham Chest" This fund was administered by the commissioner of Chatham dockyard and by four other commissioners elected by the seamen

The Cadiz Expedition postponed the threatened Spanish Invasion of England for a year and in 1588 the Great Armada sailed. It was composed, chiefly, of merchant ships which carried few if any guns. The Spanish ships were short, had tremendous freeboard and were probably little improvement upon Henry VII.'s "Regent" of 100 years before The English fleet consisted of 34 "queen's ships" and a number of merchant ships, large and small, all more modern than the Spaniards. The superior speed and handiness of the English ships enabled them to choose their own range for their heavy guns and the Great Armada was severely handled during its disastrous week of sailing up Channel Forced by fireships to move in panic, whilst at anchor off Gravelines the Spaniards were driven into the North Sea by a southwesterly gale Unable to join the army of the Duke of Parma in the Netherlands, the Armada was chased by the English until their ammunition was exhausted; scattered by wild weather in the northern seas, only a remnant returned to Spain to tell the sorry tale During the last fifteen years of Elizabeth's reign the English fleet was uniformly successful and when she died her navy consisted of 42 ships of 17,000 tons, manned by 8,000 men, more than three-quarters of whom were seamen

The Stuart Navy.—On his accession James I (1603–25) made peace with Spain under such humiliating terms that the sea power of England faded until she became almost negligible upon the sea English ships were forbidden to trade in certain seas or even to defend themselves if attacked, under penalty of being treated as pirates Despite this, Hudson, Baffin, Raleigh and others showed that English sailors still dared to sail the seas James was interested in shipbuilding and strongly supported his master shipwright, Phineas Pett, but the king's ships were allowed to go to rack and ruin and the administration was corrupt The powerful fleet built up during the previous hundred years almost ceased to exist and when a naval expedition was fitted out to attack Cadiz by Charles I (1625–49), the whole breed of Elizabethan sailors had disappeared Military officers commanded the ships and, out of the 100 required, only nine of the king's ships were found in a fit condition to serve The flagship of the expedition the "Ark Royal" had fought against the Armada and some of the ships carried the same sails that they had used in 1588 Most of the merchant ships requisitioned were in a like case and the expedition was a failure A similar fate befell two expeditions to the Isle de Ré in the attempt to support the Protestant Alliance These disasters awoke the King to the state of the navy, but the royal revenue being insufficient to rebuild the fleet he levied the Ship Money tax (*q v*) The successive levies of this tax, although they laid the basis of the first royal and national fleet, proved to be one of the main causes of the Great Rebellion In spite of the long period of naval depression, the art of shipbuilding had made great strides and the "Sovereign of the Seas," the first of the "Ship Money" fleet was the finest ship that had ever been built She carried 100 guns arranged in three tiers and was the first of the English "three-deckers" Charles' efforts to rebuild the fleet were of no avail and by 1640 the Dutch had become the greatest sea power and practically drove the English off the sea

The Commonwealth Navy.—During the Civil War the navy at first supported the parliamentarians, but afterwards joined the royal forces On the defeat of the royalists the fleet left for Holland, where under Prince Rupert and aided by the Dutch, it ruined English trade At the beginning of the Commonwealth (1649–60) no small craft or coasting vessel dared to put to sea from English ports, but in 1649, Robert Blake was given the command at sea and the regeneration of the navy fell into his able hands In seven years, Blake defeated the royalist fleet under Prince Rupert, the Portuguese, the Dutch, the Algerian pirates and the Spaniards and made the English fleet for the first time a power in the Mediterranean During the First Dutch war (1653–54) twelve desperate sea fights were fought in which both sides covered themselves with glory and the war ended in favour of Great Britain In this war Blake found that the merchant ships which supplemented the fleet were untrustworthy in action and thenceforward Parliament built its own ships and supplied its own officers Codes of fighting instructions and of discipline were published that formed the basis of the Articles of War most of which still remain in force Under the Commonwealth 200 warships were built and the fleet was brought to a high state of efficiency.

The Restoration.—Charles II did much to encourage the navy, and in the first years of his reign the fleet was used to protect British interests in the distant seas Squadrons were sent to Bombay and to the West Indies to suppress piracy and Tangier was acquired as a base, only to be evacuated in 1685 The term Royal Navy came into use and a permanent corps of officers was formed Lads of gentle birth were sent to sea to be trained as officers and many other reforms were introduced, but the ill-treatment of the crews of the ships caused bitter discontent James, Duke of York, the Lord High Admiral, was more successful as an administrator than in command at sea and he was ably assisted by Samuel Pepys (*q v*) as secretary of the Admiralty But corruption was rife money voted for the navy was wasted and the outbreak of the second Dutch war in 1665, found the fleet badly equipped Nevertheless Monk and Prince Rupert won some successes in spite of poor material The Dutch raid upon the Medway ended a war which was, on the whole, inglorious to England and disastrous to her trade, and the Peace of Breda, signed in 1667, favoured the Dutch At the outbreak of the third Dutch war (1672–74) the fleet was in an even worse case than before, as Charles had spent all available money upon troops Parliament refused to vote supplies, the dockyards were denuded of stores and it was with great difficulty that a small fleet was fitted out The French squadrons, which co-operated with the English fleet proved to be inefficient allies, and the Dutch Admiral De Ruyter was uniformly successful The war, which ended in 1674, brought little credit to the Navy: but the Netherlands were exhausted and England was left stronger at sea than any other maritime state During his short reign James II (1685–88) retained the control of the navy in his own hands and did much to restore its efficiency. On his flight after the Revolution of 1688, the fleet took no active part in preventing the landing of William III (1688–1702) War broke out with France in 1689 and after a small success at Bantry Bay and a defeat off Beachy Head the fleet under Admiral Russell, with the aid of the Dutch, destroyed the French fleet at the battles of Barfleur and Cape La Hogue The war dragged on for another five years during which the English fleet constantly raided the French Coast

The War of Spanish Succession (*q v*)—Peace was signed at Ryswick in 1697, but it was short lived, for four years later the War of the Spanish Succession broke out The navy held the command of the Narrow Seas and Marlborough's armies were transported without interference to win the victories of Ramillies, Blenheim and Oudenarde. The ships of England won renown the world over during the reign of Queen Anne (1702–14) Admiral Rooke destroyed the French and Spanish fleets at Vigo in 1702 He defeated the French Toulon fleet off Malaga and, in 1704, he captured Gibraltar, whilst four years later Sir John Leake secured Minorca, after having twice raised the siege of Gibraltar Shovell, Benbow and Martin all added renown to the British fleet and when in 1713 the Treaty of Utrecht was signed, England retained her position as mistress of the seas

At the death of Queen Anne, the material strength of the navy was 247 ships of 170,000 tons, manned by officers inured by ten years of successful war. The beginning of the Georgian era brought success to the country, but the navy was starved and impoverished. The personnel was neglected, the design of ships became careless and ships in the dockyards were poorly maintained Parliament reduced the expenditure upon the navy to less than one half, at a time when English responsibilities were increasing all over the world and the service suffered in all departments from the political corruption of the times

The War of Austrian Succession.—When the War of the Austrian Succession broke out in 1739, the fleet was in a grave state of inefficiency Vernon failed utterly before Cartagena in

the West Indies and was recalled in disgrace Matthews, a gallant and able Admiral, did his best in the Mediterranean with an inefficient and inexperienced squadron, lacking in frigates and even in supplies He was recalled, was made the scapegoat of the politicians and was dismissed from the service with disgrace Anson was sent on a voyage round the world with six small ships and sailed for South America in 1740 His ships were rotten and badly found his crews were sickly and composed of old pensioners. With indomitable firmness, faced with disaster after disaster, he pressed on with his task and after incredible hardships, he returned four years later with one ship only, the "Centurion" He had harried the Spaniards on the coast of Peru, sailed round the world, had taken an immensely rich prize and brought his booty home Hawke, Saunders and Byron were among Anson's officers on this voyage, names that made history a few years later In 1744, Anson went to the Admiralty and commenced his long period of successful administration, which laid the foundations of the glories of later years It was with ships commanded by officers trained by himself that he inflicted a heavy defeat upon the French off Finisterre in 1747, a victory repeated by Hawke off the same place later in the same year These two victories ended the war and peace was signed at Aix la Chapelle in 1748.

In the few years of peace that followed Lord Anson continued his regeneration of the navy The Naval Discipline Act was revised and remained unaltered for over a hundred years Many reforms were introduced, including the formation of the corps of Royal Marines in 1755 The navy office was compelled, for the first time to render accounts to the Admiralty, the dockyards were brought into a state of order and some, at least, of the rampant peculation was stamped out Amongst the many improvements made in the design and fitting out of ships was the adoption of the practice of coppering the bottoms of the ships, which had a marked effect upon their speed and sea keeping qualities

The Seven Years' War.—This war which broke out in 1756, opened with the political blunder of sending Byng to the Mediterranean with an inadequate force, to relieve Minorca His failure was followed by the tragedy of his court martial and sentence to death Byng's place was taken by Hawke and many attacks were made upon the French coast towns with varying success In 1759—the "year of victories"—Hawke and Rodney in the Channel and Boscawen in the Mediterranean frustrated the threatened French invasion Lord Hawke won his epic victory over the French fleet in a gale of wind in Quiberon Bay and the strategy of Admiral Saunders in the River St Lawrence enabled General Wolfe's Army to take Quebec In the East and in the West Indies the British navy held its own and when in 1763, the war came to an end with the Peace of Paris, England was dominant on the North American continent and in India, Minorca had been recovered and her navy was supreme upon the seas There followed twelve years of peace marked by voyages of discovery Byron, Wallis and Carteret explored the Pacific and Cook made his three great voyages, discovering New Zealand and Australia The period was, however, marked by the greatest state of corruption and incapacity, under the administration of Lord Sandwich, that has ever been known in the annals of the British navy

The American War of Independence.—The outbreak of the American War of Independence (1775–81) found the fleet in a deplorable condition, with unseaworthy and ill equipped ships distributed in weak and unsupported units The French who had thoroughly reorganized their fleet, joined the revolting colonies in 1779 and inflicted heavy reverses upon the British at sea and by 1780 England found herself at war with France, Spain and Holland simultaneously. Gibraltar was constantly besieged and in 1776 the American Colonies declared their independence and were able to maintain it Such was the sorry pass to which the criminal neglect of the navy had brought the country But Lord Anson's sound administration bore fruit Parker in the West Indies, Keppel and Kempenfelt in home waters and Hughes in the East Indies, all men trained under Lord Anson, eventually established British supremacy in those seas Finally, in 1782, Lord Rodney, by his great victory over De Grasse at the Battle of the Saints off Guadaloupe, brought the war with France to a successful conclusion. The Treaty of Versailles, signed in 1783, was followed by a few years of peace during which every effort was made to maintain the fleet in a state of efficiency. The organisation of the dockyards was thoroughly overhauled and under the administration of the younger Pitt, money voted for the upkeep of the fleet was used only for that purpose

The French Revolutionary Wars.—When the French Revolutionary wars broke out in 1792 the British ships were fully equipped and ready for sea, manned by skilled officers and men Howe, Hood, Jervis, Duncan, Cornwallis, Keith, Collingwood and Nelson stand pre-eminent amongst the unsurpassed band of seamen who brought honour to British arms in the years that followed The war opened by the occupation of Toulon in 1793 by Lord Hood, and in the following year Lord Howe won his sweeping victory over the French fleet on the "Glorious First of June" In 1794, Lord Hood captured Corsica (where Nelson lost his right eye) and in the next year there were actions between the French and British fleets off Genoa, L'Orient and Hyères; in each case the British were victorious but failed to press home their advantage By the end of 1796, England again was at war with France, Spain and Holland· the Cape of Good Hope had been captured by Lord Keith, but the British fleet had been withdrawn from the Mediterranean to Gibraltar In February 1797 the Spanish fleet was heavily defeated off Cape St Vincent by Admiral John Jervis and Nelson was promoted Rear-admiral

The Mutiny.—Scarcely had the news of this brilliant victory reached England, than the whole navy broke out into mutiny. Poor pay (it had not been altered since 1649), bad food, the use of the press gang and harsh treatment had for some time been the cause of complaints by the men to the Admirals These complaints had been forwarded and neglected by the Government. Matters came to a head at Spithead in April, where the attitude of the men was respectful but firm, as it was also at Plymouth Reforms were promised, but delays in carrying them out brought on a further outbreak in the fleet at the Nore Here the demands of the men, led by a disgraced officer named Parker, were unreasonable They were repudiated by the men of the western ports and after stern measures the mutiny was suppressed By October the fleet at the eastern port had so far recovered its *morale* as to enable Admiral Duncan to defeat the Dutch at the Battle of Camperdown

The Napoleonic Wars.—An attack upon Santa Cruz failed and in it Nelson lost his right arm In 1798 Admiral Warren frustrated a French invasion of Ireland and Nelson's overwhelming victory over the French fleet at the Battle of the Nile gave to the British fleet the command of the Mediterranean and Minorca again returned to British hands. In 1799 the Dutch fleet surrendered and the defence of Acre by Captain Sir Sidney Smith broke Napoleon's dreams of an Eastern empire Malta was taken by the British fleet in 1800 and in 1801 the formation of the "armed neutrality" of the North was followed by the defeat of the Danes at Copenhagen by Parker and Nelson Napoleon now threatened to invade England and was closely watched by Nelson in the Channel, and Saumarez and Linois fought with varying results at Algeciras and Gibraltar France was exhausted and peace being welcome to England, the Treaty of Amiens was signed in March 1802.

The peace proved to be but a breathing space and when Napoleon declared war in 1803, the British fleet at once assumed a dominant position at sea Napoleon's vast preparations for invading England failed through lack of command of the sea Wherever a French and later a Spanish fleet was in port, a British force waited patiently outside Cornwallis commanded in the Channel, keeping a close watch upon Brest and Rochefort, Lord Keith guarded the Downs, Sir Robert Calder and Sir John Orde were stationed off Ferrol and Cadiz. In the Mediterranean, Nelson, with only eleven ships of the line, lacking in frigates and with no base to fall back upon, maintained for two years a watch upon Toulon and Cartagena In these two years many single ship actions were fought the world over, but no clash between the main fleets took place until late in 1805 Then, at last, the French and Spanish fleets put to sea Evading Nelson in a gale

of wind, Villeneuve was chased to the West Indies and back to fight an indecisive action with Calder off Finisterre The French fleet retired into Cadiz and the combined fleet put to sea in October and met Nelson and its fate off Cape Trafalgar Once again a British victory at sea removed the terror of a French invasion, and although the war with France lasted for ten more years, the French fleet did not again dare to encounter the British navy.

The Continental System.—Napoleon, despairing of beating Britain at sea, sought to cripple her trade by closing all the ports of Europe to her ships, under the "continental system" England's reply was the bombardment of Copenhagen and capture of the Danish fleet of 70 ships by Admiral Gambier, the occupation of Heligoland in 1807 and the Walcheren Expedition for the relief of Antwerp two years later Whilst the continental system crippled British trade in Europe, it turned her attention to the markets of the East and of the West. She secured the strong places of France and Holland throughout the world and Mauritius, Guiana, Ceylon, St Lucia and the Cape were added to the British Empire In 1812 the continental system was broken by Russia throwing off the French yoke, but not before the intrigues of Napoleon had caused a war between Great Britain and the United States This unfortunate war, fought with bitterness and little capacity on both sides, was, at first, not treated seriously by the British Admiralty. In 1812, weak and isolated British ships fell victims to their vigorous opponents, but in the following year the American ports were blockaded and in 1814 the war was brought to an end by the Treaty of Ghent, a treaty in which no single point of the original quarrel found a mention After Waterloo, Napoleon fled to Rochefort and there surrendered on board H M S Bellerophon. As he saw the last of the shores of France, he summed up the effect of Britain's sea power in one sentence "In all my plans I have always been thwarted by the British fleet"

The Nineteenth Century.—The downfall of Napoleon left Great Britain supreme upon the sea, a supremacy unchallenged for a hundred years During the century her power was used, time and again, to preserve peace, to maintain the freedom of the seas and to suppress slavery and piracy In 1816 Lord Exmouth bombarded Algiers and taught the Barbary pirates a lesson which led to their extinction In 1820–23 Lord Cochrane, with a small band of British seamen played a prominent part in the liberation of the South American Republics In 1827 Codrington, with French and Russian help, fought at Navarino the last battle of the sailing battleships and liberated Greece from Turkish oppression In 1840 Admiral Stopford, at the bombardment of Acre saved the Turkish empire from an Egyptian attack Twice the British navy intervened to save the Turkish empire from destruction—in 1855 in the Crimea and in 1878 when the victorious Russians advanced upon Constantinople to find the British fleet, under Admiral Phipps Hornby, at anchor in the Golden Horn ready to maintain the passage of the Dardanelles free for the commerce of the world Besides these there were many minor wars, all directed to the same end—the welfare of mankind Unobtrusively, British seamen commenced surveying and charting the seas of the whole world and many geographical discoveries were made In 1848 the hydrographic department of the Admiralty reported that a great part of the world had been charted and asked permission to complete the work This obtained, the British naval surveyors in their small ships successfully completed the task The results of their labours were published and are now used by the ships of all nations

The Admiralty Office.—In 1832 a great reform was introduced in the administration of the navy by the amalgamation of the navy board and the Admiralty The dual control of the fleet, which had existed since 1546 was swept away and there came into being the Board of Admiralty (*q v*) and the Admiralty Office This office has been altered in detail from time to time to meet the changing requirements of the fleet, but British naval administration remains, in principle, unaltered since 1832 Many far reaching reforms were introduced in the conditions of service of the seamen and in life on board, one of the most important being the introduction, in 1825, of the system of monthly payments to the Lower Deck. The principle of continuous long service, without which no modern fleet can be efficient, has bred for the British Navy a professional personnel, which has become, to no small extent, hereditary both for officers and men. The Naval Academy at Portsmouth, formed in 1729 to train young officers was, in 1808, renamed the Royal Naval College and a higher standard of education was inaugurated Fifty years later H M S. "Britannia" was attached to the College and in 1863 the "Britannia" was transferred to Dartmouth, where for forty years young officers were trained in her In 1903 the educational scheme was brought up to date to meet the scientific requirements of the modern fleet. the "Britannia" was transferred to the new Royal Naval College at Dartmouth and a new system of training engineer officers for the fleet was started.

The Coming of Steam.—At the close of the Napoleonic Wars the sailing warship had reached its highest stage of development. During the long period of peace following 1815, battleships became larger and carried more guns, though the guns themselves did not increase in size until after the Crimean War But during this period the introduction of steam brought about great changes The steam engine was first tried afloat in 1790 and by 1815 there were nine small steamers working in England By the navy the new invention was looked upon with disfavour and the Admiralty in 1816, issued a memorandum stating that "they felt it their bounden duty to discourage to the utmost of their ability the use of steam vessels, as they considered that the introduction of steam was calculated to strike a fatal blow at the naval supremacy of the empire" In the light of after events this is an astounding pronouncement and in the face of it progress was naturally slow By 1822 the navy possessed one small paddle steamer which was regarded as an expensive and somewhat unpleasant experiment Five years later three steamships were commissioned as warships and by 1840 the number had risen to forty These were all small paddle steamers and they were used mainly, for towing the great sailing ships in and out of harbour The chief objection to the adoption of steam in ships of the line was that the paddle wheels interfered with the mounting of the guns on the broadside This objection was removed by the successful trials with the screw propeller in 1845, and when the Crimean War broke out in 1854, Great Britain possessed a fleet of wooden battleships, fitted with auxiliary steam engines and screw propellers

Shell and Armour.—In the early part of the 19th century the French and Russians introduced the shell gun, firing an explosive projectile in place of the solid round shot The British Navy regarded this weapon with suspicion as it was inaccurate and the fuzes were dangerous it was not until 1837 that, tentatively, it was adopted The Crimean War proved the value of the explosive projectile and sounded the death knell of the old wooden battleship The French were the first to find an antidote by covering the sides of their ships with iron plates and three of these "ironclad" ships proved their invulnerability in action with the Russian forts Profiting by her experience, France, in 1859, built the first armoured ship "La Gloire," a wooden frigate with a belt of iron Iron merchant ships had been built some years before the Crimean War, but until the value of the explosive projectile was proved, the navy steadfastly refused to countenance them The success of the explosive shell and the greatly increased power of artillery which followed the invention of the Armstrong gun in 1858, changed these opinions and 1860 saw the building of the "Warrior," the first iron warship She was a ship of 9,000 tons, could steam 14½ knots and was successful under sail as a full rigged ship. With her 28 seven-inch guns, mounted behind a belt of armour, she was the most powerful fighting ship of her day

The Transition Period of Naval Architecture.—By 1861 eleven ironclad ships were being built for the navy and the transition period of naval architecture had begun in earnest. Manifold problems faced the constructors, complicated, at first, by the retention of masts and yards Guns became so large as to require machinery to work them and the old broadside arrangement gave place to the central battery type, with a few heavy

guns mounted in an armoured citadel in the centre of the ship. This method was in turn superseded by the revolving turret containing one or two heavy guns The first seagoing turret ships in the British fleet were the "Monarch" and "Captain," carrying four 12-in guns in pairs in turrets amidships Both ships were fully rigged and had a large spread of canvas In 1870 the "Captain" whilst under sail in the Bay of Biscay, capsized and foundered with the loss of nearly all hands and this disaster brought about the final abolition of masts and yards. In the next decade a number of different types of ship were evolved in the search for the standard modern battleship and, by 1880, the British battle fleet was a collection of samples, no more than two ships being alike It became recognised that the strength of a modern fleet depended to a great extent upon the similarity of the units composing it and hence the policy of building battleships and cruisers in classes was instituted. In 1880 the "Admiral" class, the first group of battleships built as a class were laid down With their heavy guns mounted in pairs at each end and a broadside battery of smaller guns, these ships were the prototype of the battleships of the world for the next twenty-five years

Growth of the Modern Navy.—The Naval Defence Act of 1889 closed the transition period and laid down a settled building policy for the modern navy The "Royal Sovereign" class, with the "Hawke" and "Intrepid" classes of cruisers, were the first outcome of the act and the battle fleet was gradually built up by the "Majestic," "London," "Duncan" and "King Edward VII." classes, which, with their contemporary cruisers, joined the fleet in successive groups, each more powerful than its predecessor The invention of the watertube boiler, followed by the turbine, and the use of oil fuel, revolutionized engineering practice and greatly increased the speed and endurance of all classes of ships. The first destroyer, the "Havock," was built in 1893 and was followed by a host of others of ever increasing size and speed. Large armoured cruisers came into being, ships of high speed, moderate protection and heavy armament and 1901 saw the building of the first British submarine In this department of naval warfare England had been outstripped by France, which had ordered its first submarine as early as 1888 This boat, the "Gymnote," was launched in 1888 Naval science made rapid strides in the closing years of the 19th century, especially in naval gunnery and in the use of the torpedo Early in the 20th century the German menace, then "a cloud no bigger than a man's hand" was met by the gradual concentration of Great Britain's naval strength in home waters and by increased activity in training and practice.

The "Dreadnought" Era.—In 1905 the whole forces of naval science were embodied in the design of one ship, the "Dreadnought" Built with rapidity and secrecy, she sailed on her trials exactly a year after her first keel plate was laid. A battleship of 18,000 tons and 21 knots, she mounted ten 12-inch guns in five double turrets In offensive power, protection and speed she eclipsed any fighting ship that had ever been built and she marked a new epoch in warship construction. The "Dreadnought" was followed by nine other ships with the same armament and in 1910 a new and powerful 13·5 gun passed successfully through its trials. With this gun the "Orion," "King George V." and "Iron Duke" classes were armed and by 1914, twelve of these ships were in commission. Meanwhile the armoured cruiser had developed into a new type of capital ship, the battle cruiser, ships with the armament of a battleship, in which protection was sacrificed to speed Cruiser duties with the fleet devolved upon yet another new type, the light cruiser, which appeared in 1913 These little ships of 3,000 to 4,000 tons were unprotected, but had great speed and were armed with 6-inch guns.

The strength of the British fleet in 1914 is shown in the following table, with, for comparison, the other important fleets of the world at the time

By the middle of 1914 the British fleet was at the highest state of power and efficiency that it had ever attained in its long history The ships were all that the scientific knowledge of the time could make them, the administration was sound and highly efficient the dockyards were in first class order and nothing was lacking to equip the fleet More important still, the long service personnel, officers and men, were incomparable and had been trained in the belief that a great war was coming in their time. The high command at sea was in the hands of a band of great seamen who, when the test came, proved their worth. Under them, in 1914, the British navy calmly faced the uncertainties of the titanic struggle before it, and for its performance therein reference must be made elsewhere (*see* WORLD WAR, NAVAL)

THE POST WAR NAVY

At the armistice in November 1918, there were more than 1,350 vessels flying the white ensign, manned by 407,000 officers and men Of this great number of ships 42 were battleships and battle cruisers, 786 were cruisers, destroyers, submarines and other small fighting craft and the remainder were trawlers, minesweepers and other auxiliary craft With the coming of peace retrenchment became inevitable and in the first place, the building programme was rigidly curtailed At the time there were 211 ships under construction the building of 86, including 3 battle cruisers, 44 destroyers and 33 submarines was immediately abandoned. A great reduction in personnel resulted from the return to civil life of those who had served through the war in the naval auxiliary forces and by 1920 the numbers of officers and men had been reduced to 176,000 and the ships in commission to 332 In 1921 by the Washington Treaty (*q.v.*) the Great Powers agreed to

The British Navy in 1914, compared with the chief Fleets of the World

	Great Britain		Germany		France		Italy		Austria		Russia		United States		Japan	
	Blt	Bldg	Blt	Bldg	Blt	Bldg	Blt.	Bldg	Blt	Bldg.	Blt.	Bldg	Blt	Bldg.	Blt	Bldg.
Battleships·																
(1) Dreadnoughts	22	10	13	7	4	8	3	4	2	2		7	10	4	2	4
(2) Pre-Dreadnoughts	40		22		21		8		9		9		25	.	16	.
Total	62	10	35	7	25	8	11	4	11	2	9	7	35	4	18	4
Battle cruisers	9	1	4	3								4			2	2
Cruisers																
1st class (armoured)	38		8		19	.	3		2	.	6	4	15	.	9	
2nd class	42		16		8		10		6		8		14	.	12	.
Light cruisers	38	8	26	6			4	1	1	3		2	3			
Total . .	118	8	50	6	27	.	17	1	9	3	14	6	32	.	21	..
Torpedo boat destroyers	25	15	152	12	81	3	33	16	12	6	106	36	50	12	54	2
Torpedo boats	109*		45†		93		79	2	60	27	26		23	.	55	.
Submarines	75	20	30	?**	67	9	20	8	11	3	36	19	39	12	15	2

*51 of these boats were small and over 25 years old †Half these boats were over 25 years old. **The number under construction was uncertain.

limit the numbers and size of capital ships and aircraft carriers and to restrict the size of cruisers to 10,000 tons and their guns to 8 inches Under this Agreement, Great Britain sent no fewer than 20 modern capital ships to the shipbreakers' yards and there followed a reduction in the permanent personnel A drastic scheme of retirement of officers and of elimination amongst the older men of the lower deck brought the total personnel down to 107,800 in 1923 and to 99,000 by the end of 1924 Since then the numbers have risen gradually to a peace complement of 103,000 officers and men

The armistice did not immediately bring the warlike activities of the navy to an end The minefields around the coast had to be swept clear and this hazardous task was accomplished, in the half year following the armistice, by a flotilla of over 700 vessels manned, chiefly, by British fishermen Until the end of 1920 the navy was engaged in the Baltic, the White Sea and in the Black Sea in supporting the unsuccessful opponents of Bolshevik Russia In 1922, the presence of a strong British fleet at Constantinople facilitated the prolonged peace negotiations with Turkey and in other parts of Europe the presence of British warships had a pacifying and stabilizing effect

Redistribution of the Fleet.—The post war redistribution of the British fleet thus occupied a period of over three years The Grand fleet was officially disbanded in April 1919 and its place was taken by an Atlantic fleet of nine battleships and five battle cruisers whilst a second fleet in home waters, the Home fleet of six battleships was formed. At the same time a squadron of six battleships, with cruisers, destroyers and submarines, was sent to the Mediterranean station. Owing to the pressing needs of economy, the Home fleet was abolished at the end of 1919, and the ships that were not placed in reserve were merged into the Atlantic fleet Until the end of 1922 the bulk of the British fleet was thus kept in home waters where the squadrons were large enough to solve the many post war problems of gunnery concentration, fleet torpedo tactics, destroyer attacks, anti-submarine and anti-aerial tactics. In the years following 1922 unrest in the Near East and the general strategic situation led to a gradual strengthening of the British fleet in the Mediterranean, and by 1926 the bulk of the fleet was stationed in those waters Based upon Malta, the Mediterranean fleet is placed astride the great trade routes to the Far East and composed of units in constant commission it is well situated for the general defence of the empire

Meanwhile seven cruiser squadrons have been formed for service in different parts of the world. One squadron is attached to the Atlantic fleet, two to the Mediterranean, one is stationed at the Cape, one in the West Indies, one in the East Indies and one in China, where there are also two flotillas of river gunboats for duty on the Yangtse and Canton rivers and destroyer and submarine flotillas This organization permits of early reinforcement in any part of the world, as was demonstrated in 1927, when trouble broke out in China, and a cruiser squadron, a destroyer flotilla and an aircraft carrier were sent from the Mediterranean to strengthen the China Squadron Upon each foreign station a number of small sloops are maintained to supplement the work of the cruisers in policing the trade routes and visiting the outlying parts of the empire

After the armistice until the end of 1922, the construction of British warships practically ceased, work being confined to the leisurely completion of vessels that were too far advanced to be abandoned No new ships were laid down, though the building of four improved "Hood's" was contemplated in 1921. These four ships were abandoned as the result of the Washington Treaty which left Great Britain with only one ship of post-Jutland design. The United States had three and Japan two, and in order to equalise the quota in this type, Great Britain laid down the two battleships "Nelson" and "Rodney" in 1922. These two ships, which conform to the agreed limitations of the Treaty, joined the fleet at the end of 1927 and the four "King George V." class battleships were broken up in their stead

Need of Cruisers.—In 1924 the cruiser situation in the British fleet became acute With the exception of the four ships of the "Hawkins" class the average size of the cruisers of the fleet was under 5,000 tons. These ships had been built during the war as "Light Cruisers" for service with the fleet in the Narrow Seas and they were not designed for service upon foreign stations. Moreover, most of these ships had seen strenuous war service which had shortened their lives Their replacement by a more suitable type was necessary and a programme was started to build twelve ships of 10,000 tons and six of 8,000 tons. the Australian Government at the same time laying down two 10,000 ton ships By the Washington Treaty the size of cruisers had been limited to 10,000 tons and their guns to 8 inch This maximum became a minimum and all the principal naval powers, in laying down new cruisers, built some up to the 10,000 ton limit Although in British opinion these ships were too large and expensive for the work they were required to do, Great Britain, mindful of the empire's 80,000 miles of vital trade routes, was forced to build ships which were powerful enough to deal with any rival they might meet. At the Geneva conference in 1927, Great Britain made sweeping proposals for economy by further limiting the tonnage and the size of the guns of capital ships and also suggested that the permissible tonnage of cruisers should be reduced and that they should be restricted from carrying any gun greater than six inch The conference failed to agree upon this latter point and was adjourned in spite of the failure to agree to a limitation in the size of cruisers, Great Britain in 1928 curtailed her cruiser programme by cancelling the laying down of two 10,000 ton ships and by proceeding only with the construction of the 8,000 ton class Turning to destroyers, some sixty of these vessels that were well advanced at the armistice, were completed and no new ones were begun until 1925 Two experimental destroyers were then laid down they joined the fleet in 1927 and as the result of their extended trials, a new class of these vessels was started to replace the older boats as they became worn out.

After the war Great Britain twice expressed her willingness to abolish the submarine as a naval weapon of war. Other nations could not agree to this, but for six years after the armistice, British submarine construction was confined to the completion of vessels already in hand and to experimental work. Only one submarine was completed in this period, the large ocean going submarine "XI" In 1925, with the laying down of the new "O" class, a submarine replacement programme was put in hand

Post-War Administration.—No radical change in the administration of the navy or of the dockyards was brought about by the World War, with the exception of the formation of the naval staff On the outbreak of hostilities the navy had a very inadequate staff organization, war experience demonstrated its necessity and there is now a scientifically trained and efficient naval staff at the service of the fleet New material, new methods and the advances of science have led to specialized training in some directions, notably in electrical matters, but, in principle, the general organization of the navy has remained unaltered since 1914. The war produced no startling innovations in naval weapons. The heavy gun maintains its pride of place as the chief weapon, the torpedo has increased in power and range but not in accuracy; the possibilities and also the limitations of the submarine were demonstrated countermeasures against mines were discovered and the rapid development of the aeroplane, alone, has introduced a new factor into naval tactics Since the war the Fleet Air Arm has been formed, under the dual control of the Admiralty and the Air Ministry The aircraft carriers are naval ships and 70% of the flying personnel are naval officers and men The remainder of the personnel and all the flying material are supplied by the air force, who are also responsible for flying training The cost of the Fleet Air Arm is borne on the Naval Estimates

In 1928 there were maintained in commission just over 300 ships Of these more than 100 were vessels attached to training establishments, surveying vessels and other auxiliary units The strength of the navy of the British Empire in 1928 is shown in the following table, in comparison with that of the principal naval powers. The number of the ships shown as "projected" in the table will be subject to alteration after the revision of the Washington Treaty in 1931

The British Navy in 1928 Compared with the Chief Fleets of the World

	British Empire			United States			Japan			France			Italy			Soviet Union			Germany		
	Blt	Bldg	Proj	Blt	Bldg	Proj	Blt	Bldg	Proj	Blt	Bldg	Proj	Blt	Bldg	Proj	Blt	Bldg	Proj	Blt	Bldg.	Proj
Battleships	16			18			6			9			5			5			8		
Battle cruisers	4						4														
Cruisers	54	8	5	32	8	15	35	6	2	16	6	1	12	6	2	6	2[5]	u	8	3	1
Cruiser minelayers	1						3		1		1	1						u			
Armoured coast defence vessels and monitors	3			1														u			
Air craft carriers	8[1]	1	1	3		5	4			1	1[3]		1					u			
Flotilla leaders	17	1	2			9				7	12	6	11	12	4			u			
Destroyers	150	8	18	309[2]		12	114	12	13	45	19		64	3		77		u	17[6]	12[7]	
Torpedo boats										7			47			6		u	16		
Submarines	55	12	12	121	3	32	65	12	4	44	46	8	43	18	4	24		u			
Coastal motor boats	6						2			2	3		132	4		25	1	u			
Sloops	28		4							8	2	2	23[8]			4		u			
Gunboats				12						46			8			2		u	3		
River gunboats	19	1	1	7	5		8		2	9	1		2			4		u			
Minesweepers	31	2		42			4	2		26			48[4]			20	7	u	35		

[1]Including two cruisers under reconstruction as Aircraft Carriers
[2]Includes 14 fitted as Minelayers and 25 for Coast Guard Duties
[3]Aviation Transport
[4]Six of these are combined Minesweepers and Minelayers
[5]Of Pre-Revolutionary design
[6]Classed as large Torpedo Boats
[7]Classed as large and small Torpedo Boats
[8]Four of these are Minelayers
(u)No authentic programme published.

See also AIRCRAFT CARRIER, BATTLESHIP, CRUISERS, DESTROYERS; DOCKYARDS, FLEET AUXILIARIES, FUELLING STATIONS, MARINES; MEDICAL SERVICE, NAVAL, SUBMARINE, SUBMARINE CAMPAIGN, WORLD WAR, NAVAL (S T H W)

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DEFENCE: AIR FORCE

The British Army and Navy at the beginning of the World War in Aug 1914 had separate administrative organizations for their air services which were the Royal Flying Corps and the Royal Air Service respectively These were amalgamated early in 1918 and the Air Ministry was formed It is a state department and the Secretary of State for Air is the responsible Cabinet Minister He is also president of the Air Council, whose functions are analogous to those of the Board of Admiralty and the War Council

The Air Council.—In addition to the president, the Air Council is composed of the under Secretary of State for Air, who must be a member of Parliament (either House), four service members (the chief of the air staff, the air member for personnel, the air member for supply and research and the deputy chief of the air staff) and the secretary, a civil servant The air ministry provides the administrative machinery for giving effect to the Air Council's decisions and it consists of various main departments The directorate of civil aviation deals with all matters connected with the regulation of civil flying It comprises an accident branch, which investigates the causes of accidents, whether to service or to civil aircraft, an air transport branch, and a licensing branch The department of the secretary is charged with the internal administration of the ministry and is responsible for the general routine Included in the department are the directorates of accounts, contracts and lands and the meteorological office

The department of the chief of the air staff includes the directorate of operations and intelligence and the directorate of staff duties and organization, which, in addition to the functions implied by its designation, controls the signalling branch This branch deals with questions of wireless communication for both the Royal Air Force and civil aviation The directorate of works and buildings is also under the chief of the air staff The department of the air member for personnel deals with the recruitment, discipline, general welfare and training of officers and other ranks of the Royal Air Force The directorate of medical services forms part of this department

The department of the air member for supply and research includes the following directorates (1) the directorate of scientific research and technical development, divided into branches which deal respectively with design, armament, instruments and scientific research; (2) the directorate of airship development; (3) the directorate of aeronautical inspection, which is responsible for the inspection of all materials used in the construction of aircraft and engines, (4) the directorate of equipment, which is responsible for the supply, storage and issue of all equipment for the Royal Air Force

The Royal Air Force.—The officers of the general duties or military branch of the Royal Air Force are divided into two categories About 50% of the total are those for whom the Air Force provides a permanent career Practically all officers in this category must pass through the R A F Cadet College at Cranwell. The remainder consists of officers serving temporarily in the Royal Air Force; either those from civil life who engage for five years on the active list followed by a period in the reserve, or

those naval officers who, by agreement with the Admiralty, provide personnel for the Fleet Air Arm for certain periods The other ranks are filled either by boys who go through an apprenticeship in a trade at one of the boys' training establishments, passing into the ranks on reaching the age of 18, or by men enlisted direct from civil life. The normal period of service is seven years with the Colours and five with the reserve In addition to the general duties branch of the Royal Air Force, there are the stores, accounting, medical, dental, and chaplain's branches

Units are divided into the following types —

Type of unit	Equipment
Fighter squadrons	12 single-seater fighting aeroplanes
Bombing squadrons	12 single-engine bombers, or 10 multiple-engine bombers
Army co-operation squadrons	12 Army co-operation aeroplanes
Navy co-operation flights	6 aeroplanes, seaplanes or flying boats
Fleet air arm	6 aeroplane flights in aircraft carrying ships

The present organization of the Royal Air Force, full details of which appear in the Royal Air Force Monthly List is comprised of the following commands —

Home 1 The air defence of Great Britain which comprises all units and formations of the home defence force organized under three subordinate commands, viz , Wessex bombing area (regular bombing squadrons), fighting area (fighter squadrons), and No 1 air defence group (cadre and auxiliary squadrons)

2 The inland area which comprises all units in Great Britain with the exception of those units included in the air defence of Great Britain, the coastal area and the Cranwell and Halton Commands

3 The coastal area which comprises all units serving at the following stations —Calshot, Lee-on-Solent, Gosport, Cattewater, Donibristle, Leuchars and Felixstowe, headquarter units in aircraft carriers in home waters, flights embarked in such carriers, and all recruiting depots

4 Royal Air Force Cranwell which comprises the cadet college and all units at Cranwell

5 Royal Air Force Halton which comprises No 1 School of technical training and all units at Halton

Overseas 1 Royal Air Force Middle East which comprises all units in Egypt and the Sudan

2 Royal Air Force Transjordan and Palestine which comprises all units in those countries

3 Royal Air Force 'Iraq comprising all units in 'Iraq

4 Royal Air Force India comprising all Air Force units in India

5 Royal Air Force Mediterranean comprising units in Malta

6 Royal Air Force Aden comprising units in Aden

7 Royal Air Force China comprising units at Hongkong and embarked in Aircraft carriers

In addition to the above commands there exist the following Establishments controlled by the Air Ministry —

1 The Royal Aircraft Establishment, South Farnborough

2 The Royal Airship Works, Cardington

3 The Marine Aircraft Experimental Establishment, Felixstowe

4 The Aeroplane and Armament Experimental Establishment, Martlesham

The present approximate strength of the Royal Air Force is officers 3,450, other ranks 28,500 (X)

NATIONAL FINANCE

British Finance After 1793.—The revolutionary and Napoleonic Wars (1793–1815) imposed such a strain on English finances as to throw all previous wars into the shade The total cost is estimated to have exceeded £800,000,000 War expenditure began gradually By 1795 it had reached about £20,000,000 a year At first no taxation worth mentioning was imposed, all was borrowed In 1797 the restriction of cash payments by the Bank of England marked a new stage By a great effort tax revenue was raised from £19,000,000 in 1796 to £32,500,000 in 1799

A notable novelty was the income tax As imposed by Pitt in 1798, this tax (at the rate of 2/– in the pound) was based on personal declarations of income by the taxpayers. It was impossible to secure full and honest declarations or to check evasion, and the yield of about £5,500,000 a year was disappointing The peace secured by the Treaty of Amiens in 1802, transitory though it turned out to be, was accompanied by the repeal of the income tax On the other hand additional customs and excise duties were imposed and in 1803, when the war broke out again, the tax revenue reached £40,000,000

Addington, who was then prime minister and chancellor of the exchequer, reimposed the income tax, but with an important and indeed epoch-making change He established the system of taxation *at source* Incomes were to be declared so far as possible by those who paid them (such as the tenant of land or the borrower on mortgage) instead of by those who received them, and the tax collected accordingly This proved to be the solution both of the problem of war taxation at the time, and of the problem of income taxation in the future The rate of income tax, at first 1/– in the pound, was raised in 1807 to 2/–, and the tax at that rate regularly yielded from £12,000,000 to £14,000,000 a year

The yield of taxation was swollen all round by an inflated paper currency and a high price level, and in the years 1813 to 1815 an average annual revenue of £79,000,000 was provided towards an average expenditure of £104,000,000 Customs and excise yielded an average of £44,000,000 and income tax £14,500,000 Indirect taxes had been constantly added to, and eventually attained a degree of complexity and vexatiousness which has become notorious (and immortalised by Sidney Smith's witty description)

Though tax revenues had been thus drastically extended in the latter part of the war, the deficits still necessitated very heavy borrowing The practice was followed of issuing stock far below par, 5% and 4% stocks were issued, it is true, as well as 3 per cents, but the 3 per cents predominated and were being plentifully issued even at times when 5 per cents could not be sold at par In the whole period 1793–1816 the funded debt was increased by £566,600,000 *net* (stock redeemed out of the sinking fund and held by the National Debt commissioners being deducted) The net proceeds in money were only £368,600,000 The floating debt (which had been £10,000,000 in 1792) had risen to £50,000,000 In 1814 it had been £60,000,000

Added to the pre-existing debt this made a total of £846,000,000, and the annual charge for interest was some £32,000,000, including terminable annuities amounting to £1,898,000, which were not represented in the capital of the debt The difficulty of meeting this burden was increased when the Government was deprived by an adverse vote of the House of Commons in 1816 of the income tax The years following the peace were a period of falling prices and depression Rigorous economy (with which the name of Joseph Hume is associated as an indefatigable critic of Government extravagance) brought down expenditure below £60,000,000 a year, and by 1834 even below £50,000,000 Yet the oppressive and vexatious system of indirect taxation had to be continued to make ends meet

Some relief was soon obtained from the conversion of the debt The Government had the right to repay the 5 per cents and the 4 per cents at par In 1821 this option enabled them to convert the 5 per cents to 4 per cents (with an increase of 5 per cent in nominal capital) The stock converted amounted to £150,000,000 and the saving in interest was £1,200,000 a year Two further conversions (1824 and 1830) reduced the 4 per cents to 3½ and saved a further £1 000,000 a year In 1844 the 3½ per cents were in turn converted to a new stock bearing 3¼ per cent for ten years, and thereafter 3 per cent Thus the funded debt had been reduced to a uniform 3 per cent But the relief thus gained was restricted to the stocks which had originally yielded more than 3 per cent The burden of the 3 per cents which had amounted in 1815 to £547,000,000 could be diminished in no other way than by the operation of the sinking fund, till the

yield of gilt-edged securities at market prices fell below 3 per cent.

The sinking fund instituted by Pitt had become an absurdity; an enormous sum had to be applied every year to the redemption of debt, even when the requisite revenue was not forthcoming. Money was even raised by the creation of floating debt to redeem funded stock. After tentative amendments this ambitious but unpractical plan was swept away in 1829 in favour of a simple provision requiring the actual excess of revenue over expenditure in any year to be applied to the reduction of debt. This provision remains and is called the "old sinking fund"

For 20 years after 1815 there were as a rule moderate surpluses. In 1836 and 1837 heavy borrowing became necessary to provide £20,000,000 of compensation to the proprietors of slaves emancipated in the West Indies.

It was a time of bad trade, and in the years that followed there were serious deficits, aggravated in 1840 by the adoption of the penny post, which involved a loss of revenue of £1,000,000 a year Financial difficulties were a contributory cause of the discredit and fall of Lord Melbourne's Government in 1841

The Coming of Free Trade.—The budget fell into the masterful hands of Sir Robert Peel, who as prime minister and first lord of the Treasury quite over-shadowed Goulburn, the chancellor of the exchequer.

The path to solvency was found in the revival of the income tax At a rate of 7d in the pound it yielded £5,000,000 a year. The deficit in 1841 had been £2,100,000, and the new tax provided a margin to admit of important reforms It was the age of the classical economists and their championship of free trade A beginning had been made with the mitigation of protective customs duties in 1825 by Robinson and Huskisson Peel in his budget of 1842 made an important further advance He repealed numerous vexatious duties which yielded comparatively little revenue, but which hampered trade A further instalment of similar reforms came in 1845 The repeal of the corn laws in 1846 can hardly be regarded as a fiscal measure, the slight loss of revenue counted for little in comparison with the major issues raised

The traditions of Peel were carried on by the so-called Peelite party, the section of Conservative Free Traders who played a conspicuous part in politics till 1859, and thereafter contributed to create the modern Liberal Party Peel's successor in finance was Gladstone, the outstanding figure in that sphere in the 19th century

In the field of taxation development was in the direction of free trade Customs duties came to be confined to products which either, like tea or tobacco, were not produced at all in this country, or, like beer and spirits, could be subjected to excise duties approximately equal to the customs duties, which eliminated all protective effect The simplification of indirect taxation begun by Peel was carried out to the limit, and the number of commodities taxed reduced to a minimum From the repeal of the sugar duties in 1874 till their reimposition in 1901 the only commodities taxed were alcoholic liquors, tea, coffee, cocoa, tobacco and dried fruits

The income tax had been intended by Peel to be a temporary expedient, and this was not forgotten For long it was out of the question to dispense with it But in 1874 Gladstone, finding it possible to reduce the rate to 2d in the pound in the forthcoming budget, seriously proposed to repeal the tax altogether His Government fell, and soon it became necessary to increase the tax. The prospect of repeal vanished and has never revived

On the side of expenditure the tradition of severe economy begun in the period after 1815 was continued almost to the end of the 19th century The instrument used for this purpose was the Treasury The sanction of the Treasury is required to be given, in considerable detail, for the expenditure of all the other departments Thereby the chancellor of the exchequer is enabled to impose any desired standard of economy upon them

Progress with debt redemption was slow In 1853, on the eve of the Crimean War, the debt amounted to £769,000,000, and the war (costing £69,000,000 in all) added £39,000,000 to this total Apart from the rather fortuitous surpluses of revenue over expenditure, there was no systematic sinking fund Gladstone in 1863 started a new system of "terminable annuities" for the purpose of redeeming debt. A sum of £5,000,000 3 per cents, in which savings bank deposits were invested, was cancelled, and in place of the interest the exchequer was made liable to pay an annuity for 22 years including instalments of capital sufficient to accumulate during that period to the equivalent of the stock cancelled. The system was further developed, and in 1875 the annuities amounted to £3,500,000.

New Sinking Fund 1875.—The creation of a systematic sinking fund was the work not of Gladstone, but of the Conservative chancellor of the exchequer, Sir Stafford Northcote He obtained an act in 1875 which set up a *fixed debt charge* of £28,000,000 a year, a sum more than sufficient to cover interest and terminable annuities, and providing a margin to be applied to debt redemption (the "new sinking fund") So long as the fixed amount was not tampered with, the margin available for redemption would grow as the charge for interest diminished The provision requiring the surplus revenue to be applied to the redemption of debt (the "old sinking fund") still remained in operation

It is the practice to legislate every year on the subject of revenue and debt (the annual Finance Act), and surpluses or portions of them have often been diverted by a special clause from the redemption of debt to expenditure more or less of a capital nature The fixed debt charge was reduced to £26,000,000 in 1887, to £25,000,000 in 1890 and to £23,000,000 in 1899

The last quarter of the 19th century was a period of exceptionally low rates of interest, and the 3 per cents which had constituted the greater part of the National Debt since 1844 rose to par, and would have risen higher but for the Government's right to repay them at par In 1888 the chancellor of the exchequer, Goschen, carried through a conversion scheme, £514,000,000 of 3 per cents being converted to a new stock (new Consols) which yielded 2¾ per cent for 15 years and thereafter 2½

A turning point in financial policy was marked by the retirement of Gladstone in 1894 Though he was 84, his resignation was not entirely without political significance, the occasion for it was the insistence of his cabinet upon a costly naval programme Expenditure began to mount rapidly Soon the Boer War (1899–1902, costing £223,000,000) added £159,000,000 to the debt (yielding £152,000,000 of cash)

The growth of British expenditure is illustrated by the following table (in £ millions)

	1820	1840	1859–60	1879–80	1893–94	1908–09	1914–15**
Debt	32·0	29·5	28·7	28·8	25·2	28·0	23·5
Army	10·1	8·5	14·1	15·0	17·9	26·8	28·9
Navy	6·6	5·6	11·8	10·2	15·5	32·2	51·5
War expenditure*		·7	·8	3·2			
Post office	·6	·9	3·0	5·2	10·1	18·1	26·2
Old age pensions and social insurance						2·1	22·0
Other expenditure	9·1	8·0	11·2	19·8	22·6	35·3	45·0
Total	58·4	53·2	69·6	82·2	91·3	142·5	197·1
Grants in aid of local taxation†					7·2	9·8	9·9
	58·4	53·2	69·6	82·2	98·5	152·3	207·0

*Canada and China in 1840, China in 1859–60, Zululand, etc, in 1879–80

†Assigned revenues under Acts of 1888 and subsequent years This item was excluded from the Exchequer Account and the financial statement till 1906

**Estimates from last peace-time budget.

Expenditure from 1894 to 1915.—The 21 budgets which intervened between Gladstone's resignation and the outbreak of the World War had more than doubled the expenditure Of the increase of £108½ millions £47 millions were for defence, and £22 millions for old age pensions and Social Insurance The remaining £40 millions were partly the result of natural growth (including £16 millions for the post office) The period was one of rising prices, so that a part of the growth was only apparent

This increase in expenditure meant large increases in taxation. An important new departure was made at the outset by Sir William Harcourt, chancellor of the exchequer in the Liberal Government from which Gladstone retired in 1894 This was the application to the death duties of the principle of graduation according to the total value of the estate left by a deceased person. A small estate paid 1% or 2%, one of £1,000 to £10,000 paid 3%, while at the top of the scale one above £1,000,000 paid 8 per cent.

With expanding trade and revenue no further taxation was required till the Boer War Towards the cost of the war a sum of £71,000,000 was raised by taxation Income tax and indirect taxes were increased and new taxes were imposed, an export duty on coal (1901), and import duties on sugar (1901) and wheat (1902)

The coal duty and wheat duty were repealed again in 1903. The wheat duty was noteworthy as being the first protective duty imposed since the days of Peel, and its repeal was due to the controversies which it threatened Immediately upon it there followed Joseph Chamberlain's campaign in favour of colonial preference (*see* PROTECTION)

In the early years of the Liberal Government which took office in Dec 1905, good trade facilitated remissions of taxation and big repayments of debt The debt charge had been raised by Austen Chamberlain to £28,000,000 and was temporarily further increased Income tax remained at 1/- in the pound (as compared with 8d just before the Boer War) but H H Asquith introduced a system of differentiation in favour of earned incomes below £2,000 a year, which paid 9d only

In 1908, coincidently with a trade depression which reduced the productivity of the revenue, came new demands on the Exchequer Asquith's Old Age Pensions Act of that year was soon followed by D Lloyd George's projects for Health Insurance and Unemployment Insurance The cost of the navy was still growing In the budget of 1909 an enormous estimated deficit had to be provided for by heavy new taxes

That budget became the occasion of a great constitutional crisis The most contentious proposals were those for the taxation in various forms of "land values," especially the "unearned increment" of economic rent Heavy increases in public house license duties also evoked opposition The graduation of the estate duties was made more severe The duties on spirits and tobacco were raised But the feature of greatest permanent importance was the institution of a supertax, or additional income tax, on large incomes

Incomes above £5,000 were taxed at 6d in the pound on the excess over £3,000 At the same time the rate of income tax on unearned income was increased from 1s /- to 1s /2d

After a prolonged and stormy passage through the House of Commons the Finance Bill was rejected by the House of Lords Since the 17th century it had been a constitutional convention that the House of Lords could not *amend* a money bill But it could not be prevented from *rejecting* one In 1860 the House of Lords rejected a bill repealing the paper duties, and the Government (in which Gladstone was chancellor of the exchequer) retorted by putting all the budget proposals in a single Finance Bill Since then it had been assumed that the rejection of the Finance Bill as a whole would never be practical politics, and that the power of the House of Lords over details of the budget had dropped into abeyance

Parliament Act, 1911.—In 1909 the question was suddenly revived Two successive general elections in 1910 were required to enable the Government to pass the budget (April 1910) and the Parliament Act, 1911, which limited the powers of the Lords and almost destroyed their power over finance After the great effort of 1909 the natural expansion of revenue sufficed to cover expenditure till 1914 In that year further taxation became necessary, and the budget as finally adopted (before the war crisis) provided for an increase in estate duties, a rise in the income tax on unearned incomes from 1s 2d to 1s 3d (the earned still remaining at 9d), and an important extension of the supertax Supertax was applied to all incomes over £3,000, and was more elaborately graduated (the rate on the excess of an income over £8,000 was 1s 4d in the pound) The estimated yield for a full year was thereby raised from £3,300,000 to £7,770,000 (*see* INCOME TAX).

The following table shows the growth of taxation in the century preceding the Great War (in £ millions)

	1820	1840	1859–60	1879–80	1893–04	1908–09	1914–15*
Customs	11·9	23·4	24 5	19·3	19 7	29·2	35·5
Excise	29 6	14 9	20 4	25·3	25 2	33 6	39 8
Stamps	6 9	7 3	8 0	10 4	12 8	7·8	9·9
Death Duties						18 4	28 8
Income tax	.		9·6	9·2	15 2	33·9	48·1
Supertax	.	..					5 8
Other taxes	8·3	4 2	3 2	2 7	2 5	2 6	3 4
Post office	2 0	1 3	3 3	7 8	13 0	22 3	31 8
Other revenue	1·2	6	2 2	4·6	2·7	3·7	4·0
Total .	59 9	51 7	71 2	79·3	91 1	151 5	207 1

*Estimates from last peace-time budget

The War Period.—From the beginning of the World War in Aug 1914 it became impossible to dissociate the budget position from the state of credit generally In the first place, the Government had to come to the assistance of the financial world and support credit through the initial crisis Secondly, expenditure on the war soon grew to such dimensions as to put an almost unbearable strain on the financial fabric of the country

The outbreak of the war threw first the stock exchanges and then the foreign bill markets of the world, but above all of London, into utter disorder The machinery of remittance to London broke down almost completely and the London accepting houses found themselves faced with bankruptcy The Government was forced to step in and to proclaim a moratorium for debts, statutory power was taken for the Treasury to issue legal tender currency notes for £1 and 10s and the Government guaranteed advances by the Bank of England to acceptors to pay off pre-moratorium bills (*see* STOCK EXCHANGE)

It was in the midst of this state of confusion that the early stages of the war were financed For the initial expenses, advances of £14,720,000 were obtained from the Bank of England on "ways and means" (*i e*, under the powers annually conferred by the Consolidated Fund Act and Appropriation Act). The war was costing about £1,000,000 a day There followed half-a-dozen issues of Treasury bills of £15,000,000 at a time In Nov 1914 additional taxation was imposed and a loan of £350,000,000 (3½% at 95, redeemable 1925–28) was decided on By that time serious unsoundness was already developing in the situation The issue of £90,000,000 of Treasury bills did not in itself overstrain the market But the advances made by the Bank of England for the pre-moratorium bills, with its advances to the Government and large imports of gold, destroyed the bank's power of controlling the money market Bank rate had been reduced to 5% on the reopening of the banks on Aug 7, but in Sept it ceased to be effective and the market rate fell to 3% In Nov it fell below 3 Part of the 3½% loan was taken by the banks, and in any case the loan was not applied to strengthen the position of the Bank of England In Feb 1915 the market rate of discount fell below 2% The private deposits at the Bank of England exceeded £130,000,000

Growth of Inflation.—At last, in March 1915, severe measures were taken to counteract the growing inflation, which had already caused a considerable rise of prices The Bank of England came into the money market as a borrower at call on the same footing as the discount houses, and lent the proceeds to the Government The money was accumulated in balances, and public deposits at the bank rose from £27,000,000 at the end of Feb to £114,000,000 at the end of March and other deposits fell to £90,000,000 On April 13 a new departure was made, in that Treasury bills in unlimited quantities were placed continuously on sale at fixed rates of interest to all comers But the rates were still low (2¼% for 3 months, 3⅛% for 6 months, 3¾% for longer maturities) Public deposits rose to £130,000,000 and more It

was the Treasury bill rate, and not bank rate, which regulated the money market.

By that time the cost of the war had risen to £3,000,000 a day and exceeded one-third of the national income (even if this be assumed to have risen in proportion to prices, which were 25% higher than in 1913). This outlay (after deducting a modest contribution from the tax revenue) far exceeded the amount that the people could save But inflation only made the situation worse That the cost of the war was itself swollen by the high prices was the least part of the evil Easy credit makes trade profitable, because it encourages buying and consumption. It directs savings away from gilt-edged investments into trade In 1915 conditions were extremely abnormal, but, for all that, this tendency was at work Lavish expenditure by the public on consumable goods was competing with the Government, not only for the investment of the available savings, but for the employment of the available labour and productive power Inflation, once started, continued throughout the war and for some time afterwards and only spasmodic and half-hearted steps were taken to check it till 1920, when prices had risen to three times the pre-war level

R McKenna, in June 1915, brought out the second war loan (4½% at par, redeemable 1925–45) It was for no specified total amount. The banks again undertook to subscribe for a very large amount, but the loan was planned much more for the ordinary investor and less for the money market than the 3½% loan of November It also remained open longer, and there was more propaganda Subscribers were given the right to convert their holdings into any future long-dated war loan Holders of 3½ per cents or of consols were allowed to convert these securities into the new loan if they subscribed in addition a certain amount of cash to it The loan yielded £587,000,000 of cash, but £200,000,000 came from the banks and the balance was but a modest contribution from genuine savings towards the growing expense of the war

"Pegging" the Exchange.—While the loan was still being subscribed, ominous signs of weakness began to appear The rise of prices was resumed The exchange on New York fell below $4 80 to the £1 sterling, at the end of Aug it dropped to $4 50 The Government sought a remedy in the sale of gold and securities in New York Gold received in 1914 and deposited at Ottawa, gold displaced from circulation by currency notes, gold extracted from the precious reserves of France and Russia, all were drawn upon The total net imports of gold into the U S in 1915 were $420,000,000, of which two-thirds came in the second half of the year The British Government collected American securities from British holders, and either sold them or pledged them in America There was also direct borrowing in America, starting with the Anglo-French loan of Oct 1915 ($500,000,000, five-year 5 per cents at 98)

By means of these resources it became possible to "peg" the exchange at $4 76½ That measure made inflation more ruinous to the country than before Inflation creates an excess of imports, which can be corrected, if the gold standard is abandoned, by an adverse movement in the exchanges If the Government prevents that adverse movement by undertaking to sell foreign currencies to all comers, the excess of imports continues, and the Government has to pay for it There were obstacles to imports in 1916 (especially lack of shipping), but the burden assumed by the Government was still a formidable one The British Government also had to supply the necessary resources for pegging the French franc

What was needed above all was the cessation of inflationary finance The 4½% war loan had been of some assistance In Aug 1915 the lowest rate for Treasury bills was fixed at 4½%. In Sept. new taxation was imposed calculated to yield over £100,000,000 in a complete year, and in May 1916 further increases brought the revenue for the year 1916–17 above £500,000,000 But the cost of the war had risen to £4,500,000 a day and the rise of prices above the peace-time level exceeded 50% In Dec 1915 five-year 5% Exchequer bonds were put continuously on sale, but yet in March 1916 the floating debt (Treasury bills and ways and means advances) was almost £600,000,000.

In July 1916 bank rate was raised to 6%, and the Treasury bill rate to 5½. The effect of bank rate on borrowing depends on the profits of trade; 6% is by normal standards a very high rate but in face of the profits promised by an orgy of inflation it counts as low. At any rate it was not high enough to have much effect in 1916 The sale of five-year Exchequer bonds (raised to 6% in Oct. 1916) continued till Jan. 1917. A. Bonar Law, who had become chancellor of the exchequer in Dec. 1916, then decided on a third World War loan

This took two forms. 5 per cents at 95 (redeemable 1929–47) and income-tax free 4 per cents at par (redeemable 1929–42) A "depreciation fund," equal to ⅛% per month, was to be applied to buying up stock in the market whenever it was below the issue price The amount asked for was unlimited, and the zeal of the public was stimulated by intensive propaganda It was wisely decided to ask for no direct subscriptions from the banks The cash raised was £816,000,000, and Treasury bills subscribed amounted to £124,000,000 In addition holders of 4½% war loan and of the Exchequer bonds since issued were entitled to convert into the new stock The total amount created was £2,067,000,000 of 5 per cents and £52,000,000 of 4 per cents

Even after this great effort the floating debt at the end of the financial year (March 31, 1917) amounted to £680,000,000 Prices were almost double the peace-time level Growing difficulty was experienced in providing resources for the support of the American exchange The vast quantities of gold sent to the United States (whose net imports of gold from Jan 1915 to March 1917 amounted to $1,192,000,000) not only paid for goods, but brought about a credit inflation and rise of prices there Indeed otherwise the discrepancy in value between the pound and the dollar would have been far too great for any pegging operation to be feasible But the effect of the credit inflation in America was to make borrowing there more difficult in face of the insistent demands of trade for all available supplies of capital It was found possible to raise loans of $250,000,000 in Aug 1916, $300,000,000 in Oct 1916 and $250,000,000 in Jan 1917, but the market was growing more and more reluctant

America Enters the War, 1917.—All such anxieties were dispelled by the entry of the United States into the war in April 1917 Thenceforward the necessary resources both for supporting the exchange and for buying food and materials were advanced to the British and Allied Governments by the American Government itself The British Government continued to provide funds to enable the Allies to buy goods in England, but the amount lent was about equal to the amount borrowed from the American Government Inflation in the United States was accelerated and the export of gold was then prohibited The price index rose from 162 in March 1917 (100 being the average of 1913) to 203 in Nov 1918 The English price index in Nov 1918 was 229 The cost of the war to the British Exchequer had risen to £7,000,000 a day Bank rate had been reduced to 5½% on Jan. 18 and to 5% on April 5, 1917.

After the 5% war loan, borrowing was effected through Exchequer bonds, re-christened in Sept 1917 "national war bonds" They were 5 per cents, but were repayable on maturity at a premium (2% on the 5-year bonds, 3% on the 7-year and 5% on the 10-year), and were convertible at the holder's option into 5% war loan at 95 (*i.e.*, a £100 bond would buy £105 5s 3d of war loan) There were also income-tax free 4% 10-year bonds, repayable at par, and convertible into 4% war loan National war bonds were continuously on offer till the armistice and thereafter till May 1919 (those issued after Jan. 1919 having no conversion rights).

Much attention had been given to the attraction of savings from the working classes Special facilities were given for the purchase of the 4½% war loan of 1915 in bonds of small denominations. In 1916 a special issue of war savings certificates was started The subscriber paid 15s 6d. for a certificate entitling him to £1 after five years, and he could obtain repayment at any time at the sacrifice of a part of the accumulated interest The interest accumulating, and not payable periodically, was not liable to income tax, and to prevent too extensive an evasion of

income tax by well-to-do holders, the amount of certificates which could be held by any one person was limited to £500

On March 31, 1919, the national debt amounted to £7,481,000,000, an increase of £6,775,000,000 since March 31, 1914 The external debt was £1,365,000,000, or, if certain items which could be set off against debts due to the British Government from Canada, France, Italy and Russia be omitted, £1,179,000,000 The internal floating debt was £1,339,000,000 (exclusive of Treasury bills amounting to £73,000,000, included in external debt [*see* Cd. 1648]) including £455,000,000 of ways and means advances, the latter included sums lent by Government departments (partly from the currency notes account, partly from trading accounts and many other sources) But a large part was money borrowed at call through the Bank of England from the money market, extra interest being paid for foreign-owned balances

War Taxation.—Though there were heavy increases in indirect taxation, far the greater part of the war taxation was direct, as the following comparison shows.—

Taxation in Peace and War

Source of revenue	1914-15 (peace estimate)	1918-19
	£ millions	£ millions
Customs and excise	75 3	162 2
Income tax	48 1	255 6
Supertax	5 8	35·6
Excess profits duty		285 0
Other direct taxes	42 1	45 9
Other revenue	35 8	104 7
	207·1	889 0

The rate of income tax had been raised to 2s 6d in 1915–6 and to 5s in 1916–7 In 1918–9 the rate was raised to 6s , the effect of this last increase was not fully seen till 1919–20, when the yield was £317,000,000 Supertax rates had likewise been raised, and the highest zones of income paid 4s 6d The biggest tax of all was the excess profits duty, which had been imposed by McKenna, in Sept 1915 This was a tax on the excess of the profits made by any firm or company in the year of assessment over the annual profits made before the war (computed in the case of a business established since the outbreak of war from its capital) Administratively it was an off-shoot of the income tax, for the income tax assessments disclosed both the current profits of a business and its pre-war standard The rate of tax was at first 50%, and was raised in 1916 to 60% and in 1917 to 80% Excess profits duty was a powerful corrective of inflation It provided £645,000,000 revenue in the three years 1916–7 to 1918–9, and £540,000,000 more in the difficult years that followed It diminished the evil tendency of inflation to accentuate the inequalities of wealth By it the extravagant profits which made trading enterprises unduly attractive to capitalists, in competition with the needs of the Government, were materially reduced Excess profits duty was never anything but a makeshift It was full of anomalies and minor injustices But these, in the emergency of the time, were as dust in the balance compared to its advantages

The indirect taxes imposed included import duties on motor-cars, clocks and watches, musical instruments and cinema films —officially known as the new import duties, but more commonly called the McKenna duties They are noteworthy as being the first protective duties imposed since the days of the Peelites, except the ephemeral corn duty of 1902

Cost of the War.—An exact calculation of the cost of the war to Great Britain would be impossible, and what follows can be regarded as no more than an approximation The day after the declaration of war with Germany the Government obtained from parliament a vote of credit of £100,000,000, for "expenses, beyond those provided for in the ordinary grants of parliament, arising out of the existence of a state of war" Certain services, such as naval and military operations, maintenance of trade, relief of distress, were specifically mentioned, but the total was not divided into subheads like an ordinary vote Till March 1919 the cost of the war was met from successive votes of credit The total audited expenditure from votes of credit was £8,417,000,000 The table on the opposite page shows the principal details

Civil departments drew on votes of credit for any expenditure in excess of their own votes, attributable to the war Some items so met (*e g*, for cost of living bonus to civil servants) were not part of the cost of the war But on the other hand the ordinary votes bore many war charges such as the civil pay of staff absent on military service, or the cost of administrative work arising out of the war The total includes £1,665,000,000 of loans to allies and dominions These were an immediate burden when advanced, but the ultimate burden is only such part as is never repaid The immediate burden was relieved by the advances received from the Canadian and American Governments

Vote of Credit Expenditures
(£ Millions)

	1914-15	1915-16	1916 17	1917-18	1918-19	Total
Army	211 9	526 7	587 8	725 8	824 7	2,876·9
Navy	51 7	205 7	209 8	227 4	334 1	1,028 7
Air force				2 5	85 4	87 9
Munitions	·7	224 6	504 9	641 0	458 3	1,829·5
Railways and canals	6 8	5 9	16 9	26 4	49 6	105 6
Shipping			8 1	110 9	100 4	219 4
Food	9 7	7 3	22 4	79 3	41 5	160 2
Loans to Allies and Domns	51 8	316 0	544 7	488 3	264 6	1,665 4
Exchange account		53 1			3 7	56 8
Pre-moratorium bills		30 6				30 6
War pensions	1	2 2	7 8	23 7	46 6	80 4
Old age pensions			1 5	5 2	6 0	12 7
Other expenditure	4 0	11 6	59 1	101 4	87 0	263 1
	336 7	1,383 7	1,963 0	2,431 9	2,301 9	8,417 2
Receipts		2 5	10 3	5 1	3 6	21 5
	336 7	1,381 2	1,952·7	2,426 8	2,298 3	8,395 7

	£ *millions*
From the net total of	8,395
Deduct	
Peace establishments of army and navy for four years say	500
War pensions paid during the war	80
Allowances to old age pensioners	13
Exchange account (working balance)	53
	646
Net cost	7,749

In the years following the last vote of credit, there were large outlays and also large receipts due to the war, as shown in the following table (in £ millions) —

War Expenditures and Receipts

	1919 20	1920-21	1921 22	1922-23	1923-24
Army	411 8	165 7	86 4	50 2	46 1
Navy	154 1	92 5	76 0	57 5	54 1
Air force	54 3	20 7	13 6	9 0	10 5
Middle East			27 0	9 8	7 2
	620 2	278 9	203 0	126 5	117 9
Peace establishments	160 0	160 0	155 0	130 0	112 9
	460 2	118 9	48 0	6 5	5 0
Munitions		16 1	6 3	2 2	8
Railways and canals	56 5	47 7	73 3	32 1	9
Shipping		0		7 0	1 9
Ministry of food	2 7	1 6			
Loans to Allies, etc	137 9	24 5	3 4		
Training and resettlement of ex-soldiers	41 4	25 2	9 0	5 4	3 0
Coal mines	20 1	15 0	2 0	1 2	8
Other expenditure	16 3	12 8	6 5	4 6	3 2
Total expenditure	741 1	257 7	149 4	59 6	15 6
Receipts*	254 4	265 7	110 8	43·4	29 7
	486·7	(8 0)†	38 6	16·2	(14 1)†

*Mainly sales of war stocks, ships, etc , but exclusive of reparations
†Excess of receipts over expenditure

A further net sum of £22,250,000 was provided through the civil contingencies fund (advances, 1919–20, £64,500,000; repayments 1919–20 to 1921–22 £42,250,000) The total net war expenditure is thus (in £ millions):—

Total War Expenditure

	British Expenditure	Loans to Allies, etc.	Total
Votes of credit	6,084	1,665	7,749
Subsequent years	376	166	542
	6,460	1,831	8,291

Advances *from* Allies were (in £ millions):—

United States	865	
Canada	184	
France, Russia and Italy (gold)	136	
	1,185	
Voluntary contributions from India and colonies (principal only) up to 1923	90	
		1,275

This may be regarded as reducing the net "immediate burden" of advances to allies to £556,000,000 The burden of war pensions, actuarially capitalised at some date in the midst of the war, may be put at £1,000,000,000

Finance After the War.—In 1919 the tremendous overstrain of the war period was still making itself felt in the direction of inflation The most obvious symptoms of weakness were in the floating debt and the external debt (*see* above) The shortage of tax-revenue and genuine savings, as compared with the expenditure to be met, was made good partly by drawing on foreign resources, partly by bank credits Practically, with the cessation of advances from the American Government, foreign resources ceased to be available Bank credits meant the creation of the means of payment out of nothing—pure inflation Excessive Government borrowing seemed so entirely adequate an explanation of the growing inflation that a more insidious cause was hardly taken into account Bank rate had remained at 5%, but had not been made effective The Treasury bill rate, which governed the market, had been reduced since Feb 1918 to 3½% Under war conditions the effect of cheap commercial borrowing in stimulating business was undoubtedly much diminished though not entirely avoided With the return of peace its full effect would be felt

The committee on currency and foreign exchanges after the war, presided over by Lord Cunliffe, had presented a grave and authoritative report in Aug 1918 The report urged the cessation of Government borrowing, but also the use of a high bank rate to protect the gold reserves The foundation of all their recommendations was that "under an effective gold standard all export demands for gold must be freely met" "The conditions necessary to the maintenance of an effective gold standard in this country no longer exist, and it is imperative that they should be restored without delay" Unless the remedies approved by experience were applied, "there will be very grave danger of a credit expansion in this country and a foreign drain of gold, which might jeopardize the convertibility of our note issue" The committee condemned proposals for "a liberal supply of money at low rates," based on a further growth of the note issue, because "in the result the gold standard will be threatened with destruction through the loss of all our gold"

In spite of these wise and emphatic recommendations, the gold standard was abandoned without an effort, as soon as the arrangement for supporting the New York exchange with American credits was brought to an end. A regulation under the Defence of the Realm Act, replaced in 1920 by the Gold and Silver (Export Control) Act, prohibited the export of gold (March 1919) The régime of cheap money continued Burdened with heavy war commitments the budget for 1919–20 brought the prospect of a heavy deficit In June a new 4% loan was offered for subscription in two forms, the funding loan, at 80, redeemable 1960–90, and the victory bonds, at 85, repayable by annual drawings at 100.

During the war the issue of loans at a considerable discount had been avoided, the lowest price of issue being 95 This was a favourable contrast to the policy during the Napoleonic wars, which swelled the nominal amount of the debt and diminished the effectiveness of the big conversion operations of the 19th century. The funding loan represented a change in that respect. It secured the investor against the reduction of his interest after 1960 unless the market rate of interest had fallen by then below 4% That is a very slight advantage to the investor, and any difference that it made in the price of the loan would not go far to compensate the Government for the loss of what might be a valuable option in the future

The twin loans yielded £475,000,000, but £92,000,000 had been subscribed by banks, so that the real contribution towards sound finance was only £383,000,000 Moreover, the well established but deceptive city tradition of fertilising a loan with cheap money had been followed The sale of Treasury bills had been absolutely suspended, and the Government had borrowed at a low rate from the money market and so far as necessary from the Bank of England The inflationary tendency, already serious, was accentuated The sale of Treasury bills was resumed on July 14. In October came a change, the rate for three months' bills was raised from 3½% to 4½%—the first step towards a restriction of credit In November the rate was raised to 5½% and bank rate to 6% In December pursuant to a recommendation of the Cunliffe committee, a limit was imposed upon the currency note issue. A Treasury minute of Dec 15, 1919 (a purely administrative instrument without statutory validity) prescribed that the fiduciary issue of currency notes (those uncovered by gold or Bank of England notes) in any year should not exceed the maximum fiduciary issue recorded in the preceding year The actual maximum recorded for 1919 was £320,600,000, and accordingly this became the prescribed maximum for 1920 Under this rule the limit can decrease but cannot increase The limit for 1928 was £244,900,000

Inflation in Great Britain works through bank credits, but a limit on the supply of legal tender money, if really meant to be effective, was bound to react on the creation of credit Nevertheless in the opening months of 1920 inflation continued unabated The price level (*Statist* index, 1913 being 100) rose from 217 in April 1919 to 313 in April 1920. The American exchange fell one-third below par. In April 1920 the sales of Treasury bills at the fixed rate of 5½% fell off, and £55,000,000 had to be borrowed from the Bank of England on Ways and Means An abyss of inflation seemed to be opening The Treasury bill rate was thereupon put up to 6½%, and bank rate to 7% (April 15).

Deflation and the Collapse in Prices 1921.—The next week Austen Chamberlain introduced the budget for 1920–21 Inflation was swelling the revenue from the heavy taxes already in existence, but fresh taxation was nevertheless imposed. A tax revenue exceeding £1,000,000,000, in addition to enormous receipts from liquidation, was budgeted for, and the estimated surplus was £234,000,000 The severe régime of high discount rates and no Government borrowing, recommended by the Cunliffe Committee, was being applied But after a year of unconscionable inflation, a stronger dose was needed than they ever contemplated, and produced results which they never thought of A year of 7% bank rate caused a tremendous collapse of prices, while the exchange was little improved (*see* CURRENCY), and the gold standard was not restored

The peril of inflation had vanished It was excessive deflation that was now the trouble. But a contraction of credit, while it brings depression, bankruptcy and unemployment, nevertheless, after the first passing phase of stringency, causes a rise in the prices of fixed-interest securities and favours funding operations, just because it diminishes the profits of production and trade.

When the budget for 1921–22 was introduced in April 1921, little progress had been made with the floating debt, which still amounted to £1,243,000,000. The loan issues of 1919, together with an issue of 5¼% Exchequer bonds in Feb 1920, had been mostly used up in meeting a deficit of £326,000,000 for 1919–20

and a large amount of maturing bonds. The surplus of £230,000,000 for 1920–21 had been needed partly to pay off external debt (including $250,000,000 of the Anglo-French loan of 1915 maturing in Oct. 1920), and partly to pay off bonds Further heavy maturities were in prospect. By April 1922, £138,000,000 of Exchequer bonds would have to be met, and between Oct 1922 and Feb. 1924 the 5-year national war bonds, amounting to £574,000,000. Certain securities also had the privilege of being used in payment of death duties and excess profits duty The total amount so used had been averaging £70,000,000 a year The depreciation fund on the war loan of 1917 required over £30,000,000. All these obligations had to be met if the floating debt was to be prevented from increasing

In the budget statement in April 1921 was announced the issue of a new 3½% conversion loan. It was to be a funded stock like consols, being redeemable only at the option of the Government (after 1961), and not at any fixed due date. A sinking fund of 2% per annum on the amount outstanding was to be applied so long as the price was below 90. Cash subscriptions were not asked for, the loan being destined only to be exchanged for the 5-year and 7-year national war bonds. At that time gilt-edged stocks had not recovered far from the lowest levels of 1920 The 4% funding loan which had fallen to 66 in Dec. 1920, stood at 71 The 5% war loan had risen from 81½ to 88. The national war bonds (carrying a premium on redemption) were slightly below par. From £160 to £163 of 3½% conversion loan was offered to the holder of £100 of national war bonds The stockholder was secured a return of about 5⅓% on his money, and the interest could not be reduced before 1961, and even then only if the Government was able to borrow at less than 3½% By good fortune the loan was a failure Only £164,000,000 of national war bonds were converted, out of £630,000,000 to which the offer applied, but even so the increase in the nominal amount of the debt was about £100,000,000

A year later, still months before the earliest maturities of national war bonds, the situation had been transformed by the trade depression. The 4% funding loan at 88½, and the 5% war loan at 99 were well above their issue prices The conversion loan, which had been offered in April 1921 on terms corresponding to a price of 62, had risen to 77¾ Treasury bonds to yield 5½%, and then, as the market improved, 5% had been sold to an amount exceding £400,000,000 In 1922 a further batch of £70,500,000 of national war bonds were converted into 3½% conversion loan on the basis of a price of about 75. When the bonds were above par it ceased to be profitable to use them in payment of duties. And now that the 5% war loan was well above the issue price, the option attaching to national war bonds of converting into it at the issue price became profitable, and in the two years 1922–23 and 1923–24 £210,000,000 were so converted No difficulty was found in raising the money to pay off £96,500,000 in cash in the same period, and in addition the floating debt was reduced from £1,243,000,000 in March 1921 to £774,000,000 in March 1924 (inclusive of £186,000,000 of advances from public departments)

In April 1921 the pre-war system of selling Treasury bills by public tender was reverted to. The change was an important one, because it meant that in respect of the discount rate the Treasury followed the market instead of leading it So long as the Treasury sold all the bills that the market would buy at a prescribed rate and no more, the Bank of England was bound to lend to the Treasury if the sales of the bills did not produce enough A bank rate appreciably above the Treasury bill rate could not be made effective. A bank rate below the Treasury bill rate would be equally unworkable. In fact the Treasury had usurped the place of the bank as regulator of credit. So long as bills are issued by tender in just sufficient amounts to meet the needs of the Treasury, the Bank of England can discharge its responsibilities undisturbed.

Of the 7-year national war bonds, maturing Oct. 1924 to Sept 1925, the original total had been £62,000,000. Only £36,000,000 remained outstanding in April 1924 and no special measures were required for dealing with them

Meanwhile the total of the great 5% war loan had been swollen by conversions from national war bonds to £2,100,000,000, and in 1924 a new form of conversion loan, a 4½% security redeemable in 1940–44, was offered to holders at 97 in order to make a start with conversion. The amount converted was £148,000,000.

The period Oct. 1927–Feb. 1929 comprised the maturities of the ten-year national war bonds (£705,000,000 outstanding April 1926) To deal with these and some other maturities, a new funded stock, 4% consols, was issued in 1927, followed by a further issue of 3½% conversion stock, and an offer of 5% treasury bonds convertible at the holder's option into 4% consols

American Debt.—The net external debt had been reduced from £1,179,000,000 in March 1919 to £948,000,000 in March 1922, of which £856,000,000 represented the debt to the United States Government. But these figures exclude the interest on the American debt which the United States Government had spontaneously suspended in 1919 and which had been accumulating ever since Towards the end of 1922 it was decided to negotiate with the U S Government for the settlement of the plans for paying off the debt A sum of $100,000,000 was paid on account and in March 1923, an agreement was negotiated by S Baldwin, the chancellor of the exchequer, who with Mr Norman, governor of the Bank of England, visited the United States for the purpose

The loan had been till then in the form of an obligation payable "on demand" and yielding interest at 5% The agreement reduced the suspended interest to 4½%, and fixed the future interest at 3% for 10 years and thereafter at 3½ The capital of the debt (including past interest) was rounded down by a small cash payment to $4,600,000,000, and was to be paid off by instalments in 62 years, starting at ½% ($23,000,000) and rising gradually so as to keep the annual obligation for interest and principal together approximately fixed at about $161,000,000 for 10 years and $184,000,000 thereafter. Great Britain has the option of paying the debt either in "U.S. gold coin of the present standard of weight and fineness" or in gold bullion or in bonds of the United States and may postpone the payment of half of any instalment of interest There was in addition a debt of $61,000,000, being the balance of the advances of silver made for the benefit of India under the Pittman Act of 1918 This sum was paid off in 1923 in cash (*See* DEBTS, INTER-ALLIED)

Sinking Fund.—The war debt made the fixed debt charge under the act of 1875 (reduced to £24,500,000 in 1910 and to £23,500,000 in 1914) obsolete The "old sinking fund" remained in operation, and under the Finance Act of 1920 a surplus of revenue over expenditure could be applied to debt redemption as it accrued, instead of being accumulated in Exchequer balances till the end of the year The accumulation of a surplus of £200,000,000 like that of 1920–1 would have been an absurdity The Finance Act of 1923 repealed the fixed debt charge arrangement, and established a new sinking fund A sum of £40,000,000 was to be included in the expenditure of the year for the redemption of debt in 1923–4, £45,000,000 in 1924–5 and £50,000,000 in 1925–6 and subsequent years With the fixed debt charge the saving of interest went to increase gradually the amount applicable to debt redemption. Under the sinking fund of 1923 it goes in diminution of expenditure, the sum applicable to debt redemption remaining at £50,000,000 Surpluses, however, remain, as before, applicable to debt redemption Realized surpluses were as follows (in £ millions) —

1920–21	1921–22	1922–23	1923–24	1924–25
230·6	45 7	101 5	48 3	3·6

Repayments of principal of war advances to dominions and of relief loans are paid to the national debt commissioners for debt redemption, without appearing in the Exchequer account.

Post-war Taxation.—The year 1919–20 was financially a War year, with a heavy deficit. The Excess Profits duty was reduced from 80 to 40%, but at the same time heavy additional duties were placed on beer and spirits, calculated to produce an additional revenue exceeding £50,000,000, in a full year. The budget of that year (Austen Chamberlain's) is noteworthy for the introduction of preferences in favour of products of the

British empire. Protective duties were not introduced for the purpose, but the preference was grafted on the revenue duties already in existence (sugar, tobacco, tea, etc) The year 1920–1 saw the end of war deficits Nevertheless big additions were made to taxation, further increases on beer and spirits, an increased super-tax, a new tax on the profits of limited companies, a rise in excess profits duty to 60 per cent On the other hand an important simplification of the system of income tax abatements involved a loss of revenue in a full year of about £30,000,000 (at 5s in the pound). This year saw tax revenue at its maximum, £1,031,700,000.

The years 1921–2 to 1924–5 were years of steady remissions of taxation Excess profits duty was repealed (1921). Corporation profits tax was first halved (1923), then repealed (1924) Income tax was reduced from 6s to 5s (1922), to 4s 6d (1923) and to 4s (1925) The duties on beer (1923), sugar (1924) and tea (1924) were reduced The "McKenna" duties were repealed by Philip Snowden in 1924, but reimposed by Winston Churchill in 1925. The Safeguarding of Industries Act, 1925, imposed a number of protective duties, and in 1925 customs and excise duties were imposed on silk and artificial silk

On the other hand the budgets of 1926 and 1927 were profoundly disturbed by the conflict in the coal-mining industry The subsidy granted to the coal mines in 1925 caused the year 1925–6 to end with a deficit of £14,038,000 In order to do something towards making this good, the sinking fund for 1926–7 was raised from £50,000,000 to £60,000,000, and this non-recurrent burden was provided for by certain exceptional receipts (in particular a sum of £7,000,000 taken from the road fund). Among the new taxes a betting tax was a novelty

For 1926–7, the year of the actual coal mining stoppage, there was a deficit of £36,694,000, and the sinking fund for 1927–8 was raised to £65,000,000 Again some non-recurrent resources were found (a hastening of the payment of the beer duty, and schedule A of the income tax), and there were minor increases of taxation.

Analysis of Expenditure

	(£ millions)					
	1919–20	1920–21	1921–22	1922–23	1923–24	1924–25
I. Ordinary						
Debt	332	350	332	324	347	357
Defence	160	160	155	120	113	111
War pensions	99	106	96	81	73	70
Education	41	56	61	49	48	49
Old age pensions	19	25	26	22	23	25
Health and labour ministries	19	28	38	31	32	34
Other	123	157	196	135	148	146
Total ordinary	793	882	904	762	784	792
II Exceptional						
Bread subsidy	50	40				
War expenditure	741	258	149	60	16	4
	1,584	1,180	1,053	822	800	796

These liberal reductions of taxation could not be effected without substantial economies in expenditure In 1921 a committee with Sir Eric Geddes as chairman made a searching investigation of the expenditure of public departments and recommended extensive savings The foregoing table analyses public expenditure up to 1924–5 (appropriation accounts) and distinguishes ordinary from war expenditure

The diminution of £142,000,000 in ordinary expenditure in 1922–3 is not wholly due to economy. The exclusion of Irish services relieved civil votes of about £20,000,000 The heavy fall of prices relieved expenditures not only directly, but also through the consequent reduction of the bonus dependent on cost-of-living, which is added to civil service salaries. The increase in ordinary expenditure in 1922–3 was due to the rise of £23,000,000 in debt charges, consequent on the establishment of the new sinking fund and the beginning of the payment of the American debt (*See* also FINANCE, EXCHEQUER; NATIONAL DEBT, WAR FINANCE; INCOME TAX; ESTATE DUTIES, etc)

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BANKING

Beginnings of British Banking.—The origins of British banking are still very obscure. (*See* BANKS, HISTORY OF) Historical evidence on this point begins only after the Restoration of 1660, when, in London, there is to be found a group of goldsmith-bankers, conducting deposit banking, then known as "keeping running cash" and—apart from the discounting of commercial bills of exchange, dealing in bullion and foreign coin—in intimate touch with the Government of Charles II , financing it on a large scale, and therefore dependent on the honesty of the Crown for the safety of the money entrusted to them by their depositors The details of the evolution are, however, almost completely unknown Certain it is that out of the "goldsmith's note," that is, his receipt for the cash entrusted to him, spring both the bank note and the modern cheque, both forms of currency developing very speedily By 1677 the *Little London Directory* gives the names of 44 "goldsmiths keeping running cashes," of whom no less than 27 kept "shops" in Lombard street, still the centre of the British monetary world Private banking thus antedates the foundation of the Bank of England by at least 30 years—probably a good deal more

Bank of England, 1694.—The rise of the Bank of England (*q v*) after 1694 had a disastrous effect on the further development of private banking, since, by a series of acts, it was given the monopoly of the note issue—banks with more than six partners being deprived of this right Thus, in the course of the 18th century when provincial banking gradually extended, the typical country bank was a small localised affair. Unlike the origins of London banking, provincial banks owe their foundation to local traders gradually specialising on the financial side Two circumstances gave a powerful impetus to provincial banking. the industrial changes of the late eighteenth century and the Napoleonic Wars, which acted and reacted upon one another and, in particular, enabled the "country banker" to extend what was at that time his main activity the provision of a local paper currency By the end of the French wars there was already a sharp distinction between the London private bankers who circulated the notes of the Bank of England and the rest of the country This differentiation was to last for almost another half-century In 1826 the first breach in the privileges of the Bank of England was made when, in consequence of the crisis of 1825, joint stock banking was permitted outside a radius of 65 miles from London In 1833 joint stock banks were permitted within this radius, but without the right of note issue By this time a fierce conflict of interests had broken out between the Bank of England, which in 1826 had been given the right to open branches in the provinces, and the country bankers, who saw themselves threatened by the new branches as well as by the rise of the joint stock banks, and these latter who were without adequate legislative protection

The Bank Act of 1844 made for ultimate peace by limiting for the future the right of note issue; as the banks grew in size their right of note issue became less important to them than the right of access to the money market, and thus the amalgamation movement, already in full swing, received a fresh impulse The next step was the grant of limited liability to banks, which, after a period of experimentation, was fully sanctioned by the Companies Act of 1862, though it was not until after the disastrous losses arising out of the failure of the City of Glasgow Bank in 1879 that a general desire to safeguard shareholders from the effects of unlimited liability led to fresh legislation and to a general adoption of the limited liability form of company organisation by banks.

Thus we may regard 1880 as the date when the specifically modern period of English joint stock banking began, though it was not until almost the end of the century that the full implications of the amalgamation movement were realised Scottish banking has always followed a course of its own. Its history begins with the foundation of the Bank of Scotland in 1695, which was followed very much later by the establishment of the Royal Bank of Scotland in 1727 The British Linen Bank followed in 1746 Scottish banking, though it has also gone through a period in which small local joint stock banks and private partnerships were important, realised earlier than the banks south of the Tweed the advantages arising out of a combination of branch banking, combined with a small note issue and large scale joint stock management The attachment of the Scots to their small notes was responsible for the victory won by Scottish banking over the desire of the British Government after the crisis of 1825 to withdraw the £1 note in Scotland as well as in England and Wales, and the main effects of the Bank Act of 1845 were, in this case, not to kill the note issues of the Banks, but to make it almost impossible for new joint stock banks to be set up at all And, though the Scottish banks are now in part within the sphere of influence of London, Scotch banking is still governed by a law and a tradition of its own

Amalgamation of British Banks.—These various lines of division are in process of being eliminated by the pressure exerted by the amalgamation movement Already in the earliest days of joint stock banking, in 1833, it was predicted in the House of Commons that joint stock banking would entirely eliminate the old private partnerships The compensation of risks which operations over a wide area permit; the necessity of attracting deposits by a wide network of branches and the desire to facilitate the convenience of customers by as wide an extension of services as is possible, the fact that a large bank requires a smaller proportionate cash reserve than a small bank does, since a larger proportion of the claims on it are likely to be offset by the claims due to it, are all factors making for increase in the scale of banking, and the simplest method of attaining largeness of scale is by the fusion of banking establishments, that is by amalgamation In 1890 there were still 104 separate joint stock banks in England and Wales By 1900 these had been reduced to 77 and by 1910 to 45, possessing between them 5,102 branches, paid-up capitals and reserves of £81,000,000, and deposits amounting to £721,000,000 The nine remaining private banks held only £27,000,000 of deposits at the same date By 1914, the number of joint stock banks had fallen to 38, their branches had risen to 5,809, their capitals and reserves amounted to £82,000,000 and their deposits stood at £896,000,000 Four banks at the end of 1914 possessed over £100,000,000 of deposits each—the London, City and Midland, Lloyds, the London County and Westminster, and Barclays. Close behind them stood the National Provincial Bank with £75,000,000 of deposits Four further banks held over £40,000,000 each, and five further banks possessed deposits between £20,000,000 and £30,000,000 apiece

The amalgamation movement was now destined to take a double form, that of a competition between five leading banks for absorption and control of the lesser but still very large institutions, as well as of the remaining smaller banks, and, at the same time, of an extension of the area of influence of the leading banks in foreign countries, the empire and the other portions of Great Britain In this contest which reached its maximum intensity in 1918 and 1919—the years of boom, when control over additional facilities was a matter of urgency to the banks, each of the leading five banks absorbed a member of the group immediately below them in strength, Barclays absorbing the London Provincial and South Western, the Westminster taking over Parr's; Lloyd's, the Capital and Counties; the Midland, the London Joint Stock Bank, and the National Provincial, the Union of London and Smiths Bank At the same time, the Bank of Liverpool began to form a new and powerful sixth group, by taking over a London Clearing Bank (Martins), the Halifax Commercial Bank, the Palatine Bank and Cocks, Biddulph and Co , adding to its power in 1927 by absorbing the Lancashire and Yorkshire Bank. With the growth in size, came a simplification of name, giving the familiar titles of today

Scotland was invaded by the Midland Bank, which took over the Clydesdale Bank and the North of Scotland Bank, by Barclays, which controls the British Linen Bank, and by Lloyds, which controls the National Bank of Scotland. the Midland also took over the Belfast Banking Co Barclays has now become an Imperial Bank through its control over Barclays (Dominion, Colonial and Overseas) Bank whilst Lloyds is represented in India and in South America, and the Westminster in Ireland and the Continent, whilst Lloyds and the National Provincial are joint owners of a European subsidiary

Great concern was caused in business circles by these stupendous developments, of which only the barest outline has been given here In March, 1918, when the movement was in full swing, the Treasury appointed a committee to consider the whole problem of bank amalgamation The committee was clearly impressed by the tendency, when banks of a national scale amalgamated, for a net reduction of competition to come about and gave cautious assent to the view that circumstances might produce something approaching a "money trust" at a comparatively early date It therefore recommended legislation by which future amalgamations should be made dependent upon Treasury sanction. No such legislation has been passed, though Treasury sanction is obtained before amalgamations are carried into effect. But the degree of combination is now such that no very great difference would be made if the remaining smaller institutions should now be absorbed. An attempt to combine any of the "big five" would be a different matter and would, without doubt, bring the expediency of nationalisation to the fore-front of politics

Two main causes have co-operated to calm the excitement aroused by the events chronicled The monetary policy of the Government and the Bank of England has diverted attention from the joint stock banks to the gold standard, for it has become clearer since 1925 that the limits within which the price of accommodation can vary are narrowly set by the monetary standard. As important is the fact that the joint stock banks have not ceased to compete among themselves In fact, in spite of trade depression and relatively stationary deposit figures, the rate at which new bank branches continue to be opened is a sign that the banks are above all anxious to tap fresh sources of deposits and acquire new customers In part, the opening of new branches is an inevitable accompaniment of the shifting of the population to newer industrial and residential districts But in part it is an endeavour of each of the banks to complete its network of branches in order to prevent its non-representation in any area where its competitors are represented On balance, the public gains, but the fact that, anxious as the banks are to tap fresh deposits, they pay on deposits half per cent less than they did before the war, shows that the cost of this policy to the banks must be great At the same time, they are faced with internal difficulties of no small importance The tradition that the banking profession guarantees security subject to good behaviour means that the banks have large staffs paid on a considerably better scale than before the war, and this prevents them from introducing labour-saving devices to the full extent possible Nor is it yet clear that the problems of staff promotion and *esprit de corps* have yet been solved It is likely, therefore, that for some time to come the energies of the leaders of British banking will be absorbed by the problems of internal administration and consolidation.

Most marked since the World War has been the effort of British banks to attract as customers whole classes of people previously thought to be outside the account-owning class Facilities such as home safes, formerly the domain only of savings banks, have been offered by banks to their smaller depositors, while even such factors as the small man's unwillingness to pay the twopenny revenue stamp on every cheque transaction have been considered The attempt, in 1927, of a large London bank to devise a non-dutiable cheque form for small payments proved, however, abortive But cheque payments in Britain are undoubtedly on the increase

Statistics of the "Big Five" Joint Stock Banks

	At June 30				
	1914	1920	1923	1925	1927
Capital and reserves	56·7	101 4	106 2	109 3	114·9
Acceptances	32·7	74·8	64·5	79·8	79·9
Deposits	642·4	1,585·1	1,504·2	1,509·0	1,569·7
Cash in hand and at bank	100·3	263·2	230·0	252·4	258·8
Investments	97 2	330 0	324 8	264 7	234 8
Discounts, loans, advances and money at call	488 8	1,077·9	1,031 4	1,075·8	1,162 4
Total assets or liabilities	731·8	1,761 3	1,674 9	1,698 1	1,764 5

Since the end of the war bank figures have been affected primarily by the inflation of 1918–20, and then by the subsequent inflation. Since then there has been some rise in deposits and a considerable shifting of assets as between investments and loans, which would indicate that the banks are responding to the needs of trade by reducing their holdings of interest-bearing securities and of Treasury bills

See also BANKS, HISTORY OF (T E G)

ECONOMICS AND TRADE

SECTION 1: POWER RESOURCES

Coal.—The actual quantity of the coal reserves of the United Kingdom have been variously estimated at different dates, the estimates tending to increase in optimism, as knowledge of the extent of the seams has become more accurate The following table from the *Report* of the royal commission on the coal industry 1925 (Cmd 2,600, p 17) gives particulars of the more important estimates —

Millions of Tons

Authority and date of estimate	Estimated reserves	Quantity since extracted (excluding Ireland for years 1922–5 inclusive)	Reserves still intact at 31st Dec 1925 on basis of estimate
1st Royal Commission, 1871	146,480	11,953	134,527
2nd Royal Commission, 1905	140,398	6,147	134,251
Dr Strahan, 1912	178,727	4,330	174,397
Prof H. S Jevons, 1915	197,000	2,645	194,355

The royal commission estimated that if the present rate of working remained fairly constant and the working of levels deeper than 4,000 feet did not become possible, the coal at present known to exist would last for between four and five centuries If, however, account was taken of probable and possible reserves, there should be enough coal to last seven centuries, and there would be a further extension if means were found of using the small coal now so largely wasted. For a discussion of this important matter *see* COAL AND COAL MINING.

There is no definite evidence of the use of coal in Great Britain till between AD 1230 and 1240, when Northumbrian grants are extant of the right to take "sea-coal" probably coal eroded and washed up on the shore Outcrop mining seems to have begun in the northern coal field at the end of the century. In the 14th century elementary shafts began to be sunk, but in 1800 the production was still only about 10 million tons, and it was not until the development of the steam engine that coal mining became important

The coal fields of England are generally arranged in three groups, the *Southern, Midland* and *Northern,* comprising *Southern,* the South Wales, Forest of Dean, Somersetshire and Gloucestershire and Kentish fields, *Midland,* comprising the Yorkshire, Nottinghamshire, Lancashire, North Wales, Staffordshire, Leicestershire, Warwickshire and some smaller fields, *Northern,* comprising the fields of Northumberland, Durham, Cumberland and Scotland

The following tables from the sixth *Annual Report* of the secretary for mines, p. 104, show the output of coal in Great Britain and its distribution for the years 1913 and 1925.

Tonnage of Coal Produced, Shipped Abroad, and Available for Consumption in Great Britain in the Years 1913 and 1925

A. General distribution of the coal available

	Million tons	
	1913	1925
Output of coal in Great Britain	287·35	243·28
Quantity shipped abroad —		
Exports of coal	73 40	50 82
" " coke	1·24	2·11
" " manufactured fuel	2 05	1·16
Coal shipped for the use of steamers engaged in the foreign trade	21 03	16·44
Total quantity of coal shipped abroad	98 34	71 50
Coal, and the coal equivalent of coke and manufactured fuel imported and retained	0 02	0 02
Quantity of coal available for home consumption for all purposes	183·85	169 57

B Consumption of coal in Great Britain

	Million tons	
	1913	1925
1 Gas works	16·7	16 45
2. Electricity generating stations belonging to authorised undertakings and to railway and tramway authorities	4 9	8·08
3 Railway companies (for locomotive use)	13 2	13 36
4 Vessels engaged in the coastwise trade (bunkers)	1 9	1·16
5. Iron works (pig iron)	21·2	12·03
6 Steel and iron works (other than pig iron)	10 2	9 26
7 Collieries (engine fuel).	18 0	15 42
8 Domestic coal, including miners' coal (approximate)	40 0	40 00
9 General manufactures and all other purposes	57·7	53 81
Total	183 8	169 57

Water Power.—Any accurate estimate of the potential water power resources of Great Britain is impossible, no data being available The most important potential sources of water power are in the highlands of Scotland, North Wales and Cumberland, but throughout the industrial era the rivers, notably those of Lancashire, Yorkshire and North Derbyshire, have been used for industrial power purposes As the output of coal developed and the scale of manufacture increased, many of the early water power installations fell into disuse, but of recent years, owing no doubt to the improvement of steam turbines and electrical appliances, the use of these rivers has tended to revive

An exhaustive study of the waterpower resources of the country was made by the water power resources committee, appointed by the Board of Trade, whose report was published in 1921 In their report this committee summarised the position as follows —

"In our examination of the potential water power resources of Great Britain, we have confined our inquiry to a consideration of specific schemes which have been investigated on our behalf or material dealing with which has been placed at our disposal by Government departments, local government authorities, and private firms and individuals, and to evidence concerning the power potentialities of specific rivers. Moreover, although information concerning a number of small schemes has been secured, our investigations have been mainly directed to obtaining particulars of schemes capable of giving a large continuous output It will therefore be appreciated that the following statistics are not to be regarded as in any way exhaustive or indicative of the distribution of water power resources throughout the constituent parts of Great Britain

Leaving out of account the question of availability, the schemes in our possession relate to potential water powers of a total capacity in excess of 250,000 electrical kw. (continuous). The aggregate power involved in the various parts of Great Britain is as follows — Scotland 194,965 kw Wales 35,900 kw England 20,440 kw.

We consider that of this amount probably 210,000 electrical kw (continuous) could be developed at an economic rate. This power operating for a year represents an output of about 1,840 million Board of Trade units, which is equal to slightly less than 40 per cent

of the total units generated during the year 1917–18, in the 410 steam-power stations for electricity supply and for electric railways and tramways (but NOT private power plants) in Great Britain We estimate that, in order to develop this energy in coal-fired steam plant, it would be necessary to consume nearly three million tons of coal per annum This leaves out of consideration the quite appreciable amount of coal that would be used at the mines and on the railways in raising and transporting the coal to be used at the power stations

We wish it to be clearly understood that the above figures relate only to certain specific water power schemes, and that they by no means represent the total available water power resources of Great Britain The data in our possession are insufficient to enable us to make an estimate of this total"

According to the census of production (1907), the total engine capacity in the United Kingdom in that year was about 10 6 million horse power of which nearly 1·7 per cent represented water power installations

Fuel Oil.—The production of petroleum in Great Britain has hitherto been negligible, though there is no doubt that supplies do exist, and that these, though small, could probably in some instances be worked remuneratively

Prior to 1918 very little working had taken place, but in that year the Government commenced to carry out extensive investigations Petroleum has been found to exist in Derbyshire, Nottinghamshire, North Staffordshire, Yorkshire (near Rotherham), Cumberland, Lancashire, Shropshire and certain parts of Scotland Many of these discoveries, however, were merely small seepages noted in the working of collieries, and none have hitherto proved of commercial importance

Oil shale exists in large quantities in Dorsetshire, Somersetshire, Norfolk, Lincolnshire, Yorkshire, Midlothian, Linlithgowshire and Lanarkshire, The most important fields in England are at Kimmeridge and Corton in Dorsetshire, the former covering 2,900 and the latter 1,500 acres, the total estimated tonnage being 23,000,000 and 32,000 respectively and the estimated total quantity of oil (imperial gallons) 455,000,000 and 442,000,000 Only the Scottish deposits have, however, so far been successfully worked, the Scottish industry having been active since 1850 The Scottish Geological Survey has estimated the reserves of shale in that country as follows —

	Tons
Midlothian	163,500,000
Linlithgowshire	416,540,000
Lanarkshire	16,630,000

BIBLIOGRAPHY —Board of Trade *Interim Report* of water power resources committee (Cd. 79, 1919), Board of Trade *Final Report* of the water power resources committee (1921); Sixth *Annual Report* of the secretary for mines, Resources of British Empire Series (Federation of British Industries), "Fuel" by G W Andrew (1924)

SECTION 2: MINERALS AND MINING

Coal Output.—Great Britain's industrial supremacy was founded on her magnificent coal mines The output of coal in Great Britain and Ireland and the numbers of persons employed at the mines since 1873, are given in the following tables compiled from the sixth *Annual Report* of the secretary for mines, pages 79 and 90

Decennial period or year	Coal
Decennial averages 1873–1882	138,086,800
Decennial averages 1883–1892	169,921,705
Decennial averages 1893–1902	203,322,846
Decennial averages 1903–1912	253,983,464
Decennial averages 1913 1922	241,109,385
1919	229,779,517
1920	229,532,081
1921*	163,251,181
1922	249,606,864
1923	276,000,560
1924	267,118,167
1925	243,176,231
1926*	126,278,521
1927	252,500,000†

Great Britain

*The majority of the coal mines were idle during a considerable period of the years 1921 and 1926 owing to protracted disputes
†Estimated.

Decennial period or year	Persons employed
Decennial averages 1873–1882	503,428
Decennial averages 1883–1892	571,719
Decennial averages 1893–1902	732,391
Decennial averages 1903–1912	957,848
Decennial averages 1913–1922	1,091,391
1913	1,127,890
1914	
Up to July	1,133,746
End of December	981,264
1915	953,642
1916	998,963
1917	1,021,340
1918	1,008,867
1919	1,191,313
1920	1,248,224
1921*	1,144,311
1922*	1,162,754
1923*	1,220,431
1924*	1,230,248
1925*	1,117,828
1926*.	
March	1,128,209
December	955,056
1927*	1,011,000†

*Great Britain only †Estimated

The following figures extracted from pages 92 and 93 of the same report give the number of persons employed in 1925 in the various counties showing the geographical distribution of the industry

England and Wales	*Average Numbers Employed in 1925*
Northumberland	53,545
Durham	143,000
Cumberland and Westmorland	10,956
Lancashire and Cheshire	99,330
Yorkshire, south	123,294
Yorkshire, west	68,662
Nottinghamshire	57,223
Derbyshire (except South Derbyshire)	60,109
Derbyshire, south	5,263
Staffordshire, north	35,335
Cannock Chase	25,796
Staffordshire, South and Worcestershire	6,456
Leicestershire	11,843
Warwickshire	20,389
Shropshire	3,777
Forest of Dean	7,331
Somerset	5,595
Bristol	1,523
Kent	1,873
South Wales and Monmouth	217,809
North Wales	17,359
Scotland	
Fife, Clackmannan, Kinross and Sutherland	28,597
Lothians (Mid and East)	15,222
Lanarkshire, Linlithgow, Stirling, Renfrew and Dumbarton	66,986
Ayrshire, Dumfries and Argyll	15,169
Total in Great Britain in preceding year	1,102,442

The figures for 1913 and the post war years show that the position of the industry has undergone a serious change The position is thus described in the *Report* of the royal commission on the coal industry (1925) Cmd 2,600, pages 3 and 4

"That year (1913) up to the present, marks the climax of the industry's prosperity Essentially dependent as it is on its foreign market, it was particularly susceptible to the disorganising influences of the war For about five years it was under Government control, exports were limited in order to conserve the necessary quantities of coal for our own essential needs, export prices rose to enormous heights; markets were lost, and a sharp stimulus was given to the development of foreign coalfields and the use of substitutes By 1920 output had fallen to 230 million tons and exports had been cut down to 43¾ millions or considerably less than half the pre-war rate. It was not until the advent of the trade depression at the close of that year that the approximation of the free export price to the controlled inland price made it possible to remove the restriction on exports

It was not until July, 1921, that the industry was free to set about the task of recovering the export trade that is vital to it In the circumstances, as we shall show, the degree of success that has been attained is remarkable But this is partly because, until a year and a half ago, it has been singularly favoured by fortune. As was pointed out to us in evidence by Mr. Gowers, the permanent under secretary for mines,

> 'ever since the end of 1920 the depression that then overtook the other heavy industries has been lying in wait for the coal mining industry, but has been warded off by a series of accidents For the last half of 1921 the industry was busy filling the gaps made by the three months' stoppage in the summer of that year In the first half of 1922 the depression actually laid its hand on the coal mining industry, but the great strike in the United States of America came to our rescue After that came the French occupation of the Ruhr, and it is only during the last 15 months that the industry has not been helped by the temporary cessation of some normal sources of coal supplies. Without this its present difficulties could hardly have failed to come upon it four years earlier.' "

This prolonged depression led to two serious disputes in the industry. The first took place in 1921 and lasted from April to July. It resulted in an agreement between the owners and the miners (backed by the promise of a Government subsidy up to a total of £10,000,000) which lasted till April, 1924, the miners having given notice to terminate it in January of that year A further stoppage became imminent and the Government in August made another grant of a subsidy and appointed a royal commission under the chairmanship of Sir Herbert Samuel to survey the position This body presented its report on March 6th, 1926, but its recommendations did not prove acceptable to either party and the workers ceased work on May 1st, 1926 (by which time the Government had expended £23,000,000 in subsidy), the stoppage continuing until November in that year During and after the stoppage the Government passed various measures affecting the industry The working day, which had since 1919 been fixed at seven hours, was increased to eight, and the Mining Industry Act, 1926, made various provisions to facilitate the combination of colliery undertakings, to remove restrictions on the physical extension of collieries caused by the holding up of mining rights, and to provide for the establishment of a welfare fund for the industry by means of a compulsory levy upon the owners of coal and mineral wayleaves The close of the dispute was marked by the negotiation of fresh wage agreements in all districts, based on the eight hour day, but, after an improved period during the early months of 1927 due to shortage of stocks, the world demand for coal again proved less than the supply and a period of great depression ensued, the total exports for the year amounting only to 40,000,000 tons

At the end of 1927, however, there were again signs of improvement in most districts, with the notable exception of South Wales The close of this year was also remarkable for the initiation of schemes for co-operative marketing in the South Wales and Yorkshire, Nottinghamshire and Derbyshire fields, while the extension of the latter scheme to Leicestershire, Lancashire and Cheshire was under consideration

The following tables prepared by the Mining Association of Great Britain and Ireland illustrate the position of the coal export trade in 1913 and 1927 respectively —

	Consumption		Imports of British coal	
	1913	1927	1913	1927*
Post-war France and Saar	80,000	80,000	11,076	8,759
Italy	10,600	14,100	9,246	6,053
Post-war Germany	120,000	132,000	9,062	3,451
Sweden	6,100	5,200	4,580	2,218†
Denmark	3,100	3,600	2,884	2,027
Norway	2,300	2,200	2,192	1,600†
Belgium	32,000	34,000	2,245	1,590
Netherlands	9,900	15,400	1,986	1,816
Spain	7,400	8,700	2,576†	2,400†
Portugal	1,300	980	1,319	850

* Based on July–Dec † From British export returns

The second table shows how British coal has been displaced as between 1913 and 1927, in the principal European markets:—

Importing country	Decrease in British coal (1,000 tons)	Increase in other coals (1,000 tons)			
		French	German	Polish	Other
France	2,317	6,000			.
Italy .	3,193		3,700	1,300	
Germany	5,611		5,000		.
Sweden	2,362*		748	2,600	.
Denmark	657			1,570	
Norway	592*		46	202	
Belgium	655				4,600
Netherlands	170				7,600
Spain	176*				2,286†
Portugal	357*			.	..

* From British export statistics † Increased output of Spanish mines.

Employment in the industry remained depressed, the average for the last three months of 1927 being only 979,000, while during the 12 months ending July 31, 1927 no less than 30,000 miners had found work in other industries As the probabilities of expansion appeared remote, the Government on Jan 6, 1928, appointed an industrial transference board to facilitate the transfer of workers, in particular of miners, for whom employment in their own trade or district was no longer available

Other Minerals.—The following table from the sixth *Annual Report* of the secretary for mines gives the British output of some of the principal minerals since 1913

Decennial period or year		Iron ore and iron-stone	Tin ore dressed	Lead ore dressed	Copper ore dressed	Zinc ore dressed
1913–1922		12,317,805	5,716	16,539	855	8,419
1919		12,230,093	5,156	13,868	144	6,933
1920		12,677,670	4,858	15,399	81	5,064
1921		3,470,516	1,078	6,787	36	814
1922	Great Britain	6,836,507	650	11,070		1,620
1923		10,875,211	1,760	12,499		2,124
1924		11,050,589	3 547	14 294		2,317
1925		10,142,878	4,032	15,578		1,603
1926		4,094,386	3,878	19,076	155	1,944

Iron Ore —Iron ore is very much the most important of these minerals, and it will be seen that (omitting the war years) there has been a steady decline in production during the period, this has been accompanied by an increase in the quantity of ore imported —

Imports	*Tons*	*Imports*	*Tons*
1913	7,441,063	1923	5,860,467
1919	5,200,746	1924	5,927,359
1920	6,490,551	1925	3,381,896
1921	1,887,642	1926	2,087,725
1922	3,472,575		

The great bulk of British iron ore is produced in England, the most productive counties being Yorkshire, Lincolnshire, Northamptonshire, Cumberland and Staffordshire The richest ores come from Cumberland, Lancashire and Staffordshire

Tin Ore —Tin ore is obtained almost exclusively from Cornwall The fall in production has been accompanied by an increase in retained imports, which have been as follows —

	Imports		
Year	*Long Tons*	*Year*	*Long Tons*
1919	35,119	1924	58,970
1920	32,718	1925	63,868
1921	20,277	1926	62,172
1922	37,773	1927	64,189
1923	52,291		

Lead —The British output of lead has also heavily declined, while retained imports have increased The most productive counties are Flint, Durham and Derbyshire The ore found in the Isle of Man contains a considerable proportion of silver.

	Imports		
Year	*Long Tons*	*Year*	*Long Tons*
1919	3,794	1923	6,023
1920	5,852	1924	5,180
1921	819	1925	923
1922	2,595	1926	1,884

Copper—Copper is found mostly in Cornwall. At one time the United Kingdom supplied almost three-quarters of the copper of the world. The output has, however, now become insignificant, the United States having become by far the principal producer.

The copper imports into Great Britain (for home consumption) have been.

Year	*Tons*	*Year*	*Tons*
1919	30,326	1924	38,565
1920	28,560	1925	36,504
1921	24,338	1926	34,717
1922	31,392	1927	40,077*
1923	42,356		

*Total imports, re-exports not available

Zinc—Zinc occurs mainly in North Wales, the north of England, the isle of Man and the county of Dumfries The falling off in production has been mainly due to the closing down of mines in Cumberland, which used to produce 7,000 tons of ore yearly The import figures are.

Year	*Tons*	*Year*	*Tons*
1919	78,302	1923	60,615
1920	36,827	1924	120,424
1921	5,945	1925	121,571
1922	94,755	1926	97,178

China Clay (Kaolin)—This mineral is of great importance in the ceramic, papermaking, bleaching and chemical industries The whole British supply is derived from Cornwall The following figures give the production since 1913 —

Year	*Tons*	*Year*	*Tons*
Average 1913–1922	809,794	1922	872,112
1919	636,042	1923	982,321
1920	1,013,088	1924	1,087,018
1921	628,926	1925	1,114,365
		1926	105,249

Imports are negligible in quantity

Fluorspar—This mineral is of considerable importance in the manufacture of steel and other branches of metallurgy The British production first became substantial at the beginning of the present century, since when the quantities produced have been as follows —

Year	*Tons*	*Year*	*Tons*
Average 1903–1912	40,211	1924	49,492
Average 1913–1922	44,173	1925	39,079
1923	49,031	1926	35,883

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SECTION 3: INDUSTRIES

The Industrial Revolution.—The change from peasant to industrial civilisation in Great Britain is thus described by J L and Barbara Hammond in *The Rise of Modern Industry* (1925).

"The wants of the ordinary man were supplied in the early Middle Ages, as in the days of Greece and Rome, either by himself and his family, or by his neighbours, in the next stage these wants were supplied by special persons plying a craft, in a village or small town, organised sometimes in guilds, in the third stage the provision of those needs became the business of individual or group production and large scale merchanting, in the fourth it became the business of large scale production At that point the world passes to the industrial age, to an age in which commerce and finance are no longer aspects, growing in importance, yet still aspects of its life, but the basis on which a society depends"

Though England was comparatively late in becoming a great commercial power she was the first to develop the industrial system Before the discovery of America and of the Cape route to the East trade centred in the Mediterranean and the Mediterranean nations were the chief European traders The opening of the Atlantic routes transferred commercial supremacy to the nations possessing coast lines facing them. First came the monopoly of Spain, broken in 1588; from that time till 1660 the Dutch led, their chief rivals being Britain and France From 1660 till the end of the 18th century the two latter countries fought for commercial supremacy which then passed to Britain It was the development of large scale commerce in Britain that made possible the development of her industrial system, since without wide markets the capital required for the development of machine production would not have been forthcoming All through the 17th and 18th centuries England was developing her overseas trade, and her home market side by side

The Civil Wars laid the foundations of a long period of stable government—the development of the road system in the 17th century, and of the canals in the 18th made the home market easy of access, the establishment of a colonial empire stimulated overseas trade

These were favourable conditions for industrial development, and this was helped forward by the Protestant refugees from Antwerp at the end of the 16th century, the Huguenot refugees after the revocation of the Edict of Nantes and by the Dutch immigrants who followed William III By these were laid the foundations of our cotton, silk and other industries

More important still was the existence of great coal supplies, which were made mobile by the development of the canal system It was British coal that made possible the creation of a large iron and steel industry, and the development of machine production and of the steam engine But this development could not have been brought about without the existence of enterprise and imagination of a high order, and the 18th century was the period which saw the birth of those inventions which made the industrial system a possibility James Watt's first patent was taken out in 1769 and by the end of the century the steam engine was in use in mines, foundries, cotton mills, etc The iron industry, dependent during the 17th and early 18th centuries on charcoal, began to languish with the gradual exhaustion of British forests Coal began to be used effectively in blast furnaces as early as 1709 The use of coal in forges was made effective about 1785, thus altering the whole aspect of the iron industry, and the introduction of the steam engine was the finishing touch The output of pig iron rose from 25,000 tons in 1720 to 68,000 tons in 1788, to 253,000 tons in 1806, and to 1,347,000 in 1839

The cotton industry had a similar story In spite of the exceptionally favourable climatic conditions in Lancashire, the English industry only consumed about 2,000,000 lb of raw cotton annually during the early part of the 18th century The invention of the flying shuttle for weaving in 1733 and of the spinning "jenny" less than 30 years later revolutionized the industry Until 1785, however, the mills had to depend on water power That year marked the introduction of the steam engine and the creation of the great cotton industry, which was to become the greatest exporting industry of the country, sending no less than 80% of its huge annual production overseas In 1833 this industry, which a hundred years before had used little more than 2,000,000 lb of raw cotton annually, was importing no less than 300,000,000 lb

The woollen industry which was founded on native raw materials had a somewhat different history to that of cotton Originally the great majority of the wool produced in the country was shipped abroad for manufacture, but various English kings took special steps to foster the development of the native industry, and by the end of the 17th century this was well established, workshops being scattered all over the country wherever the conditions of wool supply and running water for power purposes made the locality convenient To this day the industry is very much more scattered than the cotton industry, although the great majority of it is now centred in the West Riding of Yorkshire whither it migrated when use of coal for power purposes began to develop.

Subject to the above differences, the woollen industry followed very much the same course as cotton.

The story of these great industries was repeated in others and it may be said that before the introduction of railway transport during the second quarter of the 19th century factory production was established in every important branch of industry. The establishment of the railways was the crowning achievement enormously facilitating as it did the mobility of the working population, the supply of raw material and distribution of the finished commodities With it the industrial system reached its characteristic form The only further fundamental change was the introduction of the use of electrical power in the 1880's.

As to the general development of British industry, the first three-quarters of the 19th century saw a very rapid increase of production and export In the middle of the century onwards, however, the rate of increase in exports of manufactured goods began to fall, while the rate of increase of imports was accelerated This tendency has continued

The census of production, 1907, and the preliminary reports issued under the third census of production, 1924, enable an idea to be formed of the progress of the principal industries of the country during the present century Previous to 1907 no census of production had been taken in the country. A census of enquiry was commenced in 1912 but not completed owing to the war Where, in the following statement particulars are given of values only, an approximate idea of the quantities involved may be arrived at by diminishing the 1924 figures by 25% since, generally speaking, the increase in values since 1907 was about 50%

Iron and Steel Trades.—The following table gives the total output for the principal branches of these trades for 1924 and 1907 and gives comparative figures for Pig Iron Production —

	1924		1907	
	Quantity	Value	Quantity	Value
Pig Iron	Tons	£	Tons	£
Forge and foundry	2,403,000	10,896,000	5,758,000	15,914,000
Basic	2,651,000	11,810,000		
Hematite	2,090,000	9,770,000	4,023,000	14,603,000
Spiegeleisen, Ferro-Manganese and other Ferro-Alloys	201,000	2,565,000	333,000	2,787,000
Total	7,345,000	35,041,000	10,114,000	33,304,000
Steel				
Total steel bars, rods, angles, shapes and sections	3,303,400	30,845,000	2,074,000	13,400,000
Castings in the rough	105,700	4,263,000		
Castings			98,000	2,256,000
Forgings in the rough	47,500	1,900,000		
Forgings			63,000	1,275,000
Girders, beams, joists and pillars	372,000	3,403,000	239,000	1,510,000
Iron				
Blooms, billets and slabs	4,400	38,000		
Puddled bars			74,000	355,000
Bars, rods, angles, shapes and sections	350,200	4,465,000		
Wrought iron in bars, rods, angles, shapes or sections			827,000	6,148,000
Castings in the rough	482,900	9,459,000		
Castings			482,900	8,459,000
Forgings in the rough	800	32,000		
Forgings	..	.	21,000	329,000
Iron or Steel				
Total railway material	1,013,200	12,559,000		
Total railroad iron and steel			1,205,000	9,876,000
Total plates and sheets other than galvanised or tinned	1,792,600	22,154,000	1,579,000	13,291,000

Iron and Steel Trades (Smelting, Rolling and Foundry)	
Total value of goods made and work done	£149,622,000
Total value of goods made and work done (excluding pig iron and by-products)	£80,583,000

The total number of persons employed in the iron and steel trades including the manufacture of pig iron and by-product recovery plants attached to blast furnaces and smelting works was 250,322 in 1924 and 261,088 in 1907. The net output per head in 1924 was £218, as against £115 in 1907. The productive capacity of the world in this industry was enormously developed during the war to meet the demand for munitions Since the war consumption has been unable to keep pace

British industry has been faced with peculiar difficulties owing to the development of plant in other countries behind tariff barriers, and the freedom of the British market to competitors who have enjoyed the additional advantages of depreciated currencies and lower labour conditions, while Britain has passed through a period of currency deflation and relatively high selling costs At the end of 1927 there was less foreign competition owing to the stabilisation of currencies, while British costs had fallen substantially The position of the industry was therefore more hopeful.

In the next table are given the Imports and Exports of Iron and Steel products for the years 1913, 1925 and 1927

Imports in Tons

Product	1913	1925	1927
Pig-iron	184,774	204,375	579,318
Ferro alloys	31,934	21,196	29,341
Ingots	45,204	49,871	110,432
Billets, blooms and slabs	513,988	652,380	934,378
Sheet bars and tinplate bars	345,503	509,435	764,649
Wire rods	95,196	113,866	135,441
Iron bars, rods, shapes, etc	199,975	231,752	297,944
Steel bars, rods, shapes, etc	133,592	169,267	382,798
Bright steel bars	7,571	10,482	
Girders, joists and beams	109,000	108,572	204,767
Hoops and strips	72,404	70,914	181,947
Plates and sheets	169,477	167,188	328,873
Tubes, pipes and fittings, cast	11,064	36,928	59,983
,, ,, ,, ,, wrought	52,816	51,387	67,959
Rails, railway	21,562	32,087	25,228
Wire and wire manufactures	104,639	125,846	136,251
Steel castings in the rough	12,036	6,008	9,527
,, forgings ,, ,, ,,	21,556	6,700	12,299
Other items	106,235	94,436	134,508
Total	2,230,955	2,719,779	4,406,125

Exports in Tons

Product	1913	1925	1927
Pig-iron	945,262	467,567	271,994
Ferro alloys	178,919	92,394	59,354
Iron bars, rods, angles	141,452	37,057	36,699
Steel bars, rods, angles	251,059	234,803	324,441
Girders, beams and joists	121,870	64,091	113,526
Hoops and strips	45,708	60,568	49,971
Plates and sheets not under ⅛ in	136,380	118,470	176,844
Black plates and sheets under ⅛ in	139,927	232,283	302,453
Galvanized sheets	762,075	713,051	772,928
Tinplates and sheets	494,497	511,355	472,029
Tubes, pipes and fittings, cast	235,052	94,241	122,823
,, ,, ,, ,, wrought	164,556	191,929	260,250
Rails, trams	6,468	9,072	19,093
,, railways	500,117	207,615	429,391
Sleepers and fishplates	118,764	94,126	140,453
Tyres and axles	30,041	16,877	32,090
Railway wheels and axles	42,860	23,138	38,955
Wire	60,532	74,155	70,275
,, manufactures	55,739	43,771	41,951
Other items	537,947	444,203	464,209
Total	4,969,225	3,731,366	4,199,735

Engineering.—The following are the relative figures of certain branches of engineering production.

Electrical

	Selling value, £	
	1924	1907
Electrical machinery	17,091,000	4,214,000
Electric wires and cables	18,444,000	5,262,000
Other forms of electrical apparatus and contract work, etc	64,487,000	13,897,000

It is interesting to note that in the figures for 1924 is included £4,845,000 for wireless apparatus, an industry not in existence in 1907

The foreign trade position of the electrical industry is very satisfactory, Great Britain now being the chief exporting country in the world, her total exports for 1927 being valued at £18,800,000 against £18,350,000 from the U S A and £17,600,000 from Germany, who before the war easily led the world in exports, the figures for 1910 being Germany, £15,887,700, Great Britain £7,655,700, U S A £5,790,000 It is noteworthy too, that in Dec 1927 the percentage of unemployment in the industry was only 4 3% This was achieved in spite of severe competition overseas and some stagnation in the home market, owing to the delay in operating schemes under the Electricity Supply Act of 1926.

The imports and exports for the years 1913, 1925 and 1927 for electrical machinery have been as follows.—

	1913	1925	1927
	£	£	£
Imports	1,346,000	1,084,559	1,597,345
Exports (U K)	2,269,433	5,762,331	6,710,817
For electrical wires and cables			
Imports	512,856	797,840	849,029
Exports (U K)	3,577,663	4,972,203	4,532,927
For other forms of electrical Goods and Apparatus:			
Imports	1,074,438	3,476,315	3,407,090
Exports	1,808,610	6,634,395	7,347,947

The average number of persons employed in electrical engineering establishments in 1924 was 156 508, the figures for 1907 are apparently not available

Machinery.

	1924	1907
	£	£
Marine machinery	13,778,000 (Gt Britain only)	6,544,000 (Including production in Ireland)
Steam engines and parts		
Pumping	516,000	1,469,000
Winding	298,000	746,000
Locomotives	4,265,000	4,406,000
Internal combustion engines	5 490,000	2,118,000
Textile machinery, excluding accessories	14,020,000	12,730,000
Metal working machine tools	3,366,000	2,763,000 (Probably including machine tools for woodworking)

The average number of persons employed in these groups in 1914 was 209,419

The imports and exports of machinery have been as follows —

	1924	1925	1927
	£	£	£
Internal combustion engines (except for aeroplanes, motor cars and motor cycles)			
Imports	190,910	433,038	
Exports	2,108,471	3,567,739	3,531,366
Steam reciprocating engines (including marine)			
Imports	148,946	49,785	
Exports	1,620,977	992,959	738,179
Steam turbine and other rotary engines.			
Imports	74,277	56,980	
Exports	1,106,007	614,316	530,786
Textile Machinery (excluding accessories)			
Imports	366,368	990,443	1,354,452
Exports	8,281,848	12,156,983	11,742,858
Metal working machine tools			
Imports	301,440	780,753	1,180,370
Exports	1,012,800*	1,561,338	1,611,838

*Including "cutting parts" in 1913, subsequently included in "Implements and tools and parts thereof "

Motor and Cycle Trades.

Kind of goods made and work done	1924		1907	
	Quantity	Selling value	Quantity	Selling value
		£		£
Motor cars and chassis	146,000	40,059,000	10,300	3,585,000
Motor cycles and tricars, complete	120,400	5,877,000	3,700	137,000
Cycles (not mechanically propelled), complete bicycles or tricycles	681,600	3,774,000	613,200	3,383,000
Parts of motor cars		14,357,000		552,000
Parts of motor cycles, tricars, and cycles		8,696,000		1,845,000
Aeroplanes and parts		3,553,000		
All other products (including work done for the trade)		2,616,000		431,000
Repair work		14,887,000		1,600,000
Total value of goods made and work done		93,819,000		11,533,000

The following figures show that the average factory value of the various products sold has declined during the period —

Year	Motor cars (including commercial cars)			
	Complete	Chassis	Motor cycles	Cycles
	£	£	£	£ s
1907	335	425	37	5 10
1924	259	355	49	5 11

This may in part be due to an increase in the demand for a lower-powered and less costly product, in the later years But it is almost certain that there has been a real reduction in values, owing to improvements in manufacturing technique, resulting from production on a larger scale

	Persons Employed
1924	200,272
1907	53,639

The very rapid increase in the demand for motor cars is shown by the increase in licensed vehicles during recent years, these having grown from 875,700 in 1921 to 1,729,000 in 1926

The table shows imports and exports from 1913 and 1919

Motor Cars and Chassis (Value in millions of £)

	Imports				Exports			
	Cars		Chassis		Cars		Chassis	
	No	£	No	£	No	£	No	£
1913	6,820	1·7	7,958	1·9	7,595	2·4	1,234	0·5
1919	4,365	1·3	2,240	0·7	1,514	1·0	678	0·5
1920	33,332	10·5	12,106	4·3	5,309	3·9	3,124	2·5
1921	7,307	1·8	4,069	1·1	2,721	2·3	1,041	1·0
1922	14,315	2·5	8,517	1·5	1,934	1·3	1,107	0·7
1923	17,199	2·9	12,627	1·7	4,232	1·9	2,022	1·0
1924	14,717	3·0	12,459	1·8	12,754	3·7	2,905	1·2
1925	33,507	6·3	15,778	2·2	19,315	5·1	9,735	2·3
1926	12,718	2·1	10,174	1·4	16,007	3·8	16,381	3·4
1927	19,340	3·6	13,359	1·6	17,877	4·6	17,819	3·8

The steady growth of exports and recent decline of imports are remarkable This industry has had the advantage of a protective duty, imported motor cars, motor cycles and accessories having been liable to duty from Sept 29, 1915, until Aug 1, 1924, and on and after July 1, 1925 Imported commercial vehicles were exempt until April 30, 1926, inclusive, but have been dutiable since May 1, 1926.

Shipbuilding.

	1924	1907
	£	£
Total value of output on ships in regard to all classes, including repair work	51,225,000	37,091,000
Persons employed in Gt Britain	176,525	188,312

	1924		1907	
	Quantity tons	Selling value	Quantity tons	Selling value
		£		£
Cement for building and engineering	3,143,000	6,705,000	2,877,000	3,439,000
Persons employed	12,874		14,819	

Cotton Spinning.—No effective comparison can be made between the years 1924 and 1907, since no particulars were recorded in the latter year of the output of yarn used for manufacturing purposes by the spinning firms

The figures for 1924 are as follows —

Kind of goods	Total make of single yarns	Goods made and sold or added to stock		Work done on commission	
	Quantities	Quantities	Net selling value	Quantities	Amount received for work done
	1,000 lb	1,000 lb	£	1,000 lb	£
Cotton Yarns					
Counts up to No 40	1,009,154	1,066,672	109,390,000	3,013	86,000
Counts over No 40 and up to No 80	310,037	363,627	57,026,000	4,664	208,000
Counts over No 80 and up to No 120	55,833	74,486	17,740,000	2,554	224,000
Counts over No. 120	3,623	5,724	1,946,000	49	6,000
Total yarns	1,378,647	1,510,509	186,102,000	10,280	524,000
Cotton waste (unmanufactured) sold		235,046	5,547,000	..	
All other products		..	1,694,000		.
Total value			193,343,000		.
Total value of goods made and work done					£193,867,000

The exports of yarn for the years 1913, 1925, 1926 and 1927 have been as follows —

	Lb	£
1913	210,099,000	15,006,291
1925	189,531,200	30,501,416
1926	168,543,200	21,783,800
1927	200,802,200	22,593,592

Cotton Weaving.—The total figures for piece-goods made for sale and piece-goods made on commission in 1924 and 1907 were as follows —

	Quantity			Net selling value
	1,000 linear yd	1,000 sq yd	Cwt	£
1924	5,425,961	5,843,491	10,271,427	156,712,000
1907	7,076,203			81,578,000

The total of other products of the cotton weaving trade, including artificial silk goods other than apparel were.—

	Net Selling Value
1924	£12,543,000
1907 . .	9,751,000

Cotton Piece Goods—The following are the export figures for piece goods for 1913, 1925 and 1927

	Yd	£
1913	7,075,252,000 Sq yd	97,775,855
1925	4,435,617,000	150,627,835
1927	4,117,683,000	109,905,715

The following are the import figures for piece goods for 1913, 1925 and 1927

	Yd	£
1913	125,658,987 Sq yd	3,375,158
1925	55,180,211	4,413,356
1927	72,349,446	4,455,439

The aggregate number of persons employed in cotton spinning and weaving for the two years 1924 and 1907 were as follows —

Ages	1924			1907		
	Males	Females	Total	Males	Females	Total
Under 18 years	28,123	53,592	81,715	51,153	89,761	140,914
Over 18 years	166,099	269,418	435,517	168,827	262,321	431,148
	194,222	323,010	517,232	219,980	352,082	572,062

The industry has suffered much since the war, particularly in the American spinning section, from the tendency of cotton growing countries to install spinning machinery, and from the unsettled state of eastern countries A number of firms have also been seriously embarrassed by the policy of recapitalisation at high prices adopted during the post-war boom, while in general the reduced purchasing power in foreign countries coupled with the high priced cotton has restricted markets

Woollen and Worsted Trades. *Semi-manufactured Products*—The total of semi-manufactured products for the years 1924 and 1907 was as follows —

	1924 (Great Britain)	1907 (United Kingdom)
	Thou lb	
Tops or slubbing (first combed)	285,808	243,500
Noils	35,076	30,000
Yarns	549,692	Between 426,000 and 466,000

Woollen and Worsted Fabrics—The total of woollen and worsted fabrics for the years 1924 and 1907 was as follows —

Products

1924		1907	
Goods made for sale Value	Goods made on commission Amount recd	Goods made for sale Value	Goods made on commission. Amount recd
£	£	£	£
89,655,000	422,000	40,069,000	225,000

The following foreign trade figures may be quoted:—

	1924	1925	1926	1927
Exports	Million lb			
Washed yarns	45·5	28·7	31·8	45·3
Alpaca and mohair	8·3	8	6·3	9
Woollen yarns	8·3	5·9	5·3	6·5
Imports	Million square yards			
Woollen tissues				
Imports	29·5	24·7	30	30·2
Exports	164·7	132·1	119·3	130·9
Worsted tissues				
Imports	·2	11·6	7·9	9·2
Exports	56·8	47·3	42·9	39·9

In this industry as in cotton there has been a world shortage of raw material resulting in high values, which, combined with reduced world purchasing power, has seriously restricted British markets Competition has also been continuously severe from countries with depreciated currencies, lower wages and longer hours The competition of artificial silk has also begun to affect the spinning industry

The average number of persons employed during the years 1924 and 1907 in factories and workshops in the woollen and worsted trades were —

1924	*1907*
275,926	259,560

Since 1924 there has been a progressive decline in employment and in July, 1927, the total number was only 249,180

Clothing and Millinery Trades.—The total value of goods made and work done during the years 1924 and 1907 was as follows —

Year	£	Persons employed
1924	122,693,000	344,209
1907	60,122,000	407,018

Silk and Artificial Silk Trades.—The total value of products in the silk and artificial silk trades for the year 1924 was £19,784,000

The total value of the output for 1907 was £5,176,000.

The very great difference in the two years is accounted for by the great development in the artificial silk industry which, in 1907, was at an elementary stage, such small amounts as were included in the census returns being included under the heading "spun silk yarn" The figures for 1912 show that the value of artificial silk produced in the United Kingdom in that year amounted to about half a million pounds sterling, and manufactures of artificial silk amounting to about £110,000 are also shown

The value of the output of artificial silk and manufactures specifically returned as of artificial silk in 1924 amounted to £10,443,000, to which must be added a substantial part of the sum of £2,549,000 which is shown in respect of articles of clothing of silk or of artificial silk The total value of artificial silk and products thereof, formed not less than 50% of that of all goods produced by the silk industry for sale in 1924.

The imports and exports for the years 1920–1927 are as follows —

Artificial Silk

(including yarn and manufactures thereof other than apparel)

Imports (in millions of £)							
1920	1921	1922	1923	1924	1925	1926	1927
0·6	1·2	2·6	4·4	5·5	6·9	4·2	6·1
Exports (in millions of £)							
3·0	1·7	2·6	3·5	4·3	5·4	7·1	7·6

An interesting feature is the growth of mixed fabrics, including artificial silk Exports of cotton and artificial silk fabrics were 60,416,222 sq yd in 1926 and 72,431,463 sq yd. in 1927, while woollen and artificial silk manufactures increased from 1,581,045 to 2,060,450 in the same period It should be noted that the export trade in this latter class of fabrics is quite small in proportion to the home trade The year 1927 was one of great development in this young industry, demand being still in excess of supply at the close of the year in spite of increased productive capacity

Persons employed	1924	1907
Under 18 years	8,660	7,561
Over 18 years	30,551	24,107
	39,211	31,668

Building Materials and Glass Trade.—The products for 1907 and 1924 are as follows.—

1907	*1924*
£	£
4,799,000	13,149,000

Included in the above figures are,

For *Glass and Manufactures* thereof

1907	*1924*
£	£
7,491,000	25,187,000

Several items of interest are included under these headings

Thus, *Tar-paving and other Road materials* in 1924 were valued at £3,539,000 (Gt Britain) whereas the total for 1907 was only £308,000, including Ireland This reflects the increasing wear and tear on the roads through motor traffic

Another symptom is the heading of £1,649,000 for *contract and job-work on roads* in 1924 (including paving materials used) for which no counterpart is to be found in the earlier year, while *Work done on Highways and Bridges* totalled £48,489,000 in 1924 against £12,679,000 in 1907 Other items which increased materially owing to the development of new methods of construction were artificial stone and roofing felts.

In *Glass* there were substantial increases Glass bottles and jars aggregated £5,315,000 in 1924, records for 1907 are not available, but the indications which exist suggest that the later year showed an increase of about 60% in quantity over the earlier. This was, no doubt, due to the development of mechanical methods of production Separate reports are not available for the different glass products shown in the 1924 returns, but here there was a striking increase amounting to no less than 186% in values

The following are the import and export figures for the years 1913, 1925 and 1927.—

For Glass Bottles and Jars

	1913	1925	1927
	£	£	£
Imports	814,932	857,751	949,545
Exports (United Kingdom)	605,847	322,475	289,746

For Domestic and Fancy Glassware

	1913	1925	1927
	£	£	£
Imports*		1,771,753	1,764,412
Exports* (United Kingdom)		324,220	356,599

For Scientific, Tubing and Rod, Illuminating and Machinery Glass

	1913	1925	1927
	£	£	£
Imports*		515,845	515,826
Exports* (United Kingdom)		174,561	198,804

*No comparable classification.

Hosiery.—This term covers practically all knitted fabrics, and the figures for 1907–1924 were as follows:—

	Total value of goods made and work done
	£
1924, Great Britain	42,473,000
1907, United Kingdom	9,074,000

	Persons employed (average numbers for the two years)
1924, Great Britain	96,003
1907, United Kingdom	51,213

China and Earthenware Trades.—The figures for the two years, including all branches, were as follows.—

	Total value of goods made and work done
	£
1924	17,421,000
The corresponding figures for 1907 are not ascertainable, but extracting certain items for which comparable figures are obtainable, the result is as follows	
1924	10,186,000
1907 (Including production in Ireland)	4,838,000

	Persons employed
1924	69,210
1907	68,168

Non-ferrous Metals.—*Copper and Brass Trades* (Smelting, Rolling and Casting)

	1924
	£
Total value of goods made and work done	21,351,000
Other non-ferrous Metals (smelting, rolling and casting)	31,222,000

Comparable figures for 1907 are not available It is believed, however, that there was an increase of more than 50% in volume, in products of brass and other copper alloys Also there was a substantial increase in the production of lead, tin, manufactures of tin, and also a large increase in the production of aluminium

	1924	1907
Persons Employed		
Brass, copper, etc	25,328	21,266
Other metals	20,544	8,233
Finished Brass Trades		
Value of goods made and work done	£10,432,000	
Figures for those sections of the trade in regard to which comparable statistics are available	£ 7,592,000	£4,979,000
Persons Employed	33,184	38,581

The following are the import and export figures for copper, brass and other non-ferrous metals for the years, 1913, 1925, 1927 —

	1913	1925	1927
Copper and Brass Trades	£	£	£
Imports	7,520,000	11,064,013	9,086,586
Exports	5,796,664	5,755,723	5,876,260
Other non-Ferrous Metal Trades			
Imports	22,100,862	29,034,516	23,520,155
Exports	6,239,439	10,079,686	12,746,773
Finished Brass Trades Particulars of finished brass goods imported and exported are not recorded in such a form as to be used in relation to production.			

Chemical and Allied Trades.

Kinds of goods	Selling value 1924	Selling value 1907
	£	£
Chemical manufactures	28,007,000	12,947,000
Dyes and dyestuffs	6,077,000	821,000
Drugs, medicines and medicinal preparations	14,458,000	4,507,000
Miscellaneous products	7,214,000	5,725 000
Total value	55,756,000	24,000,000

These figures show an increase in quantity in all branches. The increases in dyestuffs and drugs, etc, no doubt being partly due to the protective legislation passed after the war. The relatively small increase in miscellaneous products is due in some degree to differences in classification, perfumery products being included in the 1924 list

	Persons Employed
1924	68,576
1907	51,845

The following are the import and export figures for the years 1913, 1925 and 1927

For Chemical Manufactures and Products other than Drugs and Dyestuffs

	1913	1925	1927
	Value £	Value £	Value £
Imports	6,898,926	7,969,285	9,055,300
Exports	13,638,696	15,726,031	15,756,723

For Dyes and Dyestuffs

	1913	1925	1927
	£	£	£
Imports	3,082,916	2,152,862	2,573,368
Exports	311,386	918,867	752,859

For Drugs, Medicines and Medicinal Preparations

	1913	1925	1927
	£	£	£
Imports	1,984,637	2,340,231	1,930,901
Exports	2,351,781	3,125,238	2,092,540

For Miscellaneous Products

(Painters, Colours and Materials not elsewhere specified)

	1913	1925	1927
	£	£	£
Imports	1,369,316	1,924,115	1,909,860
Exports	3,231,525	3,854,166	3,936,113

This industry has shown a continuous improvement in processes and technique since the war, some striking development having taken place notably in connection with dyestuffs, fine chemicals and the production of synthetic ammonia

An interesting and important development was the formation in 1927 of Imperial Chemical Industries, Ltd, a combination of Messrs Brunner Mond and Co, Ltd., The United Alkali Company, Ltd. and the British Dyestuffs Corporation, Ltd. This concern with a capital of about £57,000,000 is evidently destined to play a dominant part in the British chemical industry

Timber Trades.

Total value of goods made and work done, 1924	£29,663,000
Manufactures of timber	25,600,000
Including sawmill products	15,028,000
The comparable figures for 1907 are unobtainable, different products having been included under the various headings for that year, but the total value of the products then returned under those headings were	16,068,000

This probably shows that there has been some small decline in the volume of production of the trade as a whole.

	Persons Employed
1924	68,638
1907	74,580

In regard to home-grown supplies of timber there are said to be 3,000,000 acres of private woodlands in Great Britain, but not half of this acreage is productive We are actually utilising 55,000,000 cubic feet of this timber annually, and not much more than 12,000 acres are being planted annually The consumption is therefore greatly exceeding replacement

According to another calculation of the 119,470 square miles constituting Great Britain and Ireland, only 4,180 square miles or 4·3% is occupied by trees, of this only 3,860 or 3 2% is given as merchantable forest, distributed as follows

2,290 sq m in England
1,240 „ „ Scotland
330 „ „ Ireland

The Government in 1919 by the Forestry Act of that year established a forestry commission charged with the duty of developing afforestation and the production and supply of timber and made the commission a grant of £3,500,000 for this purpose. The policy decided on by this commission was to plant 150,000 acres, but owing partly to the necessity of creating small holdings as an essential part of the scheme it is not expected that the money will avail for the planting of more than 140,000 acres in addition to bearing the cost of educational research work.

The import and export figures for wood and timber are as follows.—

	1913	1925	1927
Hewn	£	£	£
Imports	4,398,478	3,563,057	2,545,239
Exports	†	†	†
Sawn			
Imports	*	31,647,919	35,701,943
Exports	†	†	†
Planed or Dressed			
Imports	*	2,419,274	4,038,867
Exports	†	†	†

*Imports of sawn, planed or dressed £21,034,635
†Value of exports small

Furniture, Cabinet-making and Upholstery Trades.

	1924	1907
Total value of goods made and work done	£31,130,000	£11,681,000
Persons employed	82,841	74,119

The Import and Export figures for Furniture and Cabinet Ware are:—

	1913	1925	1927
	£	£	£
Imports	446,037	668,821	858,722
Exports	1,274,759	1,200,256	1,232,427

Boot and Shoe Trades.

	1924	1907
Total value of goods made and work done	£35,384,000	£22,747,000

The following are the import and export figures for the years 1913, 1925 and 1927 for boots and shoes (mainly or wholly of leather) —

	1913	1925	1927
	£	£	£
Imports	839,133	1,426,929	1,867,286
Exports (United Kingdom)	4,194,276	4,638,951	4,595,573

	Persons Employed
1924	147,300
1907	124,800

Leather Trades.

Products	Selling value 1924	Selling value 1907
	£	£
Leather, undressed	15,026,000	8,646,000
„ dressed, other than varnished, japanned or enamelled	11,905,000	5,957,000
Leather, varnished, japanned or enamelled	897,000	299,000
Machinery belting	1,492,000	1,159,000
„ accessories of leather	453,000	114,000
Hat leather	585,000	89,000
Wool	560,000	681,000
Hair	186,000	73,000
Hides and skins, pickled, etc	362,000	230,000
Machinery accessories of hide	104,000	91,000
Parchment and vellum	54,000	41,000
Waste products	245,000	316,000
Other products	492,000	302,000
Work done for the trade	587,000*	204,000*
Total value	32,948,000	18,202,000

*Amount received for work done.

The following are the import and export figures for the years 1913, 1925 and 1927 for leather (dressed and undressed) —

	1913	1925	1927
	£	£	£
Imports	10,572,100	13,991,131	15,486,752
Exports (United Kingdom)	3,467,388	5,337,727	6,728,030
For leather manufactures (except apparel)			
Imports	1,058,321	1,076,010	1,274,197
Exports (United Kingdom)	1,810,852	1,730,170	1,616,604

	Persons Employed
1924	30,458
1907	28,671

Rubber.—The value of goods made and work done in 1924 was £23,309,000, including the following details for rubber tyres, an industry increasing in importance with the growing motor and cycle trades

Kind of goods	Production 1924	
	Quantity	Value
	No	£
Rubber tyres and tubes		
(a) Pneumatic		
(i) Outer covers		
Motor car	1,027,100	4,913,000
Motor cycle	632,100	616,000
Cycle	5,509,800	1,231,000
(ii) Inner tubes	7,237,400	1,218,000
(b) Solid tyres		
For mechanically propelled vehicles	307,700	2 050,000

Comparison with 1907 is impossible owing to differences of classification

The following are the import and export figures for rubber tyres and tubes for the years 1913, 1925 and 1927 —

	1913	1925	1927
	£	£	£
Imports	2,778,949	3,867,632	3,127,927
Exports (United Kingdom)	1,204,197	4,079,244	3,743,033

	Persons Employed
1924	46,565
1907	24,039

Paint, Colour and Varnish Trades.

	1924	1907
	£	£
Total value of goods made and work done	17,062,000	8,562,000

The following are the import and export figures for paint and varnish for the years 1913, 1925 and 1927 —

	1913	1925	1927
	£	£	£
Imports	1,369,316	1,924,115	1,909,860
Exports (United Kingdom)	3,231,525	3,854,166	3,936,113

	Persons Employed
1924	18,761
1907	13,840

Bricks, Roofing and Street Paving Tiles.

	Selling value 1924	Selling value 1907
	£	£
Bricks of brick earth and fireclay	14,305,000	6,209,000
Roofing and street paving tiles	1,989,000	536,000

The following are the import and export figures for the years 1913, 1925 and 1927 for bricks of brick earth and clay —

	1913	1925	1927
	£	£	£
Imports	5,537	448,544	705,964
Exports (United Kingdom)	365,485	37,849	42,642
For Roofing and Street Paving, Floor, Wall and Hearth Tiles			
Imports	29,587	648,873	1,118,417
Exports (United Kingdom)	285,861	526,815	553,908

	Persons Employed
1924	68,354
1907	68,145

Printing and Bookbinding Trades.

	1924	1907
	£	£
Total value of goods made and work done	58,238,000	23,988,000

	Persons Employed
1924	178,230
1907	167,213

The output of newspapers and periodicals made great increase —

	1924	1907
	£	£
Total value of output	44,954,000	12,940,000

	Persons Employed
1924	56,837
1907	43,644

Tinplates.

	1924		1907	
	Tons	£	Tons	£
Tinplates and sheets (including plates and sheets)	779,000	18,937,000	529,000	7,402,000

	Persons Employed
1924	28,024
1907	20,628

Gas Works Undertakings.—The products of the gas industry for 1924 and 1907 are shown in the following table:—

Products	1924	1907	1924 as a percentage of 1907
	Thou cu ft	Thou cu ft	
Coal gas and water gas made	276,406,000	183,791,000	154
	Tons	Tons	
Coke and breeze	7,852,000	7,412,000	106
Tar	800,000	635,000	126
By-products			
Sulphate of ammonia	127,000	104,000	122
	Gal.	Gal	
Benzol and toluol	1,953,000	46,000	4,426
	Tons	Tons	
Pitch	114,000	85,000	134
Tar oil, creosote oil, and other heavy coal tar oils	Gal 21,314,000	Gal 7,856,000	271

The industry is about equally divided between companies and local authorities and very little change has occurred in this respect during the period

	Persons Employed
1924	108,421
1907	80,633

Generation of Electricity.—Electricity is generated in Great Britain by three main types of undertakings

1 Statutory undertakings generating for public utility purposes

2 Undertakings generating for use wholly or mainly in connection with railways and tramways

3 Power equipments maintained by industrial services

All three classes were covered by the census of production in 1907 and 1924, the returns for the last section, however, though believed to be fairly representative, being less complete than those for sections (1) and (2).

The total amount of electricity generated by undertakings in class 1 during the two census years were in thousands of B T Units

	1924 Great Britain	1907 United Kingdom
Local authorities	4,128,873	887,046
Companies	2,255,567	545,055
	6,384,440	1,432,101

and for class 2 concerns,

in 1924	757,298,000	B T
in 1907	229,819,000	Units

The following table shows the distribution of electricity supplied in 1924 by class (1) undertakings

Electricity supplied in 1924	Quantity	Selling value	
		Total	Average per unit
	Thousand B T. units	£	d
For public lighting	74,872	718,000	2 3
For traction	627,046	2,993,000	1·1
For power and manufacturing purposes	1,951,576	9,352,000	1·2
For private lighting and domestic purposes	794,079	14,396,000	4 4
General supply at uniform charges, where it is impossible to separate the purposes	413,381	1,812,000	1·1
For purposes not separately distinguished	864,520	5,250,000	1·5
Bulk supplies to authorised distributors	852,520	2,808,000	0·8
Total quantity and value of electricity supplied	5,577,994	37,329,000	1 6

	Companies		Local authorities	
	1924 B T units	1907 B.T units	1924 B.T. units	1907 B.T units
Quantity of electricity generated	2,255,567,000	545,055,000*	4,128,843,000	887,046,000*
	£	£	£	£
Total selling value of electricity supplied	13,242,000	3,145,000†	24,087,000	5,590,000†
Cost of new construction and repair work carried out	3,673,000	775,000	7,521,000	1,500,000
Cost of materials purchased and used	5,529,000	1,174,000	9,725,000	2,085,000
Net output (*i.e*, value of electricity supplied less cost of materials used)	7,713,000	1,971,000	14,362,000	3,505,000
	Number	Number	Number	Number
Average number of persons employed	15,520	8,335	31,217	13,657
	£	£	£	£
Net output per head of persons employed	497	237	460	257
Capacity of engines, etc				
Prime movers	H-p	H-p	H-p	H-p
Steam reciprocating	125,389	321,124	350,985	768,998
Steam turbines	1,481,989	226,773	3,309,866	192,208
Other	72,910	15,960	40,736	6,771
Total	1,680,288	563,857	3,701,587	967,977
	Kw	Kw.	Kw	Kw.
Electric generators	1,222,282	376,649	2,720,891	625,315

*Including production in Ireland
†Including electricity used in the works of the generating undertakings

while the following table gives some general statistics of importance for the same class of undertakings.

The great changes at work in the industry are studied elsewhere in the article ELECTRICITY SUPPLY *Commercial Aspects*

BIBLIOGRAPHY—*Census of Production* (1907), *Third Census of Production* (1924, preliminary reports), Board of Trade *Annual Statement of Trade of the United Kingdom*, and other publications referred to under separate headings

SECTION 4: EXTERNAL COMMERCE

British commerce received an enormous development after the first quarter of the 19th century In 1826 the aggregate value of the imports into and exports from the United Kingdom amounted to no more than £88,758,678, while the total rose to £110,559,538 in 1836 and to £205,625,831 in 1846 In 1856 the aggregate of imports and exports had risen to £311,764,507, in 1866 to £534,195,956 and in 1876 to £631,931,305 Thus the commercial transactions of the United Kingdom with foreign states and British colonies increased more than sevenfold in the course of fifty years

The important fact in connection with the foreign commerce of the United Kingdom is that there has been a steady increase in imports, but there has been no corresponding steady increase in exports of British produce and manufactures Many industries, which formerly were mainly in British hands, have been developed on the continent of Europe, in America and, to some extent in the East The movement began in 1872 Up to that time the exports of British home produce had kept on increasing with the imports, although at a lesser rate, and far inferior aggregate value, but a change took place in the latter year While the imports continued their upward course, gradually rising from £354,693,624 in 1872 to £375,154,703 in 1876, the exports of British produce fell from £256,257,347 in 1872 to £200,639,204 in 1876 The decline in exports, regular and steady throughout the period, and with a tendency to become more pronounced every year, affected all the principal articles of British home produce

The value of the cotton manufactures exported sank from £80,164,155 in 1872 to £67,641,268 in 1876, woollen fabrics from £38,493,411 to £23,020,719, iron and steel from £35,996,167 to £20,737,410, coals from £10,442,321 to £8,904,463, machinery from £8,201,112 to £7,210,426; and linen manufactures from £10,956,761 to £7,070,149 The decline during the four years it will be seen, was greatest in all textile manufactures and least in coal and machinery

The external trade of the United Kingdom from 1875 onward is shown by the following tables, which are based on tables given in the *Survey of Overseas Markets* issued by the committee on industry and trade in 1925 The first table gives the values of net imports, exports and re-exports, first total and then divided into the three main classes, I food, drink and tobacco, II raw materials and articles wholly or mainly unmanufactured, III articles wholly or mainly manufactured The second table, which relates only to the years from 1900 onward, shows the same items at the average values of 1913 and also the percentage variation, taking 1913 as 100

EXTERNAL TRADE OF THE UNITED KINGDOM
Net Imports, British Exports, and Re-exports During the Years 1875–1927

A TOTAL TRADE—ALL CLASSES

Period		Net imports	British exports		Re-exports
			Excluding ships	Ships	
		£1,000's	£1,000's	£1,000's	£1,000's
Pre-War (annual average)	1875–79	319,500	201,500	Particulars not available	55,500
	1880–84	343,600	234,300		64,000
	1885–89	318,800	226,200		60,900
	1890–94	357,055	234,450		61,537
	1895–99	392,704	237,830		60,318
	1900–04	446,040	282,761	6,469	67,379
	1905–09	522,116	369,225	8,117	85,159
	1910–13	610,990	466,121	8,112	106,958
War	1914–18	896,925	467,664	2,410	78,545
Post-War	1919	1,461,410	796,310	2,328	164,746
	1920	1,709,896	1,307,915	26,554	223,753
	1921	978,581	672,774	30,626	106,919
	1922	899,404	689,521	29,986	103,695
	1923	977,682	757,558	9,700	118,544
	1924	1,137,469	795,445	5,522	139,970
	1925	1,166,678	767,105	6,276	154,037
	1926	1,115,866	648,417	4,630	125,495
	1927	1,096,324	704,574	4,531	123,063

B CLASS I *Food, Drink and Tobacco*

Period		Net imports	British exports	Re-exports
		£1,000's	£1,000's	£1,000's
Pre-War (annual average)	1875–79	Particulars not available		
	1880–84			
	1885–89			
	1890–94	169,985	10,223	12,287
	1895–99	183,888	11,612	11,757
	1900–04	214,895	15,854	11,045
	1905–09	234,283	21,988	12,092
	1910–13	263,104	31,647	14,890
War	1914–18	414,289	22,436	14,659

B. CLASS I. *Food, Drink and Tobacco—Continued*

Period		Net imports	British exports	Re-exports
Post-War	1919	675,779	33,771	43,340
	1920	719,713	50,936	46,094
	1921	536,785	37,399	30,221
	1922	450,124	36,301	21,757
	1923	484,321	44,344	24,543
	1924	541,279	56,958	29,849
	1925	537,969	54,987	32,136
	1926	503,422	50,457	26,367
	1927	512,816	52,280	26,523

C CLASS II *Raw Materials and Articles Wholly or Mainly Unmanufactured*

Period		Net imports	British exports	Re-exports
		£1,000's	£1,000's	£1,000's
Pre-War (annual average)	1875–79	Particulars not available		
	1880–84			
	1885–89			
	1890–94	110,209	23,316	34,901
	1895–99	112,242	23,681	33,431
	1900–04	135,471	37,981	37,183
	1905–09	160,867	45,686	48,401
	1910–13	195,400	55,862	63,262
War	1914–18	271,408	55,589	42,371
Post-War	1919	523,792	111,291	82,992
	1920	587,425	145,516	122,931
	1921	220,757	63,595	50,037
	1922	243,275	101,965	55,063
	1923	258,170	130,809	66,752
	1924	323,792	106,482	76,227
	1925	334,447	84,351	90,336
	1926	318,370	47,162	73,814
	1927	280,716	76,356	71,246

D CLASS III. *Articles Wholly or Mainly Manufactured*

Period		British exports			
		Net imports	Excluding ships	Ships	Re-exports
		£1,000's	£1,000's	£1,000's	£1,000's
Pre-War (annual average)	1875–79	59,300	178,100	Particulars not available	
	1880–84	64,700	206,400		
	1885–89	66,800	196,900		
	1890–94	75,850	199,289		14,174
	1895–99	94,331	199,649		14,981
	1900–04	113,444	224,619	6,469	18,963
	1905–09	125,063	291,308	8,117	24,515
	1910–13	150,332	368,932	8,112	28,661
War	1914–18	207,336	372,881	2,410	21,467
Post-War	1919	257,542	639,156	2,328	38,413
	1920	399,791	1,093,186	26,554	53,649
	1921	217,939	558,263	30,626	26,542
	1922	202,928	538,538	29,986	26,821
	1923	229,855	570,257	9,700	27,164
	1924	266,031	613,304	5,552	33,743
	1925	288,173	610,332	6,276	31,458
	1926	289,501	534,711	4,630	25,181
	1927	297,272	559,434	4,531	25,135

In connection with the following tables it should be noted that owing to changes which have occurred during recent years in the character of many descriptions of goods imported and exported and also by the fact that trade with the Irish Free State is now recorded as external trade, comparison of our overseas trade with that of 1913 is becoming more and more uncertain. The Board of Trade has therefore evaluated the foreign trade declared figures for 1925 to 1927 at 1924 average prices and therefore the figures for the years 1925 to 1927 inclusive are compared with those for 1924 Those figures from 1900 to 1924 have been converted to 1913 values and the index numbers are relative to 1913 as 100.

EXTERNAL TRADE OF THE UNITED KINGDOM

Net Imports, British Exports and Re-exports, 1900–27

A. TOTAL TRADE. ALL CLASSES

Period	Net imports		British exports		Re-exports	
	Value mil. £	Relative figures 1913 = 100	Value mil £	Relative figures 1913 = 100	Value mil. £	Relative figures 1913 = 100
Annual average 1900–04	523 6	79 4	326·6	62 2	82 8	75·6
1905–09	556 8	84 5	412·4	78 5	93 3	85·1
1910–13	614·9	93·3	493 1	93 9	105·3	96 1
1910	573·4	87·0	462·4	88·0	99·6	90 9
1911	590·9	89 6	479 2	91·2	102·3	93·3
1912	636·3	96 5	505 6	96 3	109·8	100·2
1913	659 2	100 0	525 3	100 0	109·6	100 0
1919	591 4	89 7	288 2	54·9	85 9	78 4
1920	578 8	87 8	372 2	70·9	99 0	90·4
1921	484 2	73 5	261 7	49 8	86 0	78 5
1922	570 1	86·5	361·8	68·9	89·3	81 5
1923 (Including trade with Irish Free State)	641 7	97·3	404 4	77 0	94 0	85 8
1924 (Including trade with Irish Free State)	719·5	109·1	420 6	80 1	106·2	96·9
1923 (Adjusted approximately for comparison with earlier years)	625·7	94 6	391·4	74 5	89 0	81·3
1924 (Adjusted approximately for comparison with earlier years)	701 1	106 4	396 5	75 5	99 2	90 5
	Value mil £	Rel figs. 1924 = 100	Value mil £	Rel figs. 1924 = 100	Value mil £	Rel figs 1924 = 100
1924	1,137 6	100 0	801 0	100 0	130·9	100 0
1925	1,181·5	103 8	795·1	99·3	137·4	98 2
1926	1,236·4	108·7	710·6	88·7	120 0	85 7
1927	1,266·2	111 3	819 5	102·3	126·3	90 3

B CLASS I *Food, Drink and Tobacco*

Period		Net imports		British exports		Re-exports	
		Value mil. £	Relative figures 1913 = 100	Value mil £	Relative figures 1913 = 100	Value mil £	Relative figures 1913 = 100
Old classification	Annual average 1900–04	246 9	89 9	16 6	51 1	13·4	83 8
	1905–09	251 3	91 6	22 8	70 0	13 6	85 5
	1910–13	260 5	95·0	30 9	94 9	15·1	94·9
	1910	250 0	91·2	27·6	84 7	14 2	89·0
	1911	258·0	94·1	30·0	92 2	15·4	96 3
	1912	259·5	94 6	33 4	102 5	15 0	94 1
	1193	274 3	100 0	32·6	100 0	15 9	100 0
New classification	1913	278·9	100·0	33 9	100 0	16 3	100 0
	1919	263·9	94 6	14·7	43 3	21 7	133·6
	1920	240·2	86 1	18·8	55·4	25 1	154·6
	1921	252 6	90 6	16 6	48·9	22·7	139·7
	1922	275 9	98 9	17 8	52·7	17·3	106·6
	1923	319 2	114 5	23·3	68·9	18 9	116 0
	1924	349·2	125·2	29·1	85·7	21 6	132 7
		Value mil. £	Rel. figs 1924 = 100	Value mil £	Rel figs. 1924 = 100	Value mil £	Rel figs. 1924 = 100
	1924	541·3	100 0	57 0	100·0	29·8	100·0
	1925	531·8	98·2	54·9	96·3	31·0	103·8
	1926	528·5	97·6	53·4	93·7	25·4	85·2
	1927	553·2	102·2	57·2	100·4	25 7	86 6

C. CLASS II. *Raw Materials and Articles Wholly or Mainly Unmanufactured*

Period	Net imports		British exports		Re-exports	
	Value mil £	Relative figures 1913=100	Value mil £	Relative figures 1913=100	Value mil. £	Relative figures 1913=100
Annual average						
1900–04	158 5	72·8	42 2	60·4	45·1	70 4
1905–09	179 3	82·3	56 6	80 9	51·1	79 8
1910–13	204 7	94·0	64 7	92·6	60·1	92 9
1910	191 0	87·7	61·7	88 2	54 8	85 5
1911	191 4	87·9	62 8	89 9	56 9	88 8
1912	218 5	100·3	64 4	92·1	64 9	101 3
1913	217 8	100·0	69 9	100 0	64·0	100 0
1913	206·2	100 0	66 2	100 0	63·7	100 0
1919	207 3	100 5	34 7	52 5	46·4	72 8
1920	194 4	94 3	31 7	47 9	53·0	83 2
1921	127·3	61 7	29 9	45·1	47·5	74 6
1922 .	163 9	79 5	62 6	94·7	54·2	85·1
1923 .	163 6	79·3	71 1	107 4	55 6	87·1
1924	185·7	90·0	59·2	89·4	59·5	93·4
	Value mil £	Rel figs. 1924=100	Value mil £	Rel figs 1924=100	Value mil £	Rel figs 1924=100
1924	323·8	100·0	106 5	100 0	76 2	100 0
1925	345 5	106 8	95 3	89 5	75 7	99 3
1926	386 1	119·2	58 8	55 2	68 4	89 9
1927	366 1	113·1	97 8	91·8	73 2	96 1

D) CLASS II *Articles Wholly or Mainly Manufactured*

Period	Net imports		British exports		Re-exports	
	Value mil £	Relative figures 1913=100	Value mil £	Relative figures 1913=100	Value mil £	Relative figures 1913=100
Annual average:						
1900-04	116·4	70 9	264 6	64 3	24 6	83 6
1905-09	124 6	75 9	327 5	79 6	28 8	97 8
1910-13	147 8	90·0	387·4	94·2	30 1	102·3
1910	130 8	79·7	364·3	88·6	31 0	105 3
1911 .	140 2	85 4	377 0	91 6	30 3	102 9
1912	156 0	95 0	396 9	96 5	29 7	100 9
1913 .	164 1	100 0	411 4	100·0	29 5	100 0
1913 .	171·5	100·0	413·8	100·0	29·5	100 0
1919 .	118·3	68 9	234 4	56·6	17 9	60 5
1920 .	143·1	83·4	316 1	76·4	20 9	70 8
1921 .	102·7	59·9	210 1	50·8	15 7	53 3
1922	127 8	74 5	274 6	66 4	17 6	59·8
1923	155 1	90·4	303 5	73 3	19·5	66·0
1924	180·1	105·0	325 1	78·6	24·8	84 0
	Value mil. £	Rel figs 1924=100	Value mil £	Rel figs 1924=100	Value mil £	Rel figs 1924=100
1924	266 0	100 0	618 9	100·0	33 7	100·0
1925	298 4	112 2	627 9	101 4	31·0	91·9
1926	317 7	119·4	581·5	93 9	25·7	76 3
1927	341 6	128·4	646 1	104 4	26 9	79 8

These figures show a steady upward movement in both Imports, Exports and Re-exports up till the outbreak of the War, subject to a decline in the five years 1885 to 1889.

The sub-divided figures show a more rapid increase in imports than in exports of articles mainly manufactured, and conversely, a more rapid increase in exports of raw materials. These tendencies, no doubt, being both due to the gradual growth of manufacturing in other countries, which thus become increasingly consumers of our coal and exporters instead of importers of manufactured articles The figures for the post-war period show the tremendous inflation of prices in 1919 and 1920 when imports, exceeding by almost 2½ and 3 times respectively the average value of the imports for the years 1910–13, represented really only about 89·7 and 87 8 of the actual value of 1913 imports

The post-war figures show an even greater relative increase in imports than the pre-war figures, imports for 1924 being 104 4% of the 1913 volume, and exports 75 5% only, a somewhat disquieting phenomenon, especially when it is observed that imports of food, drink and tobacco are 125% on 1913, of manufactured articles 105%, and of raw materials (the basis of British manufactures) only 90 1%

The situation is not, however, without encouraging features It will be seen that in volume our total exports of 1927 showed an increase, not only on those of the abnormal year 1926, but also on 1925 and 1924 The actual balance of trade was also more favourable than in any of the preceding three years. The Board of Trade estimate of the net balance for 1927 was £96,000,000 as against a deficit of £7,000,000 in 1926 and surpluses of £54,000,000 and £86,000,000 in 1925 and 1924 respectively

Another and more satisfactory feature, which is shown in the following table, is the relatively greater increase in out trade with our own empire than in that with foreign countries, though the volume of re-exports to the empire has fallen slightly

Class of trade	1913	1925	1927	1913	1925	1927
	£1,000	£1,000	£1,000	Per cent	Per cent	Per cent
Imports from Foreign countries	577,544	898,798	860,042	75 13	70 37	73·13
British ,,	191,191	378,535	316,073	24 87	29·63	26·87
All ,,	768,735	1,277,333	1,176,115	100 00	100 00	100·00
Exports (British produce) Foreign countries	329,944	445,899	386,535	62 82	60 82	57·44
British ,,	195,310	287,264	286,427	37 18	39 18	42·56
All ,,	525,254	733,163	672,962	100 00	100·00	100·00
Exports (imported merchandise) to Foreign countries	95,057	127,914	101,098	87 58	89 40	88 92
British ,,	13,610	15,159	12,599	12 42	10 60	11 08
All ,,	109,567	143,073	113,697	100 00	100·00	100·00

The following table shows the geographical distribution of British trade for the years 1913, 1925, 1926 and 1927 Both the import and export trades with Europe have declined, though re-exports have increased Imports from all other divisions have increased in value, as have exports to Africa, North America and Australasia

Year and class of trade	Europe	Africa	Asia	North America	South America	Australasia, etc	Total
Imports	%	%	%	%	%	%	%
1913	40 53	6·10	12 71	23 86	9 06	7 74	100 00
1925	32 73	7 72	13 55	27·39	8 71	9 90	100 00
1926	36 53	6 77	12 58	26 36	8 62	9·14	100 00
1927	36 99	7 16	13 47	24 18	9 60	8 60	100 00
British exports							
1913	34 64	9 87	25·20	11·99	9·59	8·71	100·00
1925	32 01	11·61	22 83	13 01	0 11	11 43	100 00
1926	26 29	12 00	25 24	14 18	8 93	13 36	100 00
1927	30·27	1,2 00	23 57	13·15	8 93	12 08	100 00
Re-exports							
1913	56 02	3 31	2 48	32 26	1 97	3 96	100 00
1925	66·21	2 87	1 85	24·45	1 13	3 49	100 00
1926	64·45	3 48	2·77	25·17	1·32	2·81	100 00
1927	68 28	3·51	2·63	21·29	1·31	2·98	100·00

The next table shows the variations in trade with foreign countries in detail (Millions omitted)

(a) European countries	Imports from				Exports to			
	£	£	£	£	£	£	£	£
France	49,498	71,980	64,753	69,941	32,396	38,673	25,213	30,161
Italy	8,131	19,436	15,776	16,858	14,040	18,979	10,603	13,621
Switzerland	11,070	19,033	13,693	14,412	4,212	9,204	6,195	7,645
Spain	15,976	23,657	20,734	22,192	9,728	12,715	8,951	12,398
Portugal	3,898	6,299	5,384	5,608	6,053	8,427	7,055	8,933
Belgium	23,426	36,236	45,214	49,960	13,528	19,662	15,013	16,901
Germany	80,411	48,156	72,685	59,825	40,677	44,206	26,343	41,825
Czecho-Slovakia	..	10,737	10,920	9,361	.	1,560	1,330	1,836
Jugo-Slavia	.	369	405	485		1,285	867	1,273
Austria	7,706	2,598	2,391	2,434	4,481	2,212	1,806	2,421
Hungary		476	273	410		586	655	967
Greece	2,202	3,102	2,587	3,097	2,537	6,058	3,398	4,759
Rumania	2,037	2,278	2,672	2,376	1,947	3,071	2,613	2,682
Turkey (European)	1,165	847	952	1,232	2,414	3,574	2,406	2,403
Russia	40,271	32,887*	32,425*	29,698*	18,103	8,705*	7,718*	6,570*
Finland	.	13,223	13,285	15,902		3,959	2,772	3,234
Poland		5,143	8,525	8,100		3,708	2,471	5,316
Sweden	14,213	21,317	21,427	25,264	8,220	11,508	8,052	9,654
Norway	7,437	12,973	12,184	12,920	6,147	8,104	6,916	7,456
Denmark	24,053	49,303	47,960	50,013	6,061	10,987	8,715	9,785
Netherlands	27,913	62,000	65,535	61,940	22,794	36 526	26,754	30,632
	319,407	442,050	459,780	459,028	193,938	253,709	175,846	220,472

*Including Esthonia, Latvia and Lithuania.

(b) Non-European countries	Imports from				Exports to			
	£	£	£	£	£	£	£	£
United States	143,854	250,282	231,532	202,839	30,478	53,451	49,058	46,832
Cuba	3,675	11,620	4,512	6,607	2,214	2,607	2,066	2,099
Mexico	1,880	5,323	6,017	5,523	2,333	3,137	2,768	2,201
Argentine	42,485	68,544	67,497	76,584	22,641	29,177	23,002	26,993
Brazil	10,008	5,943	4,237	4,466	12,465	16,145	12,610	14,391
Chile	5,359	12,276	7,758	7,457	6,010	6,028	5,664	5,183
Peru	3,178	8,511	7,486	8,216	1,488	2,384	2,350	2,088
Uruguay	2,749	4,867	4,546	4,567	2,916	3,168	2,377	2,866
Japan	4,389	7,348	7,423	8,167	14,783	16,448	13,964	15,257
China	4,672	13,739	11,554	12,223	14,845	14,555	16,427	9,691
Turkey (Asiatic)	4,251	1,599	2,060	1,772	5,291	1,026	684	778
Egypt	21,395	34,235	25,014	23,685	9,805	16,441	11,041	12,568
Other countries	9,917	26,800	26,886	31,196	10,731	19,892	17,020	21,036
	257,812	451,087	406,522	393,302	136,000	184,457	159,031	161,983

Interesting features of British European trade are the steady decline of business with Russia, the diminution of imports from Germany, accompanied by the actual increase in value of exports to that country Heavy increases in imports from Italy, France and Belgium, the Netherlands and Scandinavia Exports nowhere show any striking increase over 1913

Turning to extra European countries, business with the United States shows a considerable growth, the recent fall in imports being due to a decrease in British purchases of raw cotton. Imports from Brazil have fallen heavily though there is a slight increase in exports Imports from other South American countries show substantial increase Imports from China are greatly in excess of 1913, but the 1927 figure for exports reflects the disturbed political conditions of that country

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SECTION 5: SHIPPING AND SHIPBUILDING

A Shipping.—The movement of British shipping since 1890 is shown by the table in the next column

A feature of the pre-war position was the steady increase in British tonnage accompanied by a considerably more rapid increase in German, Scandinavian, Dutch and Spanish tonnages The total result being that whereas in 1890 British tonnage represented 71% of total entrances and clearances, the average proportion for 1910–13 was 57% only Since the war the proportions of 1913 have been more or less maintained, the percentage of British entrances and clearances for 1925 and 1926 having been—

1925 61% 1926 64%

The war brought about a great change in the relative position of the chief maritime countries An immense quantity of tonnage was destroyed by combatants, the total being estimated at 14,202,000 tons, of which Great Britain's share was 5,202,000 On the other hand the U S A added to their fleet no less than 6,729,000 tons, the net loss of tonnage was, therefore 7,473,000 tons The German marine, however, which in 1913 numbered 5,082,061 tons was in 1921 reduced to 717,450 tons, by surrender of reparation tonnage to the allies

The war years and those immediately succeeding, witnessed a very high rate of construction. The result was that the world ship-

TONNAGE OF VESSELS ENTERED AND CLEARED AT BRITISH PORTS

Distinguishing British and Foreign

Year	Entered		Cleared	
	British	Foreign	British	Foreign
1890	26,777,955	10,057,757	27,195,157	10,253,000
1895	29,175,282	10,826,409	29,516,644	11,020,839
1900	32,135,745	17,777,478	32,147,060	18,035,379
1905	35,200,869	20,423,105	35,762,218	20,654,542
1910/13 average	42,828,465	30,712,572	43,075,761	30,934,772
1919	30,119,801	19,532,508	30,151,666	18,949,357
1920	33,217,400	22,500,423	34,005,131	23,337,570
1921	34,528,777	20,778,359	34,278,251	21,500,915
1922	44,187,598	32,057,988	45,383,518	32,112,701
1923*	51,393,266	38,969,527	51,904,150	38,316,868
1924*	52,270,768	34,783,077	53,385,497	35,372,782
1925*	52,020,734	31,997,047	52,839,274	32,450,835
1926*	53,270,145	29,008,178	53,426,971	29,180,846

The 1927 figures are not available in a comparable form

*Including tonnage entered from and cleared to the Irish Free State

ping, which in 1914 aggregated 45,409,000 tons and in 1918 had sunk to below 39,000,000 tons, had increased to 47,897,000 tons by the middle of 1919, and to 65,193,000 tons by 1927. The relation of British to other shipping is shown in the article SHIPPING

The movement of shipping freights from 1900 to 1927 is illustrated by the *Economist* index figures as follows, the year 1913 being taken as 100

INDEX NUMBERS OF SHIPPING FREIGHTS
(*Freights reduced to percentage of the 1913 index*)

Year	"Economist"	Year	"Economist"
1898	104 79	1911	83 32
1899	102·68	1912	112 56
1900	115·76	1913	100 00
1901	88·58		
1902	74·77		
1903	75·00	1920	438 52
1904	75·79	1921	158·40
1905	76·40	1922	122·02
1906	76·82	1923	106·69
1907	78·13	1924	113·44
1908	67·32	1925	102 22
1909	70 50	1926	*
1910	72 61	1927	109 64

*Freights abnormal owing to coal dispute No comparable index figures calculated

It will be seen that since the slump in 1921, which followed the unprecedentedly high level of 1920, freights have kept steadily below the level of wholesale prices, which for the corresponding years have been as follows, according to the Board of Trade Index figures and again taking the year 1913 as 100 —

1921	197 2	1925	159·7
1922	158 8	1926	148·1
1923	158 9	1927	141 4
1924	166 2		

To illustrate the state of employment in the industry, it may be stated that in 1913 the total number of seamen shipped on British foreign going vessels was 572,581 as against 524,345 in 1925, and 524,504 in 1926

B **Shipbuilding.**—The following table taken from Lloyd's *Annual Summary of Shipbuilding* gives the tonnage of merchant vessels launched in Great Britain and Ireland and the rest of the world from 1894 onwards —

Merchant Vessels Launched from 1894 Onwards

Year	United Kingdom				Other countries			
	Steamers and motors		Sailing vessels and barges		Steamers and motors		Sailing vessels and barges	
	No.	Tons gross	No	Tons gross	No	Tons gross	No.	Tons gross
1894	549	964,926	65	81,582	148	203,279	170	73,751
1900*	664	1,432,600	28	9,871	347	602,989	325	258,703
1910	473	1,137,738	27	5,431	453	719,903	324	94,781
1911	700	1,782,908	72	20,936	537	748,515	290	97,781
1912	643	1,720,957	69	17,557	720	1,074,911	287	88,344
1913	641	1,919,578	47	12,575	639	1,269,000	423	131,729
1914†	621	1,674,358	35	9,195	473	1,111,027	190	58,173
1915†	317	648,629	10	2,290	313	518,948	103	31,771
1916†	304	607,907	2	328	506	1,032,074	152	47,771
1917†	285	1,162,496	1	400	698	1,669,608	128	105,282
1918†	300	1,344,275	1	3,845	1,397	3,996,924	168	102,400
1919‡	541	1,584,920	71	35,522	1,554	5,203,712	317	320,305
1920‡	581	2,039,954	37	15,670	982	3,703,030	159	103,012
1921	399	1,532,113	27	5,939	806	2,742,262	145	61,365
1922	225	1,028,857	10	2,224	520	1,396,872	97	39,131
1923	200	640,467	22	5,184	420	974,323	59	23,207
1924	473	1,432,674	21	7,211	365	768,067	65	39,799
1925	323	1,078,775	19	5,858	419	1,063,550	94	45,221
1926	179	633,746	18	5,822	346	996,388	57	39,021
1927	356	1,221,251	15	4,622	378	1,018,271	53	41,535

*Prior to 1907 vessels of less than 100 tons gross were included, if intended to be classed in Lloyd's Register.
†Returns for Germany and Austria-Hungary not available
‡Returns for Germany not available.

The percentage of British output to total world output has been as follows —

1913	58%
1926	38%
1927	54%

Since the shortage of tonnage immediately succeeding the war the tendency to scrap obsolete tonnage has been below normal in spite of the relatively large number of old ships afloat and the inefficiency of much of the tonnage built during the war This was inevitable having regard to the prolonged depression of the freight market

Two factors have, however, tended to increase the scrapping of old tonnage and the rate of new construction, namely, the growing popularity of the motor driven vessel, due in part to the great rise in coal prices and disorganization of the coal mining industry, and the increase in the demand for oil tankers, due to the enormous growth in the world demand for fuel oils It is true that to-day only 7% of the total tonnage afloat is motor driven, but no less than 60% of the tonnage under construction abroad and 41% of that under construction in this country is motor tonnage The relative figures for the last five years are as follows —

Motor Ship Tonnage Output

Year	United Kingdom	Per cent of total output	*Other countries	Per cent of total output
1923	87,000	13	135,000	14
1924	237,000	16	262,000	32
1925	267,000	25	575,000	52
1926	202,000	32	500,000	48
1927	356,000	29	506,000	48

*Omitting wooden vessels

While Great Britain is behind the rest of the world in the proportion of motor tonnage she is building, much pioneering work is being done in this country in the development of the high pressure steam turbine and of electric drive, the first electrically driven British passenger liner having recently been laid down in the Clyde

Another tendency worthy of mention is the steady tendency towards the employment of larger sized vessels The average sizes of vessels built in this country and abroad during recent years are as follows —

	Great Britain	World
	Gross tons	Gross tons
1911	2,377	1,657
1912	2,442	1,688
1913	2,781	1,905
1925	3,171	2,565
1926	3,247	2,792
1927	3,304	2,880

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SECTION 6· TRANSPORT AND COMMUNICATIONS

Railways.—The first line of railway for regular passenger service, that from Stockton to Darlington, 14 m in length, was opened on the 27th September, 1825 The first really important railway was the line from Manchester to Liverpool, opened on the 15th September, 1830 The first sod for the London-Birmingham railway was cut at Chalk Farm, London, on the 1st June, 1834 All the great railway systems of England sprang into existence within less than ten years after the opening of the London-Birmingham line.

The railway companies were at first only authorized to construct and maintain the permanent way, charging tolls to the owners of locomotives and wagons and coaches which used the lines The next step was that they became providers of the loco-

motives which hauled the privately owned wagons and coaches Finally the companies have become providers also of the wagons and coaches, except in the case of mineral wagons on the L M S, Southern and G W Railways

The following table gives the figures for the total length of railways for carrying passengers, 1825–1850 —

Year	*Mileage*
1825	40
1830	95
1835	293
1840	1,435
1845	2,441
1850	6,621

The number of passengers carried per mile in 1832 was 4,860 and in 1842 nearly 12,000

The following table illustrates further developments —

Year	Mileage	Paid-up capital	Number of passengers	Traffic receipts		Percentage of working expenses to receipts
				Total	Per mile	
1860	10,433	348,130,127	163,435,678	27,766,622	2,661	47·00
1865	13,298	455,478,143	251,862,715	35,890,116	2,701	48·00
1870	15,537	529,908,673	336,545,397	43,417,070	2,794	48 00
1875	16,658	630,223,494	506,075,234	58,982,753	3,541	54·00
1880	17,933	728,316,848	603,885,025	62,961,767	3,511	51·00
1885	19,169	815,858,055	607,213,031	66,644,967	3,477	53 00
1890	20,073	897,472,026	817,744,046	76,548,347	3,813	54·00
1895	21,174	1,001,110,221	929,770,000	81,306,047	3,844	56·00
1900	21,855	1,176,001,890	1,142,276,686	98,854,552	4,523	62 00
1905	22,847	1,272,601,000	1,109,022,102	105,131,709	4,601	62 00
1909	23,280	1 314,406,000	1,265,081,000	110,682,266	4,754	62 00
*1913	20,246	1,248,041,241	1,549,799,921	118,780,716	5,867	63·53
*1922	20,298	1,291,935,670	1,748,956,116	217,349,631	10,708	80 24
*1923	20,314	1,170,258,632	1,771,767,220	203,836,569	10,034	81·22
*1924	20,329	1,173,242,101	1,746,854,427	201,513,442	9,913	82·61
*1925	20,391	1,192,699,103	1,743,318,314	197,755,299	9,698	83·26
*1926	20,396	1,198,193,149	1,541,879,621	170,165,503	8,343	90·36

*Excluding Ireland

The years since 1913 have witnessed a revolution in our inland transport system.

At the outbreak of the War, the Government took complete control of the railways guaranteeing the Companies their pre-War revenues The fact that the War lasted for more than four years, and involved a far-reaching re-arrangement and re-distribution of the trade and traffic of the country, made the strict terms of the agreement practically inapplicable A huge sum of money was required to put the companies back into their pre-War condition of repair and efficiency Rolling stock had been removed to other countries, stations closed, permanent way and other plant allowed to fall into comparative disrepair, staff seriously depleted, and the arrangements for the routing of traffic widely altered The costs of operation had also risen enormously

The Ministry of Transport—The Government, foreseeing the difficulties which would arise if control were suddenly removed, passed in 1919 the Ministry of Transport Act, which gave the Minister powers to control the operation and charges of all existing means of internal transport Later there was passed the Railways Act, 1921, under which

1 The 120 railways of Great Britain were amalgamated into four large groups, the Southern, the Great Western, the London, Midland and Scottish, and the London and North Eastern.

2 A new tribunal called the "railway rates tribunal" was set up, its most important function being the settlement of the charges and conditions of carriage of the amalgamated companies. The tribunal consists of one person of legal experience, who is chairman, one person of railway experience, and one of commercial experience

The first of these provisions was intended to facilitate working economies by eliminating costly competition, and the second to provide a cheap and business-like tribunal for exercising the necessary control over the new system

Charges and Wages.—The Act laid down an entirely novel principle in regard to the basis of charge. Section 58 provides that the charges be fixed on a basis estimated to yield an annual net revenue ("the standard revenue") equivalent to the aggregate net revenues in the year 1913 of the various companies absorbed by the amalgamated company together with allowances for interest on capital expended or raised since Jan 1, 1913, or capital which had not at that date become fully remunerative. Section 59 provides for periodical revisions of the charges and also lays down that if on any such review the tribunal finds that the net revenue of the company is substantially in excess of the standard revenue, such excess shall be divided between the public and the railway companies, 80% being allocated to reduction of charges and 20% being retained by the company as profits. This increased standard (the old standard plus 20% of the excess) is then to become the standard revenue of the company

In regard to wages and conditions of service, the Act provides that all disputes in regard to these shall be referred to two bodies, the Central Wages Board and the National Wages Board, the latter acting as a court of appeal from the former Both these bodies are in the nature of conciliation committees including representatives of the companies and their employees, the national wages board also includes representatives of railway users The process of working out the new system and fixing the schedules of charges has proved long and laborious, and ultimately Jan 1, 1928 was fixed as the "appointed day" when the new arrangements came into operation

The Removal of Control—The position of the companies since the removal of Government control has been an unfavourable one The economies promised through amalgamation have been slow in materialising, and the trade depression resulted in a decline of traffic At the same time the rapid increase of road transport, aided by the increase of rail charges to a level 100% above pre-war, had diverted from the rail a considerable and increasing volume of the most lucrative traffics The companies, whose position has been further complicated by the great increase in working costs, in the hope of stimulating traffic reduced their charges as from Aug, 1923, to 50 per cent above pre-war, but the hoped for improvement did not result Expenditure in 1924 exceeded that of 1913 by £96,000,000 or 117%, whereas to meet this additional burden receipts had only increased by £88,000,000 or 70% Coal was 142% higher than in 1911, and 89% over 1913, other materials were 67 9% and wages 153% above 1913 There was an increase in staff by 13%, due to the operation of the eight hours' day The year 1925 gave signs of improvement, but the coal dispute of 1926 caused a severe setback, and in Feb 1927, the charges were increased to 60% above pre-war, a general level which was confirmed in the new schedules

The companies' financial position, however, was relieved by the fact that in 1922 the Government, in order to clear up claims for compensation under the control scheme, handed over to them sums amounting in all to £62,000,000 making over £100,000,000 so distributed since the beginning of the control The companies were able to maintain their dividends by drawing money (over £5,000,000 in 1924–5) from their reserve funds, which had been enormously augmented by these grants. The year 1927 saw some improvement in railway finance and organization and for that year none of the companies was compelled to draw upon its reserves to pay dividends At the end of the year all the companies introduced private bills asking for increased powers to carry goods by road in order to enable them to compete with the road hauliers These bills were referred to a joint select committee of the two houses of parliament, which held that they had been proved. The committee agreed that the proposed extended powers should be granted The new acts, which received the royal assent in August 1928, empowered the four main railways to provide transport services by road subject to certain safeguards A Royal commission was appointed in July 1928 to consider measures for securing better traffic regulation.

In the table on p 717 the receipts since 1925 are shown quarter by quarter, omitting the figures for the period of the coal stoppage —

(*In Million £'s*)

	L.M.S.R		L.N.E.R		G.W.R		S.R	
	Pass.	Goods	Pass.	Goods	Pass.	Goods	Pass.	Goods
1925								
1st quarter	6·4	11·5	4·5	9·0	2·6	4·3	3·4	1·5
2nd ,,	8 4	10·7	5·8	8·4	3 5	4·2	4·7	1 5
3rd ,,	10·7	10 6	7 4	8·4	4 6	4 1	5 7	1 6
4th ,,	7·0	11 1	4·9	9·0	3 0	4·2	3·7	1 5
1926								
1st quarter	6·6	11·5	4·7	9·2	2 8	4 6	3 7	1·6
1927								
1st quarter	5·9	12·0	4·3	9·8	2 6	4·8	3·4	1·6
2nd ,,	7·8	11·3	5·4	9 1	3·3	4·6	4 4	1·5
3rd ,,	9 8	11·2	6 8	9 1	4·3	4 3	5 5	1·6
4th ,,	6 6	11·3	4·6	9·5	2·8	4 3	3·7	1 5

Canals.—Canal transport began in Great Britain in the middle of the 18th century, and formed a very important development of our transport system till the growth of the more speedy and elastic system of railway carriage began to impair its position At the outbreak of the war there were still about 3,800 miles of canal in use, and in 1913 these canals carried about 33,500,000 tons of traffic, their position having remained practically stationary for a generation Moreover development did not keep pace with the growth of traffic; physical limitations made the use even of 100 ton barges impossible and 300 tons is generally accepted in other countries as the minimum standard to enable canals to compete with railway transport.

The value of the canals during the war caused a revival of interest in their potentialities, especially as the railway system was very congested during the early post-war period The government instituted inquiries into the possibility of reviving the waterways which had largely fallen into disuse prior to the war, but no government felt justified in undertaking the somewhat ambitious schemes of reorganization which have been recommended at various times Local schemes have, however, been under consideration in various districts, and with government and municipal assistance important improvements are being made on the waterways between Nottingham and the Humber It is possible that further developments may be undertaken, notably between Birmingham and the Mersey, and Birmingham and the Severn.

Roads.—The first roads worthy of the name of highways were constructed about the middle of the 17th century, and these formed the main avenues of traffic until, in the middle of the 19th century, the railways began to displace them. The development of road motor transport during the first decade of the 20th century directed attention to the condition of the roads in the country and, as a result, the Development and Road Improvement Funds Act was passed in 1909 Under this Act a road board was constituted with powers —(1) to make advances to county councils and other highway authorities in respect of the construction of new roads or the improvement of existing roads, (2) to construct and maintain any new roads

Since 1909 the annual expenditure on roads has been as follows —

Expenditure, Including Loan Charges but Excluding Expenditure Out of Loans

Year	England and Wales	Scotland
	£	£
1910–11	15,124,005	1,242,765
1912–13	16,245,794	1,347,491
1914–15	17,348,435	1,484,147
1916–17	14,648,185	1,289,425
1918–19	15,700,724	1,541,830
1920–21	39,235,923	3,418,531
1922–23	40,928,764	4,236,132
1924–25	46,408,354	5,354,986

The great increase since 1918 has been due at first to arrears of maintenance during the war, and since to the very rapid increase of road transport by motor vehicles both of goods and passengers

The development is shown by the following table:—

Licences current on the 30th November (approximate)	1922 No	1926 No.	1927 No
Cars taxed on horse-power	293,740	642,850	739,310
Cycles	352,340	498,255	518,867
Goods vehicles	158,856	257,283	281,272
Motor hackneys	72,263	82,677	78,283
All motor vehicles Excluding tramcars and trade licences	909,984	1,518,712	1,657,819
Including tramcars and trade licences	933,308	1,547,391	1,687,965
Horse-drawn vehicles	237,342	127,248	103,857

During the same period horse-drawn vehicles licensed declined from 215,083 to 127,248, a loss of 40 8%

The following are the approximate number of motor vehicles licensed during the years 1921–1926 —

1921	873,700	1924	1,335,600
1922	979,000	1925	1,547,000
1923	1,141,400	1926	1,729,000

The total mileage of all roads in 1927 was,

England & Wales	153,661
Scotland	25,076

Tramways.—An act passed in 1870 to facilitate the construction of tramways throughout the country marks the beginning of their modern development It led to the laying down of "street railways" in many large towns According to a return laid before the House of Commons in the session of 1878, the total length of tramways authorized by parliament up to June 30, 1877, was 363 m and the total length opened for traffic 213 m. comprising 125 m of double lines and 88 m of single lines On June 30, 1900, there were in the United Kingdom 70 tramway undertakings with 585 m. of line belonging to local authorities, while 107 with 592 m of line belonged to other than local authorities. The capital expenditure on the former amounted to £10,203,604, on the latter to £11,532,384.

The development of tramway enterprise in the U.K. as shown by the mileage open, the paid up capital, gross receipts, working expenses and number of passengers carried, has been as follows.—

Year	Miles open	Paid up capital	Gross receipts	Working expenses	Passengers carried during year
		£	£	£	
1890	948	13,502,026	3,214,743	2,402,800	526,369,328
1895	982	14,111,521	3,733,690	2,878,490	661,760,461
1900	1,177	20,582,692	5,445,629	4,075,352	1,065,374,347
1905	2,117	51,501,410	9,917,026	6,565,049	2,068,913,226
1909	2,326	70,345,155	12,641,437	8,045,658	2,659,981,136
1913	2,489	72,972,000	14,338,000	9,014,000	3,096,168,000
1925	2,605	94,805,000	28,737,000	22,733,000	4,620,502,000

Post-war years refer to Great Britain only, the Irish figures having been excluded from the year 1913 From 1890 to 1913 the Irish figures are included.

The number of tram-cars licensed in 1927 was 14,000.

Air Transport.—Air transport first became a commercial reality after the World War, the first commercial passenger plane crossing to Paris in Aug. 1919. The first air mail contract was made by the Government in the following November. During the early years services were operated by various companies under considerable financial difficulties. In 1921 the first Government subsidy scheme was inaugurated and during the next three years subsidized services were operated by Messrs Daimler, Handley Page and Instone. In 1924 all the British air lines merged in the State aided enterprise of Imperial Airways Limited, a million pound company with Government representation on the board

The services in Europe operated by Imperial Airways are as follows —London–Paris; London–Brussels–Cologne; London–

Ostend; London–Paris–Basle–Zurich, London–Le Touquet; and Southampton–Guernsey (the latter being operated by seaplanes); and in the Middle East the present (1928) route is Cairo–Gaza–Baghdad–Basra. This latter service constitutes the first link on the imperial air route to India It was inaugurated in Jan 1927, and completed its first year's operation with a 100% regularity throughout When certain political questions have been settled with Persia, this service will be extended to India (Karachi) and the organization for this is already laid down

Air Mail—The increase in the carriage of mails by air is shown by the following figures — For the year 1924–1925 the total weight of letter mail carried by air on European services was 2 7 tons and the total weight of parcel mail 17 8 tons, whereas for the year 1926–1927 the total weight of letter mails on European services was 5 3 tons and parcel mail 24 4 tons. In the Middle East the air mail service already saves in time over surface transport up to 17 days between London and 'Iraq and from 12 to 13 days to Persia The extension to Karachi will result in a saving of seven days for the first class letter mail and, with the further extension from Egypt to Europe a reply to an air mail letter will be received in the time the first letter takes to be sent by the ordinary mail methods. To-day over one-third of the total mail between England and 'Iraq and 60% of the incoming mail from 'Iraq to London is carried by air (Imperial Airways) During the year 1927 approximately 32 tons of mail was carried on this route.

Passenger and Freight Traffic.—The number of passengers carried on Imperial Airways routes in Europe in the year 1924–1925 was 11,395 This number has steadily increased and in the year 1926–1927 the number of passengers carried on their European routes was 17,000 and on their Middle East weekly service 1,177 There has also been a steady increase in freight (1924–1925, 224 2 tons 1926–1927, 332 3 tons on the European services).

Carriage of Bullion—Bankers and brokers are utilising more and more the air services for the carriage of bullion. Imperial Airways in 1927 carried over nine millions sterling

The advantages of carrying bullion and precious metals by air are, (*a*) the greater speed in reaching its destination and the consequent saving of interest on gold; (*b*) there is less handling en route and consequently less risk of theft; (*c*) the insurance rate on bullion and precious metals is considerably lower than by alternative means of transport

The fleet has recently been augmented by three-engined aircraft which are the largest passenger aeroplanes in existence and carry eighteen passengers, a pilot, a mechanic, a steward and a fully equipped buffet A new departure in 1927 was the institution of a second class service, which left Croydon for Paris at 8 o'clock each morning and was carried out on twin engined aircraft having a seating capacity of twelve

Transport and Communications.—*Postal Service*—The first inland post was established in England in 1635. Early charges were 2d per 80 miles, 4d for 140 miles, 6d for greater distances in England, 8d. to Scotland At first the volume of correspondence was very small, and Scott in the *Heart of Midlothian* mentions that one day in the late 17th century the mail from London to Edinburgh consisted of a single letter. The institution of mail coaches in 1784 marked a great step forward Mails were first sent by rail in 1830, and the penny post was established in 1840. The sending of telegrams was originally in the hands of various telegraph companies, the transfer to the State taking place in 1870 After 1880 the then novel and undeveloped system of telephony was carried on under licence from the State, being held to be within the State telegraph monopoly The National Telephone Company gradually absorbed all other licencees, and obtained a licence which expired in 1911. The State, however, had control of all trunk lines. The National Telephone Company's system was transferred to the post office on January 1, 1912. The number of exchanges increased from 1,566 in 1910 to 3,971 on Dec 31, 1925, and the number of telephone stations from 619,399 in 1910 to 1,357,908 on Dec 31, 1925 The use of automatic exchanges developed after the World War. By the end of 1927 these were working in over 60 provincial towns, and the first automatic exchange in London was opened at Holborn in that year The same year witnessed a great extension of telephone connection with foreign countries. By the end of the year it was possible to speak not only from London but from most towns across the Atlantic, as well as to all European capitals and large commercial centres such as Lyons, Zurich, Frankfurt, Antwerp, Cologne, Hamburg, Leipzig, Gothenburg, etc , to Prussian towns on the Lithuanian border and even to Swedish towns in the Arctic circle

The following table extracted from the *Commercial Accounts* of the post office for 1926, shows the balances in the postal telegraph and telephone expenditure and income accounts from March 31, 1912, to March 31, 1927, and gives some idea of the magnitude of the business involved, while it may be mentioned that in 1926–27 the total amount expended in salaries, wages and allowances was no less than £33,880,072

Year ended 31 March	Surplus of deficit after charging interest on capital (Deficit marked *)			
	Postal	Telegraph	Telephone	Total
	£	£	£	£
1913	5,553,325	1,175,347*	303,343	4,681,321
1919	8,168,956	685,139*	36,261*	7,447,556
1920	3,469,828	2,636,183*	1,961,710*	1,128,065*
1921	1,714,238	3,728,779*	4,721,970*	6,736,511*
1922	2,330,626	3,032,246*	559,132*	1,260,752*
1923	5,208,072	1,696,836*	939,009	4,450,245
1924	4,965,030	1,270,925*	1,596,917	5,291,022
1925	6,612,113	1,645,525*	463,006	5,429,594
1926	7,416,266	1,299,214*	550,830	6,667,882
1927	6,853,335	1,349,112*	283,375	5,787,598

The following table shows the more important alterations in postage rates between 1914 and 1925 —

	1914	June 1918	June 1920	June 1921	May 1922
Initial letter rate (inland and Imperial)	1d	1½d	2d	2d	1½d
Initial letter rate (foreign)	2½d	2½d	2½d	3d	2½d*
Postcard rate (inland)	½d	1d	1d	1½d	1d
Initial printed paper rate	½d	½d	½d	1d	½d
Inland parcel rate (up to 2 lb)	4d	6d	9d	9d	6d*
Inland parcel rate (up to 11 lb)	11d	1/-	1/6	1/6	1/3*

*May 1923.

Rates for telegrams were doubled during this period

Cables—It would be difficult to exaggerate what the submarine cable has done to develop and cement the British empire The first cable was laid across the Channel in 1850, and the Atlantic was finally conquered in 1866. In 1922, when the Eastern Telegraph Company, the group which practically controls the whole system, celebrated its jubilee, the total mileage of cable in the world had grown from under 1,000 to 325,000 and the capital invested in this one group alone to 25 million pounds, with a total for all companies of about 60 millions. The system, protected as it is by the British navy, was of extraordinary importance during the war, for whereas Germany was at a very early stage completely isolated, the British cables were only cut by the enemy at two points and these were quickly restored Some idea of the potentialities of the cable in the way of speed can be gathered from the cable "Derby" in 1927, when the results of the race reached

Egypt and S Africa	in 2 seconds
India within	5 "
S. America within	11 "
Australia	in 32 "
Straits Settlements	" 45 "
China	" 51 "

while the message of H M the king announcing the opening of the British empire exhibition in 1925 travelled 31,560 miles in 80 seconds.

The principal organizations in the cable world are the Eastern Telegraph Company, which controls 130,000 miles of the total 325,000 of the world's cables connecting Britain with the whole of the empire except Canada, the Indo-European Company and the Imperial Pacific, now owned by the British and Dominion Governments, which provide an all round route to Australia via the Atlantic and Pacific.

Wireless Telegraphy—Operation of wireless telegraphy services in Great Britain were, till 1928, kept in the hands of the Government The system first used was a high-power, long wave system. In 1924 the Marconi Company entered into a contract with the Government to provide beam stations for communication with Canada, Australia, India and S Africa All these services are now (1928) working under the administration of the G P O, the last (Indian) having commenced in Sept 1927 The four circuits are said to be carrying traffic at the rate of about 30 million words per annum, the rates being lower than the cable rates on all except the Canadian circuit, where the charges are equal

Wireless services are also in operation with foreign countries, the European services being partly run by the G P O and partly by the Marconi Company under licence from the G P O There are also services with the U S A, Brazil and the Argentine, which are operated by the company

The year 1927, therefore, witnessed the definite establishment of competition between wireless and cables It is true that at the end of the year there was only one wireless transmitting service between the United Kingdom and the United States of America, which was worked on the old high-powered long wave system, and that the rates for this service were no cheaper than cable rates, none the less it was stated that this service was carrying 20% of the United States traffic in competition with 14 cables Moreover, the Marconi Company had installed at Dorchester a beam station transmitting on low power, and short wave length for communication with the U S A When this is in full operation, it is expected that the wireless service will increase its share in the U S A traffic

Up to the present the wireless business has been mostly confined to the deferred and week-end rate messages, owing to difficulties in connection with the phenomena of "fading" It was not thought, however, that this difficulty would prove insoluble The cable companies were also improving their service by the establishment of loaded cables which will be able to carry five or more separate messages simultaneously These should enable the companies to effect considerable economies and to reduce rates should the competition of the wireless service make this necessary None the less, there is no doubt that the cables are feeling the competition of wireless acutely According to the *Post Office Commercial Accounts* for 1926–7 there was in that year a deficit on the inland telegraph service of £1,300,000, on the G P O wireless service of over £100,000 and on the G P O imperial cable of £40,000 At the beginning of 1928 a negotiation took place between the Associated Cable Companies and the Marconi Company with a view to finding some basis of cooperation if possible, and at the same time a conference of representatives of the British Government, the dominions and India met to consider the future relations of the imperial wireless and cable services

Wireless Telephony—In Jan 1927 there was opened by arrangement between the post office and the American Telegraph and Telephone Company a wireless telephone service connecting the two countries Very little use had, however, been made of this during the first year of its existence

Television—During 1927, the possibility of the wireless transmission of pictures and facsimiles was much studied and hopes were entertained that a two-way service with the U S A might be established within the comparatively near future

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SECTION 7: FISHERIES

Great Britain's sea fishing industry is the most important in the world The principal kinds of fish caught are herring, cod, haddock, plaice and hake, classed as wet fish, and amongst shellfish, oysters, crabs and lobsters The annual consumption of wet fish is about 40 lb per head of the population, and with improvements in the methods of preservation (by refrigeration) and transport, consumption should be increased The principal grounds frequented by British fishermen are the North sea, Iceland, Faroe, south of Ireland, west of Scotland, Barents sea, west of Ireland, Irish sea and English Channel

The following table shows the number and total of fishing vessels on the register in Great Britain for 1914, 1920 and 1925 The decrease in total numbers of tonnage of vessels is to some extent offset by the gradual conversion from sail and steam to motor propulsion

Years	Total vessels	Net tonnage
1914	18,185	360,413
1920	17,761	340,363
1925	15,303	292,810

In England and Wales the number of fishermen employed in sea fishing declined from 45,382 in 1913 to 35,944 in 1925, in which year the total number of fishermen engaged in Scotland was 27,141 The total number of fishermen and shore-workers in that country having declined from 90,710 to 69,568 in the same period

The total quantities and values of wet fish and shell fish of British and foreign taking landed in England and Wales for 1913–1926 were as follows —

Years	British taking				Foreign taking	
	Total wet fish		Value of shell fish	Total value	Wet fish	
	Quantity	Value			Quantity	Value
	Cwt	£	£	£	Cwt	£
1913	16,152,374	10,009,326	327,363	10,336,689	178,668	131,631
1926	12,504,138	12,700,657	501,501	13,202,158	698,227	965,807

The total quantities and value of fish landed in Scotland for the same years were as follows —

Years	Total catch	
	Quantity (excluding shell fish)	Value (including shell fish)
	Cwt	£
1913	7,828,350	3,997,717
1926	7,402,052	4,888,139

For 1927 the total figures were as follows —

	Weight	Value
	Cwt	£
British caught		
England and Wales	13,079,675	12,705,119
Scotland	6,918,153	4,368,321
Shell fish		429,470
Totals	19,997,828	17,502,910
Foreign caught	1,478,597	1,278,699

1927 showed better results than 1926, landings from British vessels being 5·4% greater than in 1926 and foreign landings being 6 8% of the total landings of wet fish as against 8% for 1926 The figures for the latter year were affected by the coal dispute which involved British vessels in bunkering difficulties A notable event of 1927 was the opening of new halibut fisheries off the Greenland coast This was made possible by the adoption of new methods of brine freezing

The foreign trade in fish is large·—

Exports (All Fish of British Taking or Curing)

Quantity Cwt			
1924	1925	1926	1927
8,142,816	6,757,134	8,247,415	7,677,114
Value £			
1924	1925	1926	1927
8,438,243	7,524,620	7,373,202	7,003,258

The most important factor in the export trade is salted herrings, which represent about 70% of the total The canned fish industry of the country is peculiar as Britain imports the great bulk of the canned fish (principally salmon and sardines) which is consumed and exports most of what is actually canned in the country,—herring British freshwater fisheries, in spite of serious attempts made during the war, have never contributed substantially to the feeding of our population, though there is a considerable annual importation of eels from the continent

Very considerable attention has since the war been given to research and organisation in the fishing industry A great deal of research is carried out by the Government and under Government direction (Ministry of Agriculture and Fisheries) Government vessels continuously study the movements, habits and feeding of fish both inshore and at sea Research is carried out in hydrography and into methods of capture, into the breeding and cleansing of shellfish, etc The total amount expended by the State in these investigations in the year ending March 31st, 1927, was £21,063

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SECTION 8. SOCIAL AND INDUSTRIAL CONDITIONS

Course of Prices.—It is not possible to illustrate the course of prices satisfactorily otherwise than by index numbers compiled for wholesale prices It is true that these do not represent the prices paid by the actual consumer, but retail prices fluctuate so much between different localities and even different retailers, that representative data are practically unobtainable, especially for past times On the other hand, wholesale quotations for the principal commodities are easily obtained It is thought, however, that retail prices do follow generally the same course as wholesale prices According to W T Layton (*An Introduction to the Study of Prices*, 1920, p 18) a comparison of specific wholesale and retail prices, where both sets of figures are available, seems to show that though the fluctuations of retail prices are less violent than those of wholesale prices, the changes in the general level over a long period are always in the same direction and in most cases of the same extent

The following table, based on one compiled by Layton (*ib* p 150) from Jevons's index number from 1800 to 1865, and Sauerbeck's from 1865 to 1914 shows the fluctuation of wholesale prices from 1800 to the outbreak of the war

Prices from 1800 to 1820 were abnormally high (the figure of 235 for the year 1800 comparing with 100 for the year 1900) and subject to violent fluctuations owing to the disturbance caused by the Napoleonic wars The years 1820 to 1825 saw a boom in trade due to the rapid development of trans-atlantic commerce

Index Number of Prices Since 1800

Year	Index No	Year	Index No	Year	Index No	Year	Index No
1800	235	1829	132	1858	127	1887	91
1801	233	1830	135	1859	128	1888	93
1802	183	1831	137	1860	132	1889	96
1803	208	1832	130	1861	131	1890	96
1804	198	1833	125	1862	135	1891	96
1805	220	1834	130	1863	137	1892	91
1806	217	1835	133	1864	140	1893	91
1807	215	1836	143	1865	135	1894	84
1808	242	1837	140	1866	136	1895	83
1809	262	1838	140	1867	133	1896	81
1810	237	1839	153	1868	132	1897	83
1811	227	1840	145	1869	131	1898	85
1812	202	1841	142	1870	128	1899	91
1813	192	1842	125	1871	133	1900	100
1814	190	1843	118	1872	145	1901	93
1815	182	1844	115	1873	148	1902	92
1816	152	1845	123	1874	136	1903	92
1817	195	1846	123	1875	128	1904	93
1818	220	1847	130	1876	127	1905	96
1819	187	1848	113	1877	125	1906	103
1820	172	1849	107	1878	116	1907	107
1821	157	1850	107	1879	110	1908	97
1822	147	1851	110	1880	117	1909	99
1823	148	1852	108	1881	113	1910	104
1824	147	1853	123	1882	112	1911	107
1825	172	1854	138	1883	109	1912	113
1826	150	1855	133	1884	101	1913	113
1827	150	1856	137	1885	96	1914	113
1828	135	1857	142	1886	92		

This was accompanied by an inflation of credit and deflation of banking reserves, ending in a serious crisis 25 years of falling prices followed, until after 1850 an upward movement was started by the discoveries of gold in California and Australia The continued fall throughout the 3 last decades of the century is related to a steady decline in the gold output and the gradual adoption of the gold standard by various countries, leading to an increased demand for gold, while the rise in prices after 1900 follows an upward movement in the volume of gold production, due to the development of South African supplies Intermediate events of note were the world financial crises 1856–7 and 1863–4, the Overend Gurney failure of 1866, the Austrian, American and German crises of 1873, which caused a fall not interrupted till the trade revival of 1879, the French and American crises of 1882 and 1884, the Baring crisis of 1890, followed by an American crisis in 1893, the effects of which were felt till 1897, the South African war of 1900, which interrupted this succeeding revival and the steady upward movement of trade and prices from 1903 until the outbreak of the World War, interrupted only by the American financial crisis of 1907 The post-war figures show a rapid rise in prices, accompanying the brief period of inflation, which culminated in the slump of 1920–21, a final fall in prices being associated, after a brief upward movement, with the return to the gold standard in 1925

The relation between prices, wages and employment is shown by the next table, also extracted from Layton's book This gives average money wages, average retail prices, percentage of unemployment and real wages for the years 1850 to 1910 This table must be read subject to numerous qualifications, for which reference should be made to page 182, *et seq*, of the volume The retail price figure is that worked out by G H Wood (*see* article by him in *Statistical Journal* for 1909)

These figures show clearly the effect of prices and of unemployment on real earnings, *i e*, on the real standard of living of the working classes The steady rise in real earnings from 1860 to 1900 is remarkable, the peak being reached in that year, the subsequent real value of wages, in spite of a fairly constant level of money value, being reduced by the gradual rise in prices of commodities

The effects of the World War require separate treatment During the war the Gold Standard was abandoned and the currency divorced from gold As a result we find that the high level record attained during the Napoleonic wars was easily surpassed (more than 33⅓%) by the figure which was reached in July 1920.

Relations Between Prices, Wages and Employment
Pre-war Years

Year	Average money wages 1850=100	Average retail prices 1850=100	Percentage unemployed	Real wages: Of those in full work 1850=100	Real wages: Allowing for unemployment
1850	100	100	(4·0?)	100	96
1851	100	97	3 9	102	98
1852	100	97	6 0	102	96
1853	110	106	1·7	105	103
1854	114	122	2·9	96	93
1855	116	126	5 4	95	90
1856	116	126	4·7	96	91
1857	112	119	6 0	96	90
1858	110	109	11 9	102	90
1859	112	107	3 8	104	100
1860	114	111	1 9	103	101
1861	114	114	5 2	100	95
1862	116	111	8·4	105	96
1863	117	107	6·0	109	103
1864	124	106	2 7	117	113
1865	126	107	2 1	117	115
1866	132	114	3·3	116	112
1867	131	121	7 4	109	101
1868	130	119	7 9	110	101
1869	130	113	6 7	115	107
1870	133	113	3 9	118	113
1871	138	113	1 6	121	120
1872	146	120	9	122	121
1873	155	122	1 2	128	127
1874	156	117	1 7	133	131
1875	154	113	2 4	135	132
1876	152	110	3 7	137	131
1877	151	113	4·7	133	127
1878	148	110	6 8	132	123
1879	146	103	11 4	137	121
1880	147	107	5 5	134	127
1881	147	105	3 5	136	131
1882	147	106	2 3	135	132
1883	149	102	2 6	139	136
1884	150	100	8·1	144	132
1885	149	96	9 3	148	134
1886	148	92	10 2	151	136
1887	149	89	7 6	155	143
1888	151	89	4 9	157	149
1889	156	91	2 1	159	155
1890	163	91	2·1	166	162
1891	163	92	3·5	164	159
1892	162	92	6 3	163	153
1893	162	89	7·5	167	155
1894	162	87	6 9	170	158
1895	162	84	5 8	174	163
1896	163	83	3 3	176	170
1897	166	86	3 3	176	170
1898	167	87	2 8	174	169
1899	172	86	2 0	180	176
1900	179	89	2 5	183	179
1901	179	90	3·3	181	175
1902	176	91	4 0	177	170
1903	174	92	4 7	172	164
1904	173	93	6 0	170	160
1905	174	92	5·0	172	163
1906	176	92	3 6	174	168
1907	182	95	3 7	176	170
1908	181	97	7 8	172	159
1909	179	97	7·7	170	157
1910	179½	98	4·7	169	161

Taking 1914 as 100, the cost of living has since 1920 followed an almost continuously downward course as is shown by the figures below —

Cost of Living, Post-war Years

Year	*All Items*
1920	149
1921	126
1922	83
1923	74
1924	78

while the monthly figures for 1925, 1926 and 1927 have been as follow —

Beginning of month	1925	1926	1927
January	80	75	75
February	79	73	72
March	79	72	71
April	75	68	65
May	73	67	64
June	72	68	63
July	73	70	66
August	73	70	64
September	74	72	65
October	76	74	67
November	76	79	69
December	77	79	69

Wages.—The level of money wages in 1914 was about 6% above the level in 1910 The average percentage increase over the 1914 level in weekly full time wages has since 1920 been as follows —

Year	At end of: June	At end of: December
1920	150–155	170–180
1921	145–155	110 115
1922	85–90	70–75
1923	65·70	65–70
1924	70	70–75
1925	75	
1926	75	(whole year)

For the year 1927 (*Ministry of Labour Gazette*, Jan 1928 page 3), it was estimated that the weekly full time rates of wages of those classes of workpeople for whom particulars were available were between 70 and 75% on average above the level of the corresponding rates for August 1924

The hours of labour have been reduced in nearly all industries since 1914, the following table given in the above-mentioned issue of the *Ministry of Labour Gazette* showing the aggregate amount for the whole country —

Year	Approximate number of workpeople whose hours of labour were: Increased	Reduced	Aggregate net increase (+) or decrease (−) in weekly hours
1919	1,150	6,305,000	−40,651,000
1920	2,000	570,000	− 2,114,000
1921	31,500	12,900	+ 14,500
1922	16,000	302,700	− 93,000
1923	325,000	9,600	+ 108,750
1924	13,150	16,150	+ 12,500
1925	1,300	3,925	− 11,750
1926	934,200	340	+ 3,985,000
1927 (subject to revision)	18,650	1,650	+ 50,000

Unemployment.—The following figures complete the column for percentage unemployed already given

Year	*Per Cent Unemployed*
1911	3
1912	3 2
1913	2 1
1914	3 3

These figures relate only to the returns made by those trade unions which paid unemployment benefit to their members

In Nov 1920, when the Unemployment Insurance Act of that year came into operation, comprehensive information as to the volume of unemployment became available From that date the figures for the average annual percentages of insured persons unemployed in Great Britain and Northern Ireland are as follows —

Year	*Per Cent*	*Year*	*Per Cent*
1921	17 0*	1925	11 3
1922	14 3	1926	12·5*
1923	11 7	1927	9 7
1924	10 3		

*Exclusive of persons in the coal mining industry disqualified for unemployment benefit by reason of trade disputes

In order, however, to obtain a true picture, unemployment has to be viewed in relation to the increase of population

The Ministry of Labour's statistical survey of 1927, brought out the fact that the "average number of persons actually in employment in that year reached a higher level than in any previous year," and that the increase in the insured population between 1923—that is after the acutest phase of the depression—and 1927 had been 597,000, while the decrease of the incidence of unemployment in the same period had been 2 per cent The increase in the number of employed persons in the four years had, therefore, been well over 750,000 If there had been emigration on the pre-war scale, the available supply of labour in the country would, according to this view, have been inadequate for the needs of its new and expanding industries

Emigration.—Exact figures representing the net emigration from this country cannot be given for years prior to 1912, but the following figures founded on a table given in the *Survey of Industrial Relations* 1926, gives an approximate idea of the outward movement of population from 1900 to 1913 and from 1919 to 1927.—

Excess of Outward over Inward British Passengers in the Traffic Between the United Kingdom and Extra-European Countries

1901	72,016	1912	268,485
1902	101,547	1913	241,997
1903	147,036	1919	27,002
1904	126,854	1920	172,747
1905	139,365	1921	118,938
1906	194,671	1922	99,882
1907	235,092	1923	190,383*
1908	91,156	1924	88,441*
1909	139,693	1925	77,098
1910	233,709	1926	103,962
1911	261,809	1927	87,504

*From Apr 1, 1923, exclusive of passengers who departed from or arrived at ports in the Irish Free State.

Relief of Unemployment.—Prior to 1911, assistance to the unemployed had only been given by the poor law authorities in the form of relief on the ground of destitution In that year was passed the first Unemployment Insurance Act It covered only 2¼ million workpeople, out of some 14 millions, being confined to the building, woodworking, engineering and shipbuilding trades, which were at that time peculiarly affected by unemployment The premium under the scheme was contributed compulsorily by the employer, the workman, and the State in equal shares, and benefit was at the rate of 7/– per week In 1916 the scope of the Act was extended so as to cover certain trades which had been excessively expanded to meet the war emergency, against the anticipated post-war deflation, and in 1918, an Emergency Act was passed to provide relief for all persons thrown out of employment by the cessation of the war, this scheme was not covered by premium contributions, and it was ultimately succeeded by a new Unemployment Insurance Act of 1920 This Act covered about 12,000,000 persons, *i e*, speaking generally, all industrial workers with the exception of agricultural and domestic employees The State's contribution was reduced to about ¼ of the contribution of employer and employee, and rates of benefit were to be 15/– a week for men, 12/– a week for women, and at half those rates for workers under 18 There was a waiting period of three days before benefit could be claimed and payment was limited to 15 weeks in any one year and one week for each 6 weeks contributions Moreover, the claimant had to show that he had endeavoured but been unable to obtain suitable employment There were also certain other disqualifications, *e g*, if the loss of work was due to a Trade Dispute at the place of employment, dismissal for misconduct, etc The Act enabled industries which complied with certain conditions to contract out of its obligations

These various limitations were thought to be too rigid for the time, since they came into operation just at the time of the 1921 slump, and various acts were passed during 1921 relaxing and varying its provisions, an important new element being introduced in powers conferred on the Minister of Labour to pay "uncovenanted benefit" The scheme thus ceased to be a genuine insurance scheme, and could only be financed by borrowing from the Treasury on the security of future contributions. In spite of these relaxations, however, the scheme was not sufficient completely to cover the situation The uninsured trades, persons in insured trades who could not comply with the conditions entitling them to benefit, and persons whose circumstances rendered the rates of benefit insufficient, had recourse to poor law relief In other words, the poor law made good the gaps in the insurance scheme The following figures for the months of April, May and June give some idea of the situation in the year succeeding the coming into force of the 1921 Act

England and Wales	April	May	June
Average number of persons insured under Unemployment Insurance Acts (whether in receipt of unemployment insurance benefit or not) and wives and dependent children, who received relief in their own homes	912,323	961,153	1,090,488
Average number of other persons ordinarily engaged in some regular occupation, but not insured, and wives and dependent children, who received relief in their own homes	65,281	63,512	62,760
	£950,611 (4 weeks)	£984,803 (4 weeks)	£1,554,915 (5 weeks)
Total payment to insured persons			£3,261,170
,, ,, ,, uninsured persons			259,159

As unemployment fell, however, the need for emergency measures became less acute, and it was felt that the time had come to overhaul the Acts and make the scheme a genuine insurance scheme once more

The Government, therefore, passed the Unemployment Insurance Act, 1927, which contains the following provisions It abolished the distinction between "standard" and "extended" benefit, and with it the discretionary power of the minister to place restrictions on the grant of them The rates of contribution for young men and young women between the ages of 18 and 21 were to be 6d a week for men and 5d a week for women, from the employed person, 7d and 6d from the employer, and 5¼d and 3¾d from the State The weekly rate of benefit for men with no adult dependents was reduced from 18/– to 17/–, while the rate of benefit in respect of an adult dependent was increased from 5/– to 7/– Rates of benefit between the ages of 16 and 21 were to be as follows —

Aged 16 but under 18 years.				Boys	6/–	Girls		5/–
,, 18 ,,	,, 19	,,	Young men	10/–	Young women		8/–	
,, 19 ,,	,, 20	,,	,,	,,	12/–	,,	,,	10/–
,, 20 ,,	,, 21	,,	,,	,,	14/–	,,	,,	12/–

After a transitional period, it would be a condition of payment that at least 30 contributions had been paid in the 2 years preceding the date of claim, and the rule limiting the payment of standard benefit to one week of benefit to every 6 contributions, subject to a maximum of 26 weeks of benefit in a benefit year would cease to have effect Finally, the power of the Ministry of Labour to permit of contracting out, was to cease, but the position of the two existing schemes, namely, those for the banking industry and the insurance industry, was preserved

Another method adopted by the State to deal with the problem of unemployment was the provision and subsidising of relief work in various forms The classes of work included road work, land drainage, water supply, forestry, etc, while there were two schemes designed for the general stimulation of trade, *i e*, the "trade facilities" and "export credit" schemes

Trade Facilities.—The first of these was introduced in 1921, and empowered the Treasury to guarantee the interest and capital of loans raised for the purpose of capital expenditure, calculated to promote employment This scheme has been periodically renewed, but will lapse shortly The guarantees have been practically confined to public utility undertakings, and the total amount of those given up to March 31, 1927 was £74,251,780

Males and Females

Industry	Numbers engaged in each industry					
	1881	1891	1901	1911 (a)	1911 (b)	1921
Total aged 10 years and over	19,306,000	22,054,000	25,324,000	28,519,000	28,519,000	31,046,000
Total occupied	11,162,000	12,752,000	14,329,000	16,284,000	16,284,000	17,178,000
Agriculture	1,353,000	1,285,000	1,198,000	1,297,000	1,230,000	1,124,000
Mining and Quarrying	509,000	630,000	791,000	1,028,000	1,127,000	1,286,000
Manufacture of Metals (not precious), Machines, Implements, Conveyances	796,000	941,000	1,232,000	1,506,000	1,516,000	2,126,000
Manufacture of Textiles, including	997,000	1,058,000	995,000	1,123,000	1,174,000	1,142,000
Cotton	488,000	546,000	529,000	605,000	628,000	596,000
Wool and Worsted	222,000	242,000	210,000	223,000	233,000	237,000
Manufacture of Textile Goods and Clothing	?	?	1,025,000	1,044,000	1,050,000	815,000
including Dressmaking and Millinery	?	?	391,000	410,000	401,000	191,000
Manufacture of Food	?	?	217,000	295,000	337,000	378,000
,, ,, Drinks	?	?	?	?	108,000	117,000
Building, Decorating and Contracting	?	?	1,052,000	961,000	861,000	758,000
Transport and Communications, including	?	?	?	?	1,127,000	1,204,000
Railways	?	?	?	?	455,000	549,000
Roads	?	?	?	?	291,000	297,000
Water	?	?	?	?	284,000	330,000
National Government and Defence	?	?	?	?	414,000	647,000
Local Government	?	?	?	?	489,000	689,000
Personal Service (including Hotels) and including	?	?	?	?	2,452,000	2,025,000
Private Personal Service	?	?	?	?	1,527,000	1,232,000

NOTE The figures for 1881–1911 (first column) exclude clerks, carmen, and certain other occupations common to all industries 1911 (second column) and 1921 include all persons engaged in the industry

Export Credit.—The export credit scheme was initiated in 1920, and has been amended several times to meet the difficulties disclosed by experience of its operation Under this scheme the Department of Overseas Trade was authorised to grant exporters credits in connexion with exports to foreign countries, and to insure risks not otherwise insurable on reasonable terms

The total amounts of the credits guaranteed since the inception of the scheme up to Dec 31, 1927, are as follows —

Under the Guarantee scheme which became operative on July 1, 1921	£6,260,568
Under the Exports Credit Guarantee scheme operative from July 1, 1926	
Applications approved	£2,439,814
Guarantees given	£ 851,475

Population and Employment.—The preceding table shows the Population in the Census years 1881 to 1921 and the total number of persons occupied in those years, together with the number of persons occupied in the most important industries This table is extracted from one appearing on page 418 of *The Survey of Industrial Relations* issued by the committee on industry and trade, in 1926

Industrial and Geographical Distribution of Population.—Great difficulty exists in comparing the distribution of the population at different periods, owing to the fact that the classifications adopted in the decennial census have varied and to the fact that Scotland is dealt with on a different basis to England and Wales Professor Bowley has, however, made a valuable study of the figures of the censuses for 1911 and 1921 for England and Wales (*see* London and Cambridge Economic Service *Special Memoranda* 17 and 17A, London School of Economics) In his first memorandum he makes a fuller analysis of the numbers occupied in the principal industries in 1911 and 1921 respectively This may be compared with the table just given Professor Bowley points out that the total number of males increased 6% and that of females 5% in the ten years Attention is called to the marked decrease of those engaged in personal services, the decrease in the textile trades, chiefly in cotton, in clothing industries, and in woodworking and building On the other hand, very large increases are found in metals and metal producing (which include engineering and shipbuilding) chemical products and in Government services, and sport and entertainment These two last items have perhaps some social significance

Professor Bowley in his second memorandum compares the position in the two census years, 1911 and 1921 of the chief industries by county groups, and according to sex This table is on the next page

It will be observed that the year 1921 was the first year of the great post-war depression, and therefore not very typical Many tendencies which have since developed more fully were scarcely traceable at that time The second table does, however, give an indication of the transference of industry from the north to the south, which is still in progress The rate of increase in the London and home counties area is larger than in any other district, and this is most noticeable in the engineering groups of industries, while there is a considerable decrease in the textile group in Lancashire and Yorkshire

The following table founded on one given in the *Ministry of Labour Gazette* for Nov 1927, shows the total numbers of insured persons in each of the divisions in which the country is divided for the purpose of the Unemployment Insurance Acts in July 1923 and July 1927, with the percentage variation —

Division	Estimated number of insured persons				Percentage increase on the estimated numbers insured July 1923 July 1927
	July 1923		July 1927		
	Nos	Per cent of total	Nos	Per cent of total	
London	2,004,000	17 6	2,150,000	17 9	plus 7 29
S Eastern	756,000	6 6	875,680	7 3	,, 15·83
S Western	767,000	6 7	832,980	6 9	,, 8 60
Midlands	1,682,000	14 8	1,783,420	14 9	,, 6 03
N Eastern	1,964,000	17 2	2,024,720	16 9	,, 3 09
N Western	2,071,000	18 2	2,148,190	17 9	,, 3 73
Wales	618,000	5 4	629,190	5 2	,, 1 81
Scotland	1,288,000	11 3	1,305,720	10 9	,, 1 38
N. Ireland	252,800	2 2	254,000	2 1	,, 0 47
Total	11,402,800	100 0	12,003,900	100 0	plus 5·27

The southern divisions (London, S E , S W , and Midland) contained 47% of the insured population of Great Britain and N. Ireland in July 1927, as against 45 7% in July 1923, and shows an increase of 8 32% during the period as against an increase of 5 27% for the whole of the territory

BIBLIOGRAPHY —W T Layton, *An Introduction to the Study of Prices, Quarterly Economic Supplements* of the Federation of British Industries (Jan 29, 1924 to Dec 31, 1927), Board of Trade *Journal*, Ministry of Labour *Gazette*, Committee on Industry and Trade *Survey of Industrial Relations* (1926), *The Third Winter of Unemployment* (1922), Unemployment Insurance Acts (1911 & 1927), Trade Facilities Acts (1921 to 1926), *Reports* of Export Credits Guarantee Department (E C G 1 H M Stationery Office), and London and Cambridge Economic Service (*Memoranda* No 17 and 17[a], A L Bowley)

Males

Thousands and decimals, *e g*, 15·5 stands for 15,500

Industry	England and Wales		London, Middlesex, Surrey, Kent, Essex and Herts		Lancashire, Cheshire		Yorkshire		Northumberland, Durham, Westmorland, Cumberland		Staffordshire, Warwickshire, Worcestershire		Derby, Leicester, Nottinghamshire		Monmouth, Glamorgan, Radnor, Brecknock, Carmarthen, Pembroke, Cardigan	
	1911	1921	1911	1921	1911	1921	1911	1921	1911	1921	1911	1921	1911	1921	1911	1921
Coal and Shale Mines	885	990			104 9	109·7	138 3	155·8	208 0	223·5	76·2	85 8	106 6	125 1	215 1	244·3
Brick, Earthenware, China	135	128	15 5	16 5	19·4	19 2	17·3	16 1	6 9	5 6	45 4	39·6	7 7	7 6	3 0	2·3
Chemical Products	107	148	31 8	40·6	36 0	50 6	14 0	19 9	5 9	6 3	6 4	6·6	2 1	2·9	1 2	1·5
Iron and Steel Manufacturing	165	232	4	1 2	10 6	16 8	63 4	96·0	21 6	24 8	36 6	44 5	3·6	6 8	20·2	27 0
Tinplate, etc	28	34		1	2 2	2 7	2	·4	1	·2	·8	1 4			22 7	23·0
Engineering and Shipbuilding	629	845	80·2	127 9	157 5	194 0	91 0	99 8	102 6	137 4	45·4	56 8	32 2	38 8	16 4	21·0
Electrical Apparatus	69	127	28·0	45 9	15 5	30 7	3 3	6 6	3 0	3 8	9 6	20 5	2 7	3 5	8	1·3
Vehicles	187	326	39 8	68 5	20 2	40 3	14 2	22 7	4 4	7 9	52 9	84 8	11 1	22·9	4 1	5·8
Precious Metals, Watches	51	47	13 9	12 7	2 8	2 6	8 1	7 1	8	·7	19 7	17 0	8	5	5	·5
All other Metal Trades	337	340	49·3	49 5	41 5	41 1	55 2	55 8	11 9	11 3	111 7	124 4	10 8	7 6	12 2	9·6
Textile Manufactures	439	409	7 0	9 5	240 8	214 3	125 4	117 9	2 4	2 4	9 1	10 9	40 1	34 4	1 3	1 1
Bleaching, Dyeing, etc.	78	80	1·6	1·4	48·7	45·7	19·7	20 9	·2	·4	·9	·9	6 3	9·2		
Tanners, Fur, Leather Goods	68	58	22·4	19 7	8 4	8·5	8 2	5 9	1 8	1 7	10 5	5 1	2 7	2 2	9	7
Tailors	131	126	50 2	51 1	20 1	19·9	19 0	18 2	5 0	3·8	6·9	6 1	4·6	4·1	4 3	3·6
Boots	172	146	31·8	24·2	16·9	13·3	13 8	8 7	4 6	3 2	9·7	7·3	26·7	25·2	3 9	3·0
Other Clothing Industries	43	40	11 6	11 0	11 3	8 7	8	7	·2		2 5	1 8	1 1	1 0	1	
Timber	58	76	16 6	19·2	8 7	9 6	6 4	6 3	4·0	4 9	3 7	4 ·	2 1	2 4	2 3	2·8
Furniture	86	90	36·3	26·4	11 7	8·4	8·0	5·7	2 7	2·1	5 0	3 7	2 8	2 7	1 6	1·2
Other Wood Industries	75	58	27 0	20 7	12·8	7·8	7 4	4·9	2·1	1·4	6 6	5 1	3 5	2 6	1 5	1 6
Printing, Stationery, etc	162	183	84 4	93 1	19·8	22·0	11 8	12·4	3·6	4 5	8 9	9 6	7 1	7 0	2·3	3 0
Food Preparation	315	326	92·2	89 3	451·0	46·9	26 4	26 4	9 7	9 1	30 7	31 0	12 2	10 1	10 7	4·9
Total in Industries named above	4,220	4,809	640·0	728·5	854·9	912·8	651 9	708 2	401 5	455 0	499 2	567 1	286 8	316·6	325 1	358 2

Females

Thousands and decimals, *e.g*, 29 3 stands for 29,300

Industry	England and Wales		London, Middlesex, Surrey, Kent Essex and Herefordshire		Lancashire, Cheshire		Yorkshire		Northumberland, Durham, Westmorland, Cumberland		Staffordshire, Warwickshire, Worcestershire		Derby, Leicester, Nottinghamshire		Monmouth, Glamorgan, Radnor, Brecknock, Carmarthen, Pembroke, Cardigan	
	1911	1921	1911	1921	1911	1921	1911	1921	1911	1921	1911	1921	1911	1921	1911	1921
Brick, Earthenware, China	36	49	·7	2 1	1 5	3 3	5	1 7	1 0	1 6	29 3	35 9	1 3	2 3	2	3
Chemical Products	25	50	10 4	19 4	6 1	14·9	3 2	5 9	5	1 6	2 2	2 6	4	1 6	1	1
Electrical Apparatus	11	39	5·8	18 7	1 9	8·3	·1	9	7	6	2·0	7·0	·4	1 0		·2
Vehicles	11	31	·9	5 5	·5	2 1	·3	1 5		·4	7 8	16 3	·6	1·6		·2
Precious Metals, Watches, etc	18	23	1 7	2·8	·4	·6	4·8	6 1	.		11 2	13·0	·1	1		
Engraving and other Metal Trades	79	151	9 6	21 5	5 5	16 7	9 8	21 6	1 5	5 5	44 6	67 2	1 9	4 7	3·3	5 2
Textile Manufacture	644	632	12 9	11 3	361 2	348 5	153 4	149·5	4·7	4·7	16·6	20 3	76 8	76 0	·9	·6
Bleaching, Dyeing, etc	12	22	·7	·5	8·1	23·9	1·3	4·2			·2	·2	1 2	4·7		·1
Tanners, Fur, Leather Goods	18	22	8 3	10·2	1 0	2 4	·8	1 1	·5	·4	6 4	4 5	·3	6		·1
Tailors, Dressmakers	526	346	173·9	115 9	77 3	55·9	61 2	47·8	21·0	11 1	32·9	20 1	22 6	14·2	23·5	11 9
Boots	46	52	5 9	6 2	2·4	3·4	1·9	1·6	·4	·4	2·6	3 0	11·9	13·9	·1	1
Other Clothing Industries	131	105	44 5	32·7	28·3	23·2	5·3	4·7	1 6	1·3	8·9	6·1	5·6	4·1	·9	·6
Furniture	14	10	6·0	3·7	1·5	·9	1 4	1·0	3	·3	1 9	1 1	·4	·4		·1
Other Wood Industries	9	14	3 5	5·0	1 9	2·5	1 2	1·6	2	1·1	1·0	1 6	·4	·7	·1	·3
Printing, Binding, Stationery	88	107	41·8	49·9	13·6	15·5	7 3	7 7	1 9	2 6	7·5	8 3	4 0	4·8	6	1·1
Food Preparation	130	169	37·1	51 7	27·9	33·6	16·2	19·6	7·9	9·3	10·0	12·2	2 9	5 0	3·6	3 5
Total in the Industries named above	1,798	1,822	363·7	357·1	539·1	555·7	268·7	276·5	42 2	40 9	185·1	219 4	130·8	135·7	33·3	24·4

SECTION 9: HOUSING

One of the greatest social problems has always been to ensure that an increasing population was adequately housed Even before the war British housing fell sadly short of the ideal standard. According to the census of 1911 no fewer than $\frac{1}{10}$ of the population were living in overcrowded conditions, *i e*, more than two to a room (including living rooms) The shortage extended to both town and country and in addition a number of the working class houses in occupation were dilapidated and insanitary, large areas in many cities being characterised as slum areas At the end of the World War, there was estimated to be a shortage of houses of between 300,000 and 400,000, in addition to considerable arrears of work to be done in slum clearance and making good defective dwellings This deficit had arisen from two causes. There had been a distinct slowing up of the normal rate of building from 1910 to 1914, and during the war very few working class houses were built at all The estimated normal annual requirements to meet the natural increase of the population are 70,000 new houses and 30,000 to replace those which go out of use for various causes

The position at the conclusion of hostilities was further complicated by the great shortage of building materials and building trade workers, with a concomitant rise in the cost of building Therefore not only was there a severe shortage of houses, but it seemed impossible that houses to make good this shortage could be supplied by normal methods at rents which would be within the means of the working classes to pay and which would adequately remunerate the capital expended It was generally felt that to leave the solution of this problem to the play of ordinary economic forces would involve an intolerable strain upon the health and social stability of the nation and it became necessary to take special measures Local authorities had already under existing legislation (the principal acts being the Housing Act of 1890 and the Housing and Town Planning Act of 1909) considerable powers of providing for the working classes, and improving the standard of existing houses On July 31, 1919 was passed a new act, which completely transformed the position of those authorities, converting what had been a power into a positive obligation, and enabling the State to reimburse them all expenditure exceeding the produce of a penny rate, incurred for this purpose

Under the combined provisions of subsequent legislation, the ordinary rates of Exchequer grant payable to local authorities and other bodies in respect of qualified houses were as follows —

£6 per house per annum for 20 years in respect of houses not subject to the special conditions as to rents, etc, prescribed by section 3 of the 1924 Act

£9 per house per annum for 40 years for houses subject to the special conditions and situated in a non-agricultural parish.

£12 10s per house per annum for 40 years for houses subject to the special conditions and situated in an agricultural parish as defined by Section 2 (2) of the 1924 Act

Up to Nov 12, 1927 a total of £58,900,669 had been paid by the Government in respect of housing schemes under these Acts, while the total expenditure on housing of local authorities in England and Wales for the years 1918–1925 was as the following table shows

Year (1)	Expenditure from revenue: Maintenance and other expenses (2)	Loan charges* (3)	Total (4)
	£	£	£
1918–19	406,123	696,361	1,102,484
1919–20	746,304	717,559	1,463,863
1920–21	1,334,250	2,820,490	4,154,740
1921–22	1,896,213	8,094,575	9,990,788
1922–23	2,642,235	11,752,319	14,394,554
1923–24	2,993,427	12,662,227	15,655,654
1924–25	3,940,242	13,387,705	17,336,947

*"Loan charges" comprises interest, repayments of principal otherwise than out of sinking funds, and payments into sinking funds.

Year	Expenditure from capital: Out of loans	Out of other capital moneys	Total
	£	£	£
1918–19	131,717	(a)	131,717
1919–20	4,843,386	(a)	4,843,386
1920–21	52,209,823	(b) 130,178	52,340,001
1921–22	81,725,737	(b) 187,966	81,913,703
1922–23	29,644,089	(b) 197,368	29,841,457
1923–24	11,301,844	(b) 626,282	11,928,126
1924–25	24,268,378	1,149,407	25,417,785

(a) Capital expenditure (if any) other than out of loans is for these two years included in column 2 above, separate particulars not having been obtained

(b) For all local authorities except rural district councils, whose capital expenditure other than out of loans (if any) is included in column 2 (above)

In regard to actual house construction the total number of houses built in England and Wales between the armistice and March 31, 1927 was as follows —

Year	State assisted	Unassisted	Total
1920	715		
1921	28,549	53,500*	251,988
1922	101,071		
1923	67,853		
1924	18,664	67,546	86,210
1925	67,669	69,220	136,889
1926	106,987	66,439	173,426
1927	153,779	63,850	217,629
Totals	545,287	320,855	866,142

*Separate figures are not available for the years 1920–23 and the number is based partly on an estimate

The number and nature of the houses built during the last 12 months of this period was as shown in the following table —

	Half year ended: Sept 30	March 31	Total
State assisted houses			
1 Local authorities			
1919 Act	531	351	882
1923 ,,	7,637	6,484	14,121
Totals	30,732	37,361	74,093
2. Private enterprise			
1923 Act	38,085	40,400	78,485
1924 ,,	546	655	1,201
Totals	38,631	41,055	79,686
Total assisted	75,363	78,416	153,779
Unassisted houses	31,200	32,650	63,850
Grand totals	106,563	111,066	217,629

The proportion of houses built with State assistance and by private enterprise between 1923 and 1927 was as follows —

	Houses built by private enterprise: With state assistance	Without state assistance	Houses built by local authorities with state assistance	Total
1923 24	4,311	67,546	14,353	86,210
1924–25	47,045	69,220	20,624	136,889
1925–26	62,769	66,439	44,218	173,426
1926–27	79,686	63,850	74,093	217,629

It remains to add that the rate of construction was well maintained through 1927, the millionth house being completed in September, and the total between Jan 1, 1919 and Dec. 31, 1927, being 1,062,629.

BIBLIOGRAPHY.—*Memorandum* by the Advisory Housing Panel on the Emergency Reconstruction Problems (Ministry of Reconstruction, Cd 9087, 1918), *Housing in England and Wales* (Ministry of Reconstruction, 1918), *Annual Reports* of the Ministry of Health; and publications of the National Housing and Town Planning Council

SECTION 10: SAVINGS

The establishment of the savings bank in Great Britain dates from the year 1799, when the first private bank was founded The post office savings banks were founded in 1861, at which date there were over £40,000,000 invested in the trustee banks The Government institutions gradually overhauled the other system, and at the end of the century, whereas the trustee banks had only increased their deposits to about 50 millions, the post office banks had over 140 million deposits

The intermediate development is shown by the following table —

Year ending 31st December	Average number of accounts	Average amount of deposits	Average balance in each account	Average number of offices
		£	£	
1863–68	663,000	7,000,000	11 3 5	3,290
1869–74	1,373,000	18,000,000	13 5 3	4,498
1875–80	1,889,000	29,000,000	15 12 5	5,742
1881–85	3,088,000	42,000,000	13 11 3	7,348
1886–90	2,248,000	59,000,000	13 16 10	9,025
1891–95	5,776,000	83,000,000	14 7 0	10,888

Between the foundation of the banks and the end of 1899, upwards of £648,000,000 inclusive of interest was credited to depositors, of which £474,000,000 was withdrawn There were 232,634,596 deposits, 81,804,509 withdrawals, 27,071,556 accounts opened and 18,631,573 accounts closed The cross entries, or instances where the account is operated upon at a different office from that at which it was opened, amounted to 33% It is chiefly in respect of this facility that the post office savings bank enjoys its advantage over the trustee savings bank

In 1905, 16,320,204 deposits were made, amounting to £42,300,617. In the same year the withdrawals numbered 7,155,282, the total sum withdrawn being £42,096,037 The interest credited to depositors was £3,567,206, and the total sum standing to their credit on Dec 31, 1905, was £152,111,140

The following are the figures for the total amount standing to the credit of depositors at the end of 1914 and in certain of the years succeeding the war:—

Year	*Amount*	*Increase or Decrease* %
1914	190,533,207	12 5
1918	234,633,322	10 11
1921	264,156,528	19 8
1923	273,070,983	7 1
1925	285,491,388	0·5
1926	283,658,417	1 11

The last year no doubt showed the effect of the coal stoppage

During the World War great efforts were made to increase the volume of national savings, and in 1916 the national savings movement was instituted in order to find some means whereby the resources of the small investor could be made available to the State in the national emergency The instrument adopted was the "war savings certificate," a British Government security, registered and non-negotiable, and accumulating compound interest over a fixed period free of income tax After the end of the war the war savings committee and war savings certificate dropped the word "war" from their titles and became part of a national savings organisation which now embraces local committees, savings associations, regional conferences and a national savings assembly which meets annually The certificate now costs 16/– and its value after 10 years is 24/–. Certificates are repayable at any time at the option of the holder, but owing to the exemption from income tax, it has been thought necessary to limit the individual holding to 500 The following figures show the actual amounts subscribed under the scheme year by year, and the net amounts subscribed after deducting repayments:—

Savings Certificates Issued up to March 31, 1927

	Actual amount subscribed at 15/6 or 16/– per certificate	Net amount subscribed after deducting repayments
	£	£
From commencement to March 31, 1917	75,607,798	74,487,067
April 1, 1917 to March 31, 1918	66,514,526	63,262,760
,, 1, 1918 ,, ,, 31, 1919	97,921,218	89,221,217
,, 1, 1919 ,, ,, 31, 1920	71,519,471	46,569,771
,, 1, 1920 ,, ,, 31, 1921	41,195,948	11,454,703
,, 1, 1921 ,, ,, 31, 1922	93,338,798	57,145,067
,, 1, 1922 ,, ,, 31, 1923	39,675,050	11,708,246
,, 1, 1923 ,, ,, 31, 1924	45,208,520	12,293,020
,, 1, 1924 ,, ,, 31, 1925	32,225,544	2,696,253
,, 1, 1925 ,, ,, 31, 1926	35,115,630	6,737,556
,, 1, 1926 ,, ,, 31, 1927	31,924,514	3,752,331
Total from commencement to March 31, 1927	630,247,017	371,823,329

Another repository of savings which should be mentioned is the building society The total assets of these societies in 1925 was £169,100,000, and the number of members 1,133,281

Efforts have been made to estimate the total of national savings and to compare the post-war with the pre-war rate of saving These must be more or less conjectural According to the committee on industry and trade (*Factors in Industrial and Commercial Efficiency*, 1927, p 55) the national savings immediately before the war amounted to between £380 and £400 millions per annum At the price level of 1925 that would have amounted to between £600 and £650 millions The actual savings of 1925 were estimated by different authorities at £400, £450, and £500 millions Taking everything into consideration, therefore, it seems probable that the deficiency in the rate of saving in 1925 was at the rate of about £150 millions per annum

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AGRICULTURE

In spite of the rapid growth of manufactures and commerce in Great Britain during the past hundred years, agriculture remains the largest industry of the country It employs over one and a quarter million persons The area devoted to it is about four-fifths of the country's land—over 45,100,000 acres out of the total area of 56,200,000 acres The agricultural output of Great Britain in 1925 was probably worth £275,000,000

The agricultural land is classified into three groups—arable, permanent grass and uncultivated rough grazings The following table shows the area of each in 1926 —

(*Thousands of Acres*)

	England and Wales	Scotland	Great Britain
Arable land	10,548	3,194	13,742
Permanent grass	15,128	1,499	16,627
Rough grazings	5,064	9,710	14,774
Total	30,740	14,403	45,143

The total area in each category is not very dissimilar, but the distribution varies considerably as between Scotland and England and Wales In Scotland over two-thirds of the land used for agriculture is uncultivated rough grazings, mostly of mountain type, while more than two-thirds of the cultivated area is arable land; in England and Wales three-fifths of the cultivated area is under permanent grass and only one-sixth of the total agricultural land is rough grazings In these circumstances the number of persons employed per acre is much lower in Scotland than in England and Wales

Apart from the period of the World War, when special efforts were made to produce as much home-grown corn as possible, economic influences have for many years led to the laying down of arable land to permanent grass. The increased production of corn in the new countries of the world caused prices of corn to fall and the production of meat and milk to become relatively more profitable The extent to which arable cultivation has been reduced between 1871 and 1926 may be seen from the following figures·—

(*Thousands of Acres*)

Average of Years	England and Wales		Scotland		Great Britain	
	Arable land	Permanent grass	Arable land	Permanent grass	Arable land	Permanent grass
1871–75	14,766	11,799	3,476	1,085	18,242	12,884
1881–85	13,747	13,838	3,604	1,195	17,351	15,033
1891–95	12,676	15,116	3,543	1,356	16,219	16,472
1901–05	11,914	15,545	3,463	1,429	15,377	16,974
1911–15	11,131	16,013	3,313	1,494	14,444	17,507
1921–25	11,144	14,805	3,298	1,422	14,442	16,227
1926	10,548	15,128	3,194	1,499	13,742	16,627

The reduction in the arable area has been relatively less rapid in Scotland than in England and Wales, possibly owing to the fact that much of Scotland's arable land would very quickly revert to rough grazings if left for many years under grass Changes have, however, been much less marked in some parts of England than in others, the eastern counties, where rainfall is small and good permanent pasture is difficult to maintain, showing the smallest decreases in arable land

Areas Devoted to Chief Crops.—The three chief corn crops have not shared equally in the reduction of the corn area, indeed, the area under oats increased, the decrease being confined to wheat and barley In the fifty years from 1871–75 to 1921–25 the area under wheat was reduced by about one-half and that of barley by over one-third, while the acreage of oats was increased by one-eighth The heavy reduction in the wheat acreage, as compared with other cereals, was no doubt mainly a result of the greater fall in price of this grain, while the increase in the acreage of oats was apparently due to the substitution of this crop for other cereals, as the bulk of it is used for feeding to stock on farms and its selling value is not the chief consideration The relatively low prices for grain crops since 1921, as compared with most other classes of farm produce, have led to further reductions in the area of corn

Acreage of Corn Crops in Great Britain

	Average 1871–75	Average 1921–5	1926
	(Thousands of Acres)		
Wheat	3,527	1,803	1,646
Barley	2,367	1,510	1,270
Oats	2,672	3,009	2,804
Total corn crops (including rye, beans and peas)	9,518	6,922	6,225

Nearly one-half of the total acreage of wheat in Great Britain is to be found in the ten eastern counties of England from the East Riding to the Thames as far inland as Bedford and Huntingdon, while over one-half of the barley acreage is in the same ten counties The acreage of oats on the other hand is fairly evenly distributed throughout the country, this being by far the chief corn crop in the west and north where the total arable area is smallest The density of the wheat crop is greatest in Cambridge and Huntingdon, and passing from these counties it becomes gradually less dense in all directions except for two or three counties in the east of Scotland in which appreciable areas are grown Barley is most densely grown in Norfolk and Rutland, and generally is a much more important crop along the seaboard from the Thames to the Moray firth than in the middle or west of the country

The area devoted to potatoes has not followed the decline in the arable area, but has increased during the past 50 years This increase in the potato acreage has been necessary to meet the requirements of the rising population Potatoes are grown most extensively in Lancashire and Cheshire in the west of England and in the south of Lincoln and the Isle of Ely in the east In the last 50 years the acreage of potatoes has changed little in Lancashire and Cheshire, but in the eastern counties named above and in the adjoining counties the acreage has been trebled during that period Potatoes are also an important crop in some of the eastern counties of Scotland

The acreage of mangolds has been maintained, owing to the value of this crop as a food for dairy cattle, the numbers of which have increased On the other hand, turnips and swedes, which are expensive crops to grow and are more liable than mangolds to damage by pests and adverse weather conditions, have been grown on rapidly declining areas, so that they now occupy little more than one-half the area of 50 years ago The acreage of clover and rotation grasses has shown comparatively little reduction With the aid of the sugar subsidy sugar beet has become a crop of importance in the last few years

Acreage of Certain Arable Crops and Bare Fallow in Great Britain

	Average 1871–75	Average 1921–25	1926
	(Thousands of acres)		
Potatoes	550	652	641
Turnips and swedes	2,129	1,249	1,158
Mangolds	340	301	340
Sugar beet		23	129*
Clover and rotation grasses	4,389	4,017	3,987
Bare fallow	623	441	424

*Increased to 233,000 acres in 1927

Yields.—The crop statistics provide little evidence that there has been any appreciable change in the productivity of the land since produce statistics were first collected in 1885 The returns show that average yields rose somewhat until the first decade of the 20th century, after which they fell away, although since the war they seem to be recovering In the *Report* on the agricultural output of England and Wales published early in 1927 it is stated that

"For practically all farm crops except potatoes the period of maximum yield was approximately the ten-year period 1901–10, and especially the latter half of the period, in which it was rare to find any crop yielding in any year less than the average for the previous decade For this the weather must have been mainly responsible as also for the falling off which occurred shortly before the outbreak of war Subsequently, yields were probably affected by war conditions owing to the shortage of labour and fertilisers, but since the end of the war there has been an apparent recovery Although this variation in yields is of interest it appears in the main to be due to climatic conditions over which the farmer has no control There is no evidence of a general increase in the actual productivity of crops nor the reverse, as one would hesitate to attribute the declining average yields of recent years to any cause other than the weather and to some extent, war conditions In the case of wheat, beans and mangolds, notwithstanding the decline in recent years, the general level is still well above that of the early years, a condition which does not, however, apply to other crops, particularly barley"

The average yields per acre of the chief crops in Great Britain have been as follows —

	1885–94	1901–10	1917–26
	Cwt	Cwt	Cwt
Wheat	16·2	17·5	17·4
Barley	15·8	16·0	15·1
Oats	13·6	14·3	14·0
Beans	14·0	16·2	15·5
Peas	13·5	14·6	13·8
Seed hay	28·2	30·1	28·8
Meadow hay	23·9	23·8	21·1
Hops	7·7	9·0	11·9
	Tons	Tons	Tons
Potatoes	5·8	6·1	6·2
Turnips and swedes	13·1	14·4	13·9
Mangolds	17·4	20·0	19·3

Live Stock.—With the conversion of arable land to grass live stock have become of increasing importance in the agriculture of Great Britain, but the increase has been confined to cattle Pigs have fluctuated about a mean which has shown little change, though there is some evidence of an increase since the Great War, while sheep have more or less steadily declined in numbers

Cattle—Cattle occupy a predominating position in British agriculture, accounting for about 40% of the total output from the farms of Great Britain In the 50 years from 1871–75 to 1921–25 the total number of cattle increased by 20%, while the increase in the dairy herd was even greater, the addition being nearly 40 per cent In neither case, however, did the increase keep pace with the increase in population, the number of the dairy herd per 1,000 of population being 10% less and of other cattle about 20% less in the later than in the earlier period The needs of the increasing population for fresh milk were met by the additions to the dairy herd, but this was not the case as regards butter and cheese, of which more has been imported as the years have advanced Similarly more and more beef has been imported to supply the increased demand

The numbers of cattle in Great Britain during the 55 years 1871–1926 have been as follows —

(*Thousands*)

Average of years	Cows and heifers in milk or in calf	Other cattle	Total cattle
1871–75	2,204	3,609	5,813
1881–85	2,353	3,757	6,110
1891–95	2,562	4,078	6,640
1901–05	2,627	4,147	6,774
1911–15	2,825	4,272	7,097
1921–25	3,053	3,942	6,995
1926	3,207	4,244	7,451

The check in the increase in the number of cattle in 1921–25 resulted from an extensive slaughter of calves at the end of the war food control, due primarily to the decontrol of veal prices in advance of those of other meat, but since 1921 there have been increases each year, and in 1926 the number was the largest ever recorded The density of cattle on the land is naturally larger in the grass areas of the west of the country than in the east, for example, Norfolk, Suffolk, Essex and Cambridge in England, and Berwick, Roxburgh and Selkirk in Scotland have fewer than 140 cattle per 1,000 ac, whilst the north-western counties of England and Wales as far south as Salop and Staffs, one or two of the south-western counties of England (notably Cornwall), and some of the south-western counties of Scotland have over 300 cattle per 1,000 acres of cultivated land The greatest concentration of dairy cattle is in Cheshire, where there are 250 per 1,000 ac of land, and the group of counties centred on Cheshire—including Flint, Lancashire, Derby and Stafford—forms an area in which dairying is more intensive than in any other part of the country Somerset, Dorset and Wiltshire in the south-west of England, and Ayr, Lanark and Wigtown in the south-west of Scotland are also areas where dairying is carried on very largely, there being over 150 dairy cattle per 1,000 ac in each of these counties Many counties on the eastern side of the country, on the other hand, have fewer than 50 dairy cattle per 1,000 ac of cultivated land Increases in the number of dairy cattle have taken place in all parts of the country during the past 50 years

Sheep—The number of sheep in Great Britain, though fluctuating to some extent, has on the whole declined during the 50 years 1871–75 to 1921–25 The ravages of liver fluke and unfavourable weather in the first decade of this period caused a sharp fall which was subsequently partially recovered, while the numbers were reduced very sharply towards the end of the war, and immediately thereafter, since when there has been a good recovery Between 1920 and 1926 the flocks of the country have been increased by 4,320,000 or 22 per cent Changes in the number of sheep in different parts of Great Britain have, however, varied considerably, as will be seen from the following table —

(*Thousands*)

	Number of sheep			
	England	Wales	Scotland	Great Britain
1871–75	18,518	3,111	7,161	28,790
1881–85	15,683	2,748	6,883	25,314
1891–95	16,535	3,336	7,409	27,280
1901–05	14,752	3,719	7,178	25,649
1911–15	14,069	3,790	7,015	24,874
1921–25	10,788	3,597	6,826	21,211
1926	12,722	4,137	7,203	24,062

During the 50 years covered by the table the numbers of sheep have been maintained in Scotland and increased in Wales, the whole of the reduction being confined to England A sub-division of the figures for England, however, shows that there was practically no reduction in the northern counties, while in the eastern counties the numbers in 1921–25 were less than one-third those of 1871–75, and in every other part of England except the south-west the decreases were 50% or more during the same period The reduction in the sheep population, therefore, has been most drastic in the arable counties, and sheep breeding has made headway or at least held its own in those areas where costs are low owing to the existence of extensive rough grazings on hill land The sheep population is naturally most dense in the mountain districts, in several counties reaching up to one per acre of the total agricultural area, including rough grazings, while in some parts of the eastern counties they run lower than one for every 10 acres In very few counties, however, are sheep much more dense on the ground than in Kent, where there are 110 per 100 ac, the marsh lands of that county being very heavily stocked with sheep

Pigs—Since pigs may be bred much more quickly than other farm live stock there are relatively much more rapid changes in the numbers from year to year, and consequently sharper rises and falls in prices During the past 50 years the numbers have moved up and down with fair regularity every five years, with little change in the general level

Number of Pigs in Great Britain

1871–75	2,485,000	1911–15	2,585,000
1881–85	2,433,000	1921–25	2,825,000
1891–95	2,483,000	1926	2,345,000
1901–05	2,491,000		

The high average in 1921–25 may indicate that pig-keeping is likely to be increased as compared with earlier years, but the number in 1926 was no higher than the minima of some pre-war cycles. Pigs are kept much more largely in the eastern counties of England than in most other districts, though in Cornwall, Kent, Isle of Wight, Cheshire and Flint there are comparatively large numbers The numbers in Scotland are relatively small, the average being only about 150,000.

Poultry—There are many more poultry on the farms of Great Britain than formerly The earliest figures available relate to 1908, when there were 32,360,000 fowls in Great Britain, in 1926 there were 41,600,000 Lancashire stands easily first in point of numbers, having nearly 6 birds per acre of cultivated land in 1926, while East Sussex comes second with only slightly over 2 per acre

Value of Agricultural Output.—The Ministry of Agriculture estimated that the value of the farm produce sold off farms or consumed in farm households in 1925 in England and Wales was £225,000,000, and if similar figures were available for Scotland it would probably be found that the value of the agricultural output of Great Britain would be in the neighbourhood of £270,000,000 to £280,000,000 Of this output live stock and live stock products account for the bulk—at least 70 per cent. (For other particulars *see* AGRICULTURE, CENSUS OF.)

It should be explained that the sums received from the sale of live stock and live stock products have to cover the cost of growing those corn, root and fodder crops used for feeding to live stock, and it is only those proportions of the crops which are sold off the farms which are valued as crops in the above figures.

Sizes of Agricultural Holdings.—The total number of agricultural holdings in Great Britain in 1926 was 478,655, of which about 312,275 were of under 50 acres of cultivated land. The numbers in each of several size groups are as follows:—

Number and Size of Holdings in Great Britain

Above	1 and not exceeding 5 acres	91,154
„	5 „ „ „ 20 „	131,350*
„	20 „ „ „ 50 „	89,771*
„	50 „ „ „ 100 „	71,250
„	100 „ „ „ 150 „	37,774
„	150 „ „ „ 300 „	42,326
„	300 acres	15,030
Total		478,655

*Approximate.

While it is true that there are some 50,000 to 60,000 holdings of agricultural land which are separately included in the agricultural returns without being economic farm units, since they are small pieces of land attached to residential properties, or detached fields separately returned, etc, the figures in the table indicate the very large number of separate farm units in the country. Since 1895 there has been a fairly steady reduction in the number of holdings, especially in those under 20 acres in extent, but as very many of these are not economic farm units and there are indications that the number of such holdings has declined rapidly in recent years, it is not possible to estimate whether the number of economic small holdings has increased or decreased. Since 1895 there has been no very marked change in the number of holdings of from 20 to 300 acres, but the number above 300 acres has declined steadily. A classification of the holdings above 20 acres in extent in England and Wales (excluding certain special types of holding), accounting for over 93% of the whole of the agricultural land, shows that holdings consisting mainly of grass land (70% or over of permanent grass) are the most numerous In 1925 there were in England and Wales 104,200 grass holdings, 72,900 mixed holdings, and 39,600 arable holdings of over 20 acres. The average size of the grass holdings was, however, only 90 acres whereas mixed holdings averaged 130 acres and arable holdings 140 acres each. Fruit and vegetable farms, of which the bulk are of less than 20 acres, though over 500 exceed 100 acres, numbered 28,400, and poultry farms, which are also usually small, averaging only 7 acres each, numbered 4,500 Of the total number of holdings about 33 per cent, comprising a fairly similar percentage of the total acreage of cultivated land, are owned by the occupiers

Persons Employed.—From the statistics which are available it is not easy to arrive at the number of people engaged in agriculture For example, there are many occupiers of agricultural holdings of an economic nature whose main source of income is from other employment, and they would not describe themselves as farmers in the census enumeration Further, many workers, especially females, who are employed very largely on farm work describe themselves as general labourers, and in the case of women as married women Until 1921 all gardeners, including domestic and jobbing gardeners, were included in the population census with market gardeners It is clear, however, from the population censuses of the past 50 years that the number of persons employed in agriculture (excluding horticulture) in Great Britain has declined considerably, from about 1,500,000 in 1871 to about 1,100,000 in 1921 This reduction was probably the result of several causes, among which the decrease of arable cultivation and the increased use of machinery are no doubt the most important An estimate made by the Ministry of Agriculture in 1925 put the number of persons employed in agriculture and horticulture in England and Wales at 1,100,000, of whom 800,000 were employees, and 300,000 farmers, market gardeners, nurserymen, etc., occupying agricultural holdings. Of the employees about 700,000 were males and about 100,000 females A similar estimate for Scotland would probably be in the neighbourhood of 180,000, of whom about 125,000 would be employees and about 55,000 to 60,000 occupiers of holdings The total number of persons engaged in agriculture in Great Britain is thus nearly 1,300,000.

Capital Invested.—The capital invested in agriculture in England and Wales was estimated in 1925 at £1,180 millions, of which £815 millions was the value of the land, including farm houses and buildings, and £365 millions the working capital of the occupiers of the land Assuming similar figures per acre for Scotland, for cultivated land and rough grazings respectively, the total capital invested in the whole of Great Britain in agriculture would amount to nearly £1,500 millions

(R Rs, H C. L.)

GREAT CIRCLE. The circle in which a sphere is cut by a plane is called a "great circle," when the cutting plane passes through the centre of sphere Treating the earth as a sphere, the meridians of longitude are all great circles Of the parallels of latitude, the equator only is a great circle. The shortest line joining any two points is an arc of a great circle. For "great circle sailing," *see* NAVIGATION

GREAT DIVIDING RANGE, a name given to the eastern and south-eastern highlands of Australia It is applicable in so far as it forms the main water-shed between coastwards and inward-flowing drainage on these sides, but misleading in that the highlands in question are a belt of plateaux rather than mountain ranges in the ordinary sense (*See* AUSTRALIA)

GREAT FALLS, the second largest city of Montana, U S A, 11om. N E of Helena, at an altitude of 3,300ft., on the Missouri river, opposite the mouth of the Sun river, 10m above the falls of the Missouri (92ft. high) from which it derives its name; a port of entry and the county seat of Cascade county. It is on Federal highways 87 and 91, and is served by the Chicago, Milwaukee, St Paul and Pacific and the Great Northern railways Pop. 24,121 in 1920 (19 4% foreign-born white), and was estimated locally at 36,000 in 1928 The area of the city is 8 sq m. It has a fine system of parks, connected by 15m of boulevards The assessed valuation of property in 1927 was $74,187,310 The region is rich in minerals of many kinds, including oil, and is the most productive agricultural and stock-raising area of the State Great Falls is an important distributing, commercial, financial and manufacturing centre It is the headquarters of the customs district of Montana and Idaho, which in 1926 had exports valued at $6,736,337, and imports amounting to $3,468,489 Bank clearings for 1927 were $55,408,891 Shipments of wool amount to 7,000,-000lb annually There is a Federal land office in the city Of 348,000 potential h p, 165,000 has been developed The manufacturing industries include oil refineries, railroad shops, packing plants, and the electrolytic plant of the Anaconda Copper Mining Company, which performs the final step in the process begun at the reduction works in Anaconda on ores from the Montana and Idaho mines. The aggregate output of the factories within the city in 1925 was valued at $10,675,972

Lewis and Clark visited this neighbourhood in 1805, and held here (it is claimed) the first 4th of July celebration west of Lake Superior The city was founded in 1883, by Paris Gibson of St Paul, Minn, and was incorporated in 1888 In 1890 the population was 3,979, in 1900, 14,930 There are many points of scenic interest near by, including the Rainbow falls (48ft high), the Belt mountains, and the Sun River valley Within 40m to the S W and the S E respectively are the Lewis and Clark and the Jefferson National forests In the city is Giant spring, one of the largest in the world, which has a daily flow of 388,000,000 gal of water, at a temperature of 52° F the year round

GREAT HARWOOD, urban district, Clitheroe parliamentary division, Lancashire, England, 4½ m N E of Blackburn, on the L M S railway Pop (1921), 13,605. The inhabitants are employed in cotton mills and collieries in the vicinity

GREATHEAD, JAMES HENRY (1844–96), British engineer, was born at Grahamstown, South Africa, on Aug 6, 1844 He learned the shield system of tunnelling which bears his name from P W Barlow, who proposed to build underground railways in London on this system In 1869 Greathead built a subway under the Thames near the Tower He invented, among other things, the "Ejector" fire-hydrant The Greathead shield system was used in constructing the City and South London railway, which was opened in 1890 Greathead was also concerned with the Waterloo and City and the Central London underground railways. He died at Streatham, London, on Oct. 21, 1896.

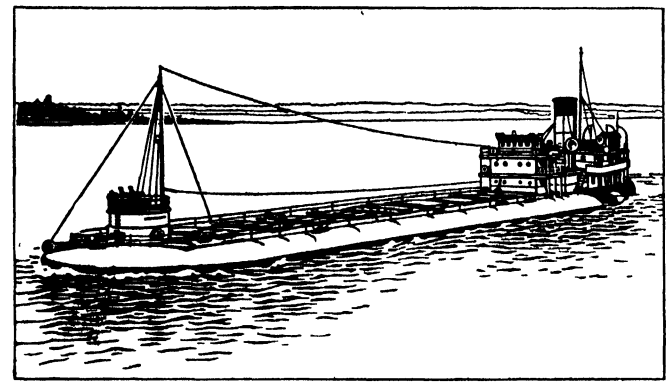
GREAT LAKES, THE. The Great Lakes and their connecting waterways are in general along the boundary between the United States and Canada between 75° and 92° W of Greenwich. In 1909 the United States and Great Britain signed a treaty known as the "Boundary Waters Treaty," whereby the waters between the United States and Canada were guaranteed free and open to the inhabitants of both countries on equal terms, and principles governing the use of boundary waters were laid down. An international joint commission consisting of three members from Canada and three members from the United States was established Neither the United States nor Canada has found it necessary or desirable to organize any defences on the boundary between the two countries or maintain ships of war in the Great Lakes for over 100 years. The channels in the connecting waterways and the sailing courses in the open lakes cross and recross the international boundary many times

The Great Lakes and their connecting waterways are the most important unit of inland waterway transportation in the world, and have been of great economic importance in the development of the North American continent. Their drainage basin has an area of about 300,000 sq m , approximately 60% lying within the United States. The water surface of the lakes and rivers themselves covers 96,000 square miles The total distance, measured along the steamer track from Duluth to the outlet of Lake Ontario, is 1,160 miles Their outlet to the Atlantic ocean is through the St Lawrence river.

Dimensions, elevations and other descriptive details of each of the lakes and connecting waterways are given in the following table, the data being derived from the bulletin and charts of the U.S Lake Survey.

mainder in vessels of the United States. Traffic through the Detroit river in 1926 amounted to 95,003,604 tons, valued at $1,179,944,762 Package freight has not developed in anything like the same proportions as has bulk freight, the total on the lakes averaging about 2,500,000 tons per annum

Connecting Waterways (*see* table) —The critical points in the navigation of the lakes are the connecting waterways The



BY COURTESY OF THE CANADIAN NATIONAL RAILWAYS

WHALE-BACKED OIL-TANKER SPECIALLY BUILT FOR THE GREAT LAKES
Ships of 10,000 tons' capacity traverse the Great Lakes, the annual shipping through the Sault Ste. Marie canal being greater in tonnage than that through the Suez canal A distinct type of ship, similar to that shown, has been evolved for carrying oil, grain and mineral ore on the lakes

channels in their waterways are exceptionally free from silting Periodic dredging is necessary at a few localities only On account of the great volumes of commerce, and of the many miles of

Lakes	Length	Width	Area of water surface	Total area of basin	Maximum recorded depth	Mean elevation approved low water datum	Ordinary fluctuations, water surface	Average date of opening of navigation	Average date of closing of navigation
	Miles	Miles	Square miles	Square miles	Feet	Feet	Feet		
Superior	350	160	31,810	80,700	1,180	601 6	2 5	April 23	Dec 9
Michigan	307	118	22,400	69,040	870	579 6	2 8	April 12	Dec 15
Huron	206	101	23,010	72,600	750	579 6	2 6	April 6	Dec 17
St Clair	26	24	460	6,420	26	573 8		March 30	Dec 18
Erie	241	57	9,940	34,690	210	570 8	3 0	March 29	Dec 17
Ontario	193	53	7,540	34,640	738	244 5	3 3	April 5	Dec 18

Rivers	Length	Least width	Greatest width	Limiting depth at low water	Current in navigated portions	Discharge at mean stage
	Miles	Feet	Feet	Feet	Miles per hour	Cubic foot seconds*
St Mary's	63	300	24,000	21	1–3½	
Straits of Mackinac	30	10,900	100,000	110		47,000
St. Clair	40	800	5,100	20	1–5	203,000
Detroit	31	1,900	19,000	22	1–6	208,000
Upper Niagara	20	1,500	8,000	10–23	1–7	207,000
Lower Niagara	15	210	2,600	30	1–2½	207,000
St Lawrence (to Montreal)	179	1,200	40,000	14	1–6	240,000

*In its original condition the mean stage discharge of the St Mary's river was about 78,000 cu ft per second The flow of this river is now entirely controlled by regulating works

Traffic.—During the 1926 navigation season 137,000,000 tons of freight, valued at over $2,000,000,000, moved over the Great Lakes. This commerce consists primarily of bulk freight such as iron ore, wheat, limestone and coal The cost of transporting freight on the bulk carriers of the Great Lakes is cheaper than that of any other inland transportation for equal haul in the world Freight rates are from one-seventh to one-tenth of the rates per ton mile for similar transportation on the railroads of the country The tonnage passing through the locks at Sault Ste Marie is steadily increasing The average for the years 1922–26 was 80,000,000 tons, while for the years 1917 to 1921 it was 74,000,000 tons. In 1926 it amounted to a total of 85,679,087 tons of freight, valued at $1,063,875,987 Of this traffic 10,374,000 tons was down-bound grain, 57,549,700 tons was iron ore down-bound, and 14,439,000 tons was coal up-bound About 50% of the grain, 1% of the iron ore and 5% of the coal was carried in Canadian vessels, the re-

channel with a narrow margin between keel and channel bottom, extensive sweeping is done annually to ensure that channels in hard bottom are free from accidental obstructions The Lake Carriers' Association, a federation including nearly all the owners of freight-carriers on the lakes, have formed an efficient system of communication and supervision which permits them to take advantage of water conditions and load their vessels to the greatest possible depth. The deepening and widening of the connecting channels authorized some years ago have practically been completed; and at many of the most critical points, such as the Neebish channels below Sault Ste Marie and the channels between Lakes Huron and Erie, separate up-bound and down-bound passageways are maintained On the upper lakes the minimum width of channels used for two-way traffic is 500ft., whereas 300ft is the least width of channel now used for one-way traffic. Towards the close of the navigation season, the blockade of one-way chan-

nels in the St. Mary's river by ice is a fairly frequent occurrence

The excavated portions of the channels have an aggregate length of about 82m, much of which is in rock and boulder bottom Their cost to June 30, 1927, including the cost of St. Mary's Falls canal and locks, but excluding maintenance, has been $44,754,-832 83 The project depths of these channels range from 20 to 23ft below datum The only portions having a project depth of 20ft lie in soft bottom, and in these reaches the available depth has been increased by the wash from the propellers of the procession of vessels passing through them Little if any of the channel has actually a depth less than 21ft below datum The dimensions of the locks in the St Mary's Falls are as follows.

Name of lock	Length between gates	Usable length	Width	Depth on upper sill	Depth on lower sill	Lift
Weitzel*	515	480	80 60 at gates	16	12 6	20 5
Poe	800	773 to lower gate 677 to intermediate gate	100	22	18	20 5
Davis	1,350	1,300	80	24 5	24·5†	20 5
Fourth	1,350	1,300	80	24 5	24 5†	20 5
Canadian	900	860	60	18 2	18 2	20 5

Note (1) All lengths are given in feet
(2) All depths and lift are in feet and are referred to datum, which is 601 1 above and 580 6 below the locks, respectively, corresponding to Lake Superior datum of 601 6 and Lake Huron datum of 579 6
*Not used at present
†Depth over lock floors, which are higher than lower sills

The total expenditures by the United States upon connecting channels and harbours, amounting to over $160,000,000, are more than paid for each year by the present savings in transportation costs effected

Studies made in 1928 by the U S war department will undoubtedly lead to the deepening of inter-lake channels, but no work has been authorized by the U S Congress To deepen all down-bound channels to permit their use by vessels of 24ft draft when lake levels are at datum will cost about $26,000,000 Up-bound channels will cost $11,000,000 for similar deepening The costs for 22ft draft are $16,000,000 and $7,000,000 respectively

Between Lake Erie and Lake Ontario where the Welland canal overcomes the falls and rapids of the Niagara river navigation is still restricted to a 14ft draft This canal has 25 lift locks, with a total lift of 326¾ feet These locks are each 270ft long (usable length about 255ft) by 45ft wide, and were designed to have 14ft depth on the sills The Dominion of Canada is now constructing a new Welland canal which will admit the largest existing lake freighters The southern portion of the new canal is chiefly an enlargement of the old canal The northern portion follows a new location entering Lake Ontario at Port Weller about 3m E of the terminus of the old canal The new canal will be 25m long, with a total lockage of 326½ feet It will have four single locks, one flight of three double locks, and one guard lock The locks have a usable length of 820ft, a clear width of 80ft, and 30ft depth of water on the sill at lowest lake stages All locks have a lift of about 46 feet The gates are of the mitring type. The canal prism is 200ft wide at the bottom, 310ft wide at the water line, and from 25 to 26½ft deep at low water All masonry structures are so designed as to allow an ultimate deepening to 30ft at low water The estimated total cost of the canal is $115,600,000 The construction of this canal was commenced in 1913 It was largely suspended during the World War, but was later resumed, and it is estimated that the canal will be opened to navigation about 1930

In the past more than 90% of the freight movement of the Great Lakes and all of the large vessels have been confined to the lakes above the Niagara river. The opening of the new Welland canal will admit the largest freighters to Lake Ontario and the St. Lawrence river above Ogdensburg and open these waters to the highly developed commerce of the upper lakes.

Harbours.—Originally the mouths of rivers were used as harbours on the lakes It was necessary to dig out the bars which usually formed at the lake entrance, and later piers were constructed at river mouths which contracted the area of flow and tended to keep the channels scoured out Still later, breakwaters were built in the lakes to protect pier entrances from wave action. As conditions became more congested in the rivers, the breakwaters were extended to form large outer harbours These structures were originally stone-filled timber cribs, the tops of which, after the timber decayed, were replaced by concrete or stone The more recently constructed breakwaters are formed of a line of concrete caissons sunk side by side, or of a long rubble mound composed of stones varying from half a ton to 10 and 12 tons in weight, more or less carefully placed Some of these outer harbours are as much as four and five miles long and afford ample protection to the largest lake vessels Maintenance dredging must be carried on at all times in most of the harbours of the Great Lakes About 65 harbours on the upper lakes (excluding Lake Ontario) have an authorized project depth of 19ft or more at low water, many others have been improved so as to be available for smaller vessels

Carriers.—The aggregate gross registered tonnage in 1927 of the entire lake fleet, including both United States and Canadian vessels, vessels in the package and automobile trade, barges, etc , but excluding passenger steamers and car ferries, is given in the report of the Lake Carriers' Association as 2,887,427 gross registered tons The number of vessels was 765 During the five year period 1922–26 there were built 30 new bulk freight-carriers with a carrying capacity, on 20ft draft, of 395,192 net tons During the same period 12 steel bulk freighters were lost on the lakes, eight of which had a carrying capacity in excess of 3,000 gross tons each The standard bulk freight-carrier on the lakes (except Ontario) is a vessel with machinery in the stern, navigating bridge far forward and quarters for crew both forward and aft The vessel is long, narrow and deep, with maximum possible cargo capacity for its displacement The cargo is open, without intermediate decks, but is usually divided into three compartments by cross bulkheads Cargo is handled through large hatches extending nearly full width of the deck spaced uniformly at 12ft or 24ft centres This type of freighter is generally regarded as the most economical bulk freight-carrier yet devised and while admirably suited for the lakes' trade is not suitable for ocean navigation The standard bulk freighter has no equipment for handling cargo although some self-unloaders, largely used for carrying limestone, have been developed The larger freighters have engines of about 2,500 h p. and are designed with a cargo-carrying capacity of from 13,000 to 15,000 net tons and for a speed of about 10 5 statute miles per hour The largest boat on the lakes in 633ft long, 70ft in beam and 29ft moulded depth Except for several motor ships with diesel engines there has been no marked change in the type of freighters built in recent years The highly specialized freight-handling equipment at the terminals has resulted in remarkable economies in loading and unloading and quick turn round for vessels The record for handling cargo between shore and ship is 16½min for loading 12,508 tons of ore, and 3hr and 5min for unloading the same cargo The package and passenger-carrying steamers are in general of the same design as boats in coastwise service along the Atlantic seaboard The car ferries are strongly built and maintain service throughout the entire year

About 30 important passenger lines are in regular operation upon the Upper Great Lakes, exclusive of the companies operating day-excursion boats and passenger ferries Most of these lines operate only during the navigation season, although in certain instances, notably in the case of the Pere Marquette Line steamers which operate across Lake Michigan, passenger service is maintained throughout the year Several of the lines offer especially good passenger accommodations and attractive long-distance cruises Other lines operating between important cities, notably those running between Detroit, Cleveland and Buffalo, in overnight

service, carry a heavy passenger traffic in luxurious boats, some of which are of exceptionally large size. Two of the latest passenger steamers, the "Greater Detroit" and "Greater Buffalo," are said to be the largest inland waterway passenger steamers in the world They are steel vessels of the side-wheel type, 550ft. length overall; width, over guards, 100ft ; draft, 16ft ; speed, 21 statute miles per hour. Sleeping accommodations are provided for 1,200 passengers. These boats are in operation between Detroit and Buffalo. Passenger steamers usually have accommodations for automobiles and for a limited amount of express freight.

Diversions.—The period of low rainfall occurring during the years just prior to 1926 brought down the levels of the lakes and with other factors created new low levels The minimum recorded monthly mean levels during the navigation season since 1860, taking the latter as from May to November inclusive, were as follows·

		Low level	Standard datum
Lake Superior	(May 1926)	600·2	601 6
Lake Michigan	(Nov 1925)	577·7	579 6
Lake Huron	(,, 1925)	577·7	579 6
Lake Erie	(,, 1925)	570 45	570 8

For all the lakes except Lake Superior the standard datum planes are two feet below the mean level of these lakes for the period 1860–75 The datum plane for Lake Superior is one foot below the mean level of that lake for the same period The datum planes were intended to represent low-water conditions, but not the extreme minimum lake levels during the navigation season At the time of their adoption the minimum recorded monthly mean levels during the navigation season had been below datum as follows· on Lake Superior 0 8ft , Lakes Michigan and Huron 0 5ft , Lake Erie 0 1ft and Lake Ontario 1 1 feet

The effect of the present diversions and outlet changes is estimated as follows

Cause	Amount of diversion cubic feet per second	Effect, in feet, on levels of lakes	
		Michigan Huron	Erie
Diversion Chicago sanitary district and City of Chicago (average 1921-25)	8,660	−0 5	−0 4
Welland canal	3,100	−0 04	−0 15
Black Rock canal	1,000	−0 01	−0 05
Changes in St Clair river		−0 6	
Total		−1 15	−0 6

Upon the opening of the new Welland ship canal the lowering of Lake Erie, due to increased diversion for navigation purposes, will be increased to 0 7 foot. Any additional deepening of channels in St Clair river will further lower the levels of Lakes Huron and Michigan

A dike on which sluice gates are installed has been constructed across the St Mary's river near Sault Ste Marie The gates are operated under the supervision of an international board of control in order to maintain water-levels in Lake Superior and to compensate for diversions on both the Canadian and the American sides at Sault Ste Marie for power purposes

The construction of compensating works in the Niagara and St Clair rivers, designed to raise the level of Lake Erie by 0·7 foot and of Lakes Huron and Michigan by one foot, have been recommended by a joint board of engineers appointed by the Canadian and U S Governments The locks include a series of submerged rock sills in St Clair river with crests 31ft below datum, and a timber crib dike, stone weir and submerged rock sills in the Niagara river

The question of diversion of water from Lake Michigan into the Chicago drainage canal for the purpose of sewage disposal has not been settled The Supreme Court of the United States decided against the Chicago drainage district in a suit instituted to enjoin the district against withdrawing water However, in order to permit the Chicago sanitary commission to prepare plans and construct works necessary to take the place of the prevailing system of sewage disposal, temporary authority to divert 8,500 cu ft. of water per second from Lake Michigan was granted by the U S War Department for a period of five years under certain conditions, which, when carried out, will permit the reduction and perhaps the eventual discontinuance of the diversion for sewage purposes The question is of importance because of the enormous losses claimed by shipping interests on account of lower water-levels The matter is again before the Supreme Court of the United States as a result of an action brought by some of the States to restrain the Chicago drainage district from diverting water from Lake Michigan The report to the court made by former chief justice, Chas. E Hughes, who was designated as special master, was to the effect that the permit granted by the War Department is valid and effective according to its terms. Final decision in the matter has not been made.

Outlets to the Sea.—The Chicago drainage canal from Lake Michigan at Chicago to Joliet, Ill , the Illinois and Michigan canal from Joliet to La Salle, Ill , and the improved waterways of the Illinois and Mississippi rivers, give a continuous water route from Lake Michigan to the Gulf of Mexico This route, however, will accommodate at present only very small, shallow-draft boats, and is but little used The various Federal, State and other agencies concerned are now engaged in works that will deepen this through waterway to nine feet The U S War Department engineers have surveyed and studied several routes for a canal between Lake Erie and the Ohio river, but these reports have to date been unfavourable It was found that the benefits would be out of proportion to the cost, which would be in excess of $100,000,000 for 9ft depths Unfavourable reports have also been made on a proposed ship canal following in general the line of the New York State barge canal

The New York State barge canal has replaced the old Erie canal It connects with the Great Lakes at Tonawanda on Niagara river, and at Oswego on Lake Ontario The present 12ft depth of canal is designed for use by barges and boats drawing 10½ feet.

The St Lawrence river from its source at the outlet of Lake Ontario to the Atlantic at Belle Isle strait is 1,184m in length For purposes of navigation the river may be considered in three portions. the broad estuary below Father Point, 661m in length, the section 342m in length from Father Point to Montreal which has been improved for navigation by ocean vessels; and the section 181m in length between Montreal and Lake Ontario, in which there is a fall of approximately 225ft , and which has been canalized at all rapids and is available for small vessels of 14ft. draft The problem of providing a channel through the St Lawrence for ocean shipping is now the subject of negotiation between the Canadian and U S Governments (*See* ST LAWRENCE RIVER)

By treaty stipulation the amount of water that may be diverted from the Niagara river for power purposes has been limited to 36,000 cu ft per sec on the Canadian side and 20,000 cu ft per sec. on the United States side Of the Canadian diversion all but about 10,000 cu ft per sec. is used by the Hydro-electric Power Commission of Ontario in three plants, the largest of which, near Queenstown, has a gross head of over 300ft. and develops about 450,000 h p from the nine turbo-generators installed Of the American diversion practically all the water is utilized by one concern with an installation of 560,000 horse-power Three of the units of the latter company are rated at 70,000 h.p each and are the largest hydro-electric units in existence At all the plants, electricity is generated at 11,000 volts, 25 cycles Much is used in nearby electro-chemical industries for the manufacture of aluminium, ferro-silicon, carborundum, artificial graphite, liquid chlorine, calcium carbide, cyanamide and other products. The remainder is transmitted to various cities for miscellaneous uses. The maximum distance to which this power is transmitted is somewhat in excess of 200 miles

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Report, Lake Carriers' Association; *Great Lakes Commerce,* by Fay, Spofford and Thorndyke, consulting engineers. (E. JA.)

GREAT MOTHER OF THE GODS, the ancient Oriental-Greek-Roman deity commonly known as Cybele (q v) in Greek and Latin literature from the time of Pindar She was also known under many other names, some of which were derived from famous places of worship. as Dindymene from Mt. Dindymon Cybele is her favourite name in ancient and modern literature, while Great Mother of the Gods, or Great Idaean Mother of the Gods (*Mater Deum Magna, Mater Deum Magna Idaea*), the most frequently recurring epigraphical title, was her ordinary official designation

The legends agree in locating the rise of the worship of the Great Mother in Asia Minor, in the region of loosely defined geographical limits which comprised the Phrygian empire of prehistoric times and was more extensive than the Roman province of Phrygia Her best known early seats of worship were Mt Ida, Mt Sipylus, Cyzicus, Sardis, and Pessinus, the last-named city, in Galatia near the borders of Roman Phrygia, finally becoming the strongest centre of the cult But the existence of numerous very similar non-Phrygian deities indicates that she was merely the Phrygian form of the nature deity of all Asia Minor

From Asia Minor, the cult of the Great Mother spread first to Greek territory It found its way into Thrace at an early date, was known in Boeotia by Pindar in the 6th century, and entered Attica near the beginning of the 4th century At Peiraeus, where it probably arrived by way of the Aegean islands, it existed privately in a fully developed state, that is, accompanied by the worship of Attis (q v), at the beginning of the 4th century, and publicly two centuries later The Greeks from the first saw in the Great Mother a resemblance to their own Rhea, and finally identified the two completely, though the Asiatic peculiarities of the cult were never universally popular with them In her less Asiatic aspect, *i e* , without Attis, she was sometimes identified with Ge and Demeter It was in this phase that she was worshipped in the *Mētrōon* at Athens

In 204 B C , in obedience to the Sibylline prophecy which said that whenever an enemy from abroad should make war on Italy he could be expelled and conquered if the Idaean Mother were brought to Rome from Pessinus, the cult of the Great Mother, together with her sacred symbol, a small meteoric stone reputed to have fallen from the heavens, was transferred to Rome and established in a temple on the Palatine (Livy xxix 10–14) Her identification by the Romans with Maia, Ops, Rhea, Tellus, and Ceres contributed to the establishment of her worship on a firm footing By the end of the republic it had attained prominence, and under the empire it became one of the three most important cults in the Roman world, the other two being those of Mithras and Isis Epigraphic and numismatic evidence prove it to have penetrated from Rome as a centre to the remotest provinces During the brief revival of paganism under Eugenius in A D 394, occurred the last appearance of the cult in history Besides the temple on the Palatine, there also existed minor shrines of the Great Mother in the present Piazza S Pietro, on the Sacra Via on the north slope of the Palatine, near the junction of the Almo and the Tiber rivers, south of the city (*ibid* , 311–14)

In all her aspects, Roman, Greek, and Oriental, the Great Mother was characterized by essentially the same qualities Most prominent among them was her universal motherhood She was the great parent of gods and men, as well as of the lower orders of creation Especial emphasis was placed upon her maternity over wild nature She was called the Mountain Mother, her sanctuaries were almost invariably upon mountains, and frequently in caves, lions were her faithful companions Her especial affinity with wild nature was manifested by the orgiastic character of her worship Her attendants, the Corybantes, were wild, half demonic beings Her priests, the Galli, were eunuchs attired in female garb, with long hair fragrant with ointment Together with priestesses, they celebrated her rites with wild music and dancing until their frenzied excitement found its culmination in self-scourging, self-laceration, or exhaustion Self-emasculation sometimes accompanied this delirium of worship on the part of candidates for the priesthood

Though her cult sometimes existed by itself, in its fully developed state the worship of the Great Mother was accompanied by that of Attis (q v) The cult of Attis never existed independently. There is no positive evidence to prove the existence of the cult publicly in this phase in Greece before the 2nd century B C , nor in Rome before the empire, though it may have existed in private

The philosophers of the late Roman empire interpreted the Attis legend as symbolizing the relations of Mother Earth to her children the fruits In this interpretation they were not far wrong, for Cybele and all her kind are embodiments of the earth's fertility

At Rome the immediate direction of the cult of the Great Mother devolved upon the high priest, *Archigallus,* called *Attis,* a high priestess, *Sacerdos Maxima,* and its support was derived, at least in part, from a popular contribution, the *stips* Besides other priests, priestesses, and minor officials, such as musicians, curator, etc , there were certain colleges connected with the administration of the cult, called *cannophori* (reed-bearers) and *dendrophori* (branch-bearers) The quindecimvirs exercised a general supervision over this as over all other authorized foreign cults Roman citizens were at first forbidden to take part in its ceremonies, and the ban was not removed until the time of the empire

The main public event in the worship of the Great Mother was the annual festival, which took place originally April 4, and was followed next day by the *Megalesia,* games instituted in her honour on the introduction of the cult Under the empire, from Claudius on, the *Megalesia* lasted six days, April 4 to 10, and the original one day of the religious festival became an annual cycle of festivals extending from March 15–27, in the following order.

(1) March 15, *Canna intrat,* the sacrifice of a six-year-old bull, the high priest, a priestess and the *cannophori* officiating, the last named carrying reeds in procession in commemoration of the exposure of the infant Attis on the reedy banks of the stream Gallus in Phrygia

(2) March 22, *Arbor intrat,* the bearing in procession of the sacred pine, emblem of Attis' self-mutilation, death and immortality, to the temple on the Palatine, the symbol of the Mother's cave, by the *dendrophori,* a guild of workmen who made the Mother, among other deities, a patron

(3) March 24, *Dies sanguinis,* a day of mourning, fasting and abstinence, especially sexual, commemorating the sorrow of the Mother for Attis The frenzied dance and self-laceration of the priests and the self-mutilation of neophytes, were special features of the day The *taurobolium* (q v) was often performed on this day, on which probably took place the initiation of mystics. *See* also CRIOBOLIUM

(4) March 25, *Hilaria* All mourning was put off, and good cheer reigned in token of the return of the sun and spring, which was symbolized by the renewal of Attis's life

(5) March 26, *Requietio,* a day of rest and quiet

(6) March 27, *Lavatio,* the crowning ceremony of the cycle The silver statue of the goddess, with the sacred meteoric stone, the *Acus,* set in its head, was borne in gorgeous procession and bathed in the Almo, the remainder of the day being given up to rejoicing and entertainment, especially dramatic representation of the legend of the deities of the day

The Great Mother is especially prominent in the art of the empire No work of the first class, however, was inspired by her She appears usually with mural crown and veil, well draped, seated on a throne, and accompanied by two lions Other attributes which often appear are the patera, tympanum, cymbals, sceptre, garlands, and fruits Attis and his attributes, the pine, Phrygian cap, pedum, syrinx, and torch, also appear In literature she is the subject of frequent mention, but no surviving work of importance, with the exception of Catullus lxiii , is due to her inspiration Her importance in the history of religion is very great, for her cult, like the other mystic worships, at once

formed a rival to Christianity and acted as a stepping stone to it. (*See* MYSTERY)

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GREAT NORTHERN RAILWAY COMPANY. The Great Northern's genealogy began in 1857 with the chartering of the Minnesota and Pacific railway by the State of Minnesota, a road that was soon taken over by the St Paul and Pacific railway Ten miles of actual railroad were then built between St Paul and St Anthony, now Minneapolis, upon which service was established in 1862, the first in the North-west

In 1875, Mr. J J Hill and a group of associates began reorganizing the St. Paul and Pacific, then in the hands of receivers, into the St Paul, Minneapolis and Manitoba railway Under the leadership of Mr Hill this new road expanded rapidly, despite the lack of Government aid then considered so essential to the construction of new lines By 1888 the line reached central Montana and five years later the Rockies had been crossed through the elusive Marias Pass and service established between the Twin Cities and Puget Sound It was during this latter period that the present Great Northern Railway Company was formed

In 1928 the Great Northern ranked among the leading railroads of the United States It operated 8,312 m of line, covering a territory extending from the Great Lakes to the Pacific ocean It also owned a half interest in the Chicago, Burlington and Quincy railroad, and in the Spokane, Portland and Seattle Ry Easy grades and low mountain crossings, only 5,213 ft in the Rockies and 2,883 ft. in the Cascades, mark the main line of the Great Northern It keeps in service over 1,200 locomotives, 1,200 passenger cars and approximately 55,000 freight cars Its freight service varies from the branch line way freight to the fast through freights operating between the Twin Cities and Puget Sound Its passenger service ranges from short haul transportation by rail motor cars and branch line trains to fast transcontinental service between Chicago and the Pacific coast

The Great Northern also provides bus service on highways through a subsidiary, the Northland Transportation Company The Northland had in 1928 over 3,000 m of bus routes, mainly in Minnesota and Wisconsin, and was rapidly extending its service

(R BU)

GREAT REBELLION (1642–52), a generic name for the civil wars in England and Scotland, which began with the raising of King Charles I's standard at Nottingham on Aug 22, 1642, and ended with the surrender of Dunottar Castle to the Parliament's troops in May 1652 It is usual to classify these wars into the First Civil War of 1642–46, and the Second Civil War of 1648–52 During most of this time another civil war was raging in Ireland Its incidents had little or no connection with those of the Great Rebellion, but its results influenced the struggle in England to a considerable extent

FIRST CIVIL WAR (1642–46)

It is impossible rightly to understand the events of this most national of all English wars without some knowledge of the motive forces on both sides On the side of the king were enlisted the deep-seated loyalty which was the result of two centuries of effective royal protection, the pure cavalier spirit foreshadowing the courtier era of Charles II, but still strongly tinged with the old feudal indiscipline, the militarism of an expert soldier nobility, well represented by Prince Rupert, and lastly a widespread distrust of extreme Puritanism, which appeared unreasonable to Lord Falkland and other philosophic statesmen and intolerable to every other class of Royalists The foot of the Royal armies was animated in the main by the first and last of these motives; in the eyes of the sturdy rustics who followed their squires to the war the enemy were rebels and fanatics To the cavalry, which was composed largely of the higher social orders the rebels were in addition, bourgeois, while the soldiers of fortune from the German wars felt all the regular's contempt for citizen militia Thus in the first episodes of the First Civil War moral superiority tended to be on the side of the king On the other side, the causes of the quarrel were primarily and apparently political, ultimately and really religious, and thus the elements of resistance in the Parliament and the nation were at first confused, and, later, strong and direct.

Democracy, moderate republicanism and the simple desire for constitutional guarantees could hardly make head of themselves against the various forces of royalism, for the most moderate men of either party were sufficiently in sympathy to admit compromise But the backbone of resistance was the Puritan element, and this waging war at first with the rest on the political issue soon (as the Royalists anticipated) brought the religious issue to the front. The Presbyterian system, even more rigid than that of Laud and the bishops—whom no man on either side supported save Charles himself—was destined to be supplanted by the Independents and their ideal of free conscience, but for a generation before the war broke out it had disciplined and trained the middle classes of the nation (who furnished the bulk of the rebel infantry, and later of the cavalry also) to centre their whole willpower on the attainment of their ideals The ideals changed during the struggle, but not the capacity for striving for them, and the men capable of the effort finally came to the front and imposed their ideals on the rest by the force of their trained wills

Material force was throughout on the side of the Parliamentary party They controlled the navy, the nucleus of an army which was in process of being organized for the Irish war, and nearly all the financial resources of the country They had the sympathies of most of the large towns, where the trained bands, drilled once a month, provided cadres for new regiments Further, by recognizing the inevitable, they gained a start in war preparations which they never lost The earls of *Warwick*, *Essex* and *Manchester*, and other nobles and gentry of their party, possessed great wealth and territorial influence (N B The names of Parliamentarians and Covenantors are in italics for simplicity of distinction) Charles, on the other hand, although he could, by means of the "press" and the lords-lieutenant, raise men without authority from Parliament, could not raise taxes to support them, and was dependent on the financial support of his chief adherents, such as the earls of Newcastle and Derby Both parties raised men when and where they could, each claiming that the law was on its side—for England was already a law-abiding nation—and acting in virtue of legal instruments These were, on the side of the Parliament, its own recent "Militia Ordinance", on that of the king, the old-fashioned "Commissions of Array" In Cornwall the Royalist leader, Sir Ralph Hopton, indicted the enemy before the grand jury of the county as disturbers of the peace, and had the *posse comitatus* called out to expel them The local forces in fact were everywhere employed by whichever side could, by producing valid written authority, induce them to assemble

The Royalist and Parliamentarian Armies.—This thread of local feeling and respect for the laws runs through the earlier operations of both sides almost irrespective of the main principles at stake Many a promising scheme failed because of the reluctance of the militiamen to serve beyond the limits of their own county, and, as the offensive lay with the king, his cause naturally suffered far more therefrom than that of the enemy But the real spirit of the struggle was very different Anything which tended to prolong the struggle, or seemed like want of energy and avoidance of a decision, was bitterly resented by the men of both sides, who had their hearts in the quarrel and had not as yet learned by the severe lesson of Edgehill that raw armies cannot bring wars to a speedy issue In France and Germany the prolongation of a war meant continued employment for the soldiers but in England "we never encamped or entrenched . . . or lay fenced with rivers or defiles . . " 'Twas the general maxim of the war—Where is the enemy? Let us go and fight them Or . if the enemy was coming . Why, what should be done! Draw out into the fields and fight them" This passage from the *Memoirs of a Cavalier*, ascribed to Defoe, though not contem-

porary evidence, is an admirable summary of the character of the Civil War. Even when in the end a regular professional army is evolved—as in the case of Napoleon's army—the original decision-compelling spirit permeated the whole organization From the first the professional soldiers of fortune, be their advice good or bad, are looked upon with suspicion, and nearly all those Englishmen who loved war for its own sake were too closely concerned for the welfare of their country to attempt the methods of the Thirty Years' War in England The formal organization of both armies was based on the Swedish model, which had become the pattern of Europe after the victories of Gustavus Adolphus, and gave better scope for the *moral* of the individual than the old-fashioned Spanish and Dutch formations in which the man in the ranks was a highly finished automaton

Campaign of 1642.—When the king raised his standard at Nottingham on Aug 22, 1642, war was already in progress on a small scale in many districts, each side endeavouring to secure, or to deny to the enemy, fortified country houses, territory, and above all arms and money Peace negotiations went on in the midst of these minor events until there came from the Parliament an ultimatum so aggressive as to fix the warlike purpose of the still vacillating court at Nottingham, and, in the country at large, to convert many thousands of waverers to active Royalism Ere long Charles—who hitherto had less than 1,500 men—was at the head of an army which, though very deficient in arms and equipment, was not greatly inferior in numbers or enthusiasm to that of the Parliament The latter (20,000 strong exclusive of detachments) was organized during July, August and September about London, and moved thence to Northampton under the command of *Robert, earl of Essex*

At this moment the military situation was as follows Lord Hertford in south Wales, Sir Ralph Hopton in Cornwall, and the young earl of Derby in Lancashire, and small parties in almost every county of the west and the midlands, were in arms for the king North of the Tees, the earl of Newcastle, a great territorial magnate, was raising troops and supplies for the king, while Queen Henrietta Maria was busy in Holland arranging for the importation of war material and money In Yorkshire opinion was divided, the royal cause being strongest in York and the North Riding, that of the Parliamentary party in the clothing towns of the West Riding and also in the important seaport of Hull The Yorkshire gentry made an attempt to neutralize the county, but a local struggle soon began, and Newcastle thereupon prepared to invade Yorkshire The whole of the south and east as well as parts of the midlands and the west and the important towns of Bristol and Gloucester were on the side of the Parliament A small Royalist force was compelled to evacuate Oxford on Sept 10

On Sept 13 the main campaign opened The king—in order to find recruits amongst his sympathizers and arms in the armouries of the Derbyshire and Staffordshire trained bands, and also to be in touch with his disciplined regiments in Ireland by way of Chester—moved westward to Shrewsbury, *Essex* following suit by marching from Northampton to Worcester Near the last-named town a sharp cavalry engagement (Powick Bridge) took place on the 23rd between the advanced cavalry of *Essex's* army and a force under Prince Rupert which was engaged in protecting the retirement of the Oxford detachment The result of the fight was the instantaneous overthrow of the rebel cavalry, and this gave the Royalist troopers a confidence in themselves and in their brilliant leader which was not destined to be shaken until they met *Cromwell's* Ironsides

Rupert soon withdrew to Shrewsbury, where he found many Royalist officers eager to attack *Essex's* new position at Worcester But the road to London now lay open and it was decided to take it The intention was not to avoid a battle, for the Royalist generals desired to fight *Essex* before he grew too strong, and the temper of both sides made it impossible to postpone the decision; in Clarendon's words, "it was considered more counsellable to march towards London, it being morally sure that the earl of *Essex* would put himself in their way," and accordingly the army left Shrewsbury on Oct 12, gaining two days' start of the enemy, and moved south-east via Bridgnorth, Birmingham and Kenilworth This had the desired effect Parliament, alarmed for its own safety, sent repeated orders to *Essex* to find the king and bring him to battle. Alarm gave place to determination when it was discovered that Charles was enlisting papists and seeking foreign aid The militia of the home counties was called out, a second army under the earl of *Warwick* was formed round the nucleus of the London trained bands, and *Essex*, straining every nerve to regain touch with the enemy, reached Kineton, where he was only 7 m from the king's headquarters at Edgecote, on the 22nd

Battle of Edgehill.—Rupert promptly reported the enemy's presence, and his confidence dominated the irresolution of the king and the caution of Lord Lindsey, the nominal commander-in-chief Both sides had marched widely dispersed in order to live, and the rapidity with which, having the clearer purpose, the Royalists drew together helped considerably to neutralize *Essex's* superior numbers During the morning of the 23rd the Royalists formed in battle order on the brow of Edgehill facing towards Kineton *Essex*, experienced soldier as he was, had distrusted his own raw army too much to force a decision earlier in the month, when the king was weak, he now found Charles in a strong position with an equal force to his own 14,000, and some of his regiments were still some miles distant But he advanced beyond Kineton, and the enemy promptly left their strong position and came down to the foot of the hill, for, situated as they were, they had either to fight wherever they could induce the enemy to engage, or to starve in the midst of hostile garrisons Rupert was on the right of the king's army with the greater part of the horse, Lord Lindsey and Sir Jacob Astley in the centre with the foot, Lord Wilmot (with whom rode the earl of Forth, the principal military adviser of the king) with a smaller body of cavalry on the left In rear of the centre were the king and a small reserve *Essex's* order was similar Rupert charged as soon as his wing was deployed and before the infantry of either side was ready Taking ground to his right front and then wheeling inwards at full speed he instantly rode down the Parliamentary horse opposed to him Some infantry regiments of *Essex's* left centre shared the same fate as their cavalry On the other wing Forth and Wilmot likewise swept away all that they could see of the enemy's cavalry, and the undisciplined Royalists of both wings pursued the fugitives in wild disorder up to Kineton, where they were severely handled by *John Hampden's* infantry brigade (which was escorting the artillery and baggage of *Essex's* army) Rupert brought back only a few rallied squadrons to the battlefield, and in the meantime affairs there had gone badly for the king The right and centre of the Parliamentary foot (the left having been brought to a halt by Rupert's charge) advanced with great resolution, and being at least as ardent as, and much better armed than, Lindsey's men, engaged them fiercely and slowly gained ground Only the best regiments on either side, however, maintained their order, and the decision of the infantry battle was achieved mainly by a few Parliamentary squadrons

One regiment of *Essex's* right wing only had been the target of Wilmot's charge, the other two had been at the moment invisible, and, as every Royalist troop on the ground, even the king's guards, had joined in the mad ride to Kineton, these, *Essex's* life-guard, and some troops that had rallied from the effect of Rupert's charge—amongst them Captain *Oliver Cromwell's*—were the only cavalry still present All these joined with decisive effect in the attack on the left of the royal infantry The king's line was steadily rolled up from left to right, the Parliamentary troopers captured his guns and regiment after regiment broke up Charles himself stood calmly in the thick of the fight, but he had not the skill to direct it The royal standard was taken and retaken, Lindsey and Sir Edmund Verney, the standard-bearer, being killed By the time that Rupert returned both sides were incapable of further effort and disillusioned as to the prospect of ending the war at a blow

On the 24th *Essex* retired, leaving Charles to claim the victory and to reap its results Banbury and Oxford were reoccupied by the Royalists, and by the 28th Charles was marching down the

Thames valley on London Negotiations were reopened, and a peace party rapidly formed itself in London and Westminster. Yet field fortifications sprang up around London, and when Rupert stormed and sacked Brentford on the 12th of November the trained bands moved out at once and took up a position at Turnham Green, barring the king's advance. *Hampden,* with something of the fire and energy of his cousin *Cromwell,* urged *Essex* to turn both flanks of the royal army via Acton and Kingston, but experienced professional soldiers urged him not to trust the London men to hold their ground while the rest manoeuvred *Hampden's* advice was undoubtedly premature A Sedan or Worcester was not within the power of the Parliamentarians of 1642, for, in Napoleon's words, "one only manoeuvres around a fixed point," and the city levies at that time were certainly not, *vis-à-vis* Rupert's cavalry, a fixed point As a matter of fact, after a slight cannonade at Turnham Green on the 13th, *Essex's* two-to-one numerical superiority of itself induced the king to retire to Reading Turnham Green has justly been called the Valmy of the English Civil War Like Valmy, without being a battle, it was a victory, and the tide of invasion came thus far, ebbed, and never returned.

The Winter of 1642–43.—In the winter, while *Essex* lay inactive at Windsor, Charles by degrees consolidated his position in the region of Oxford The city was fortified as a *redutt* for the whole area, and Reading, Wallingford, Abingdon, Brill, Banbury and Marlborough constituted a complete defensive ring which was developed by the creation of smaller posts from time to time In the north and west, winter campaigns were actively carried on "It is summer in Yorkshire, summer in Devon, and cold winter at Windsor," said one of *Essex's* critics At the beginning of December Newcastle crossed the Tees, defeated *Hotham,* the Parliamentary commander in the North Riding, and relieved the pressure on York *Lord Fairfax* and his son *Sir Thomas,* who commanded for the Parliament in Yorkshire, had to retire to the district between Hull and Selby, and Newcastle was free to turn his attention to the Puritan "clothing towns" of the West Riding —Leeds, Halifax and Bradford The townsmen, however, showed a determined front, the younger *Fairfax* with a picked body of cavalry rode through Newcastle's lines to help them, and about the end of January the earl gave up the attempt to reduce the towns He continued his march southward, however, and gained ground for the king as far as Newark, so as to be in touch with the Royalists of Nottinghamshire, Derbyshire and Leicestershire, and to prepare the way for further advance when the queen's convoy should arrive from over-seas

In the west Sir Ralph Hopton and his friends, having obtained a true bill from the grand jury against the Parliamentary disturbers of the peace, placed themselves at the head of the county militia and drove the rebels from Cornwall, after which they raised a small force for general service and invaded Devonshire (November 1642) Subsequently a Parliamentary army under the earl of *Stamford* was withdrawn from South Wales to engage Hopton, who had to retire into Cornwall There, however, the Royalist general was free to employ the militia again, and thus reinforced he won a victory over a part of *Stamford's* forces at Bradock Down near Liskeard (Jan 19, 1643) and resumed the offensive About the same time Hertford, no longer opposed by *Stamford,* brought over the South Wales Royalists to Oxford, and the fortified area around that place was widened by the capture of Cirencester on Feb 2 Gloucester and Bristol were now the only important garrisons of the Roundheads in the west In the midlands, in spite of a Parliamentary victory won by *Sir William Brereton* at Nantwich on Jan 28, the Royalists of Shropshire, Staffordshire and Leicestershire soon extended their influence through Ashby-de-la-Zouch into Nottinghamshire and joined hands with their friends at Newark Further, around Chester a new Royalist army was being formed under Lord Byron, and all the efforts of *Brereton* and of *Sir John Gell,* the leading supporter of the Parliament in Derbyshire, were required to hold their own, even before Newcastle's army was added to the list of their enemies

Lord Brooke, who commanded for the Parliament in Warwickshire and Staffordshire and was looked on by many as *Essex's* eventual successor, was killed in besieging Lichfield cathedral on March 2, and, though the cathedral soon capitulated, *Gell* and *Brereton* were severely handled in the indecisive battle of Hopton Heath near Stafford on March 19, and Prince Rupert, after an abortive raid on Bristol (March 7), marched rapidly northward, storming Birmingham en route, and recaptured Lichfield cathedral He was, however, soon recalled to Oxford to take part in the main campaign The position of affairs for the Parliament was perhaps at its worst in January. The Royalist successes of November and December, the ever-present dread of foreign intervention, and the burden of new taxation which the Parliament now found itself compelled to impose, disheartened its supporters Disorders broke out in London, and, while the more determined of the rebels began thus early to think of calling in the military assistance of the Scots, the majority were for peace on any conditions But soon the position improved somewhat; *Stamford* in the west and *Brereton* and *Gell* in the midlands, though hard pressed, were at any rate in arms and undefeated, Newcastle had failed to conquer the West Riding, and *Sir William Waller,* who had cleared Hampshire and Wiltshire of "malignants," entered Gloucestershire early in March, destroyed a small Royalist force at Highnam (March 24), and secured Bristol and Gloucester for the Parliament

Finally, some of Charles's own intrigues opportunely coming to light, the waverers, seeing the impossibility of plain dealing with the court, rallied again to the party of resistance, and the series of negotiations called by the name of the Treaty of Oxford closed in April with no more result than those which had preceded Edgehill and Turnham Green About this time too, following and improving upon the example of Newcastle in the north, Parliament ordered the formation of the celebrated "associations" or groups of counties banded together by mutual consent for defence The most powerful and best organized of these was that of the eastern counties (headquarters Cambridge), where the danger of attack from the north was near enough to induce great energy in the preparations for meeting it, and at the same time too distant effectively to interfere with these preparations Above all, the Eastern Association was from the first guided and inspired by *Colonel Cromwell*

The Plan of Campaign, 1643.—The king's plan of operations for the next campaign, which was perhaps inspired from abroad, was more elaborate than the simple "point" of 1642 The king's army, based on the fortified area around Oxford, was counted sufficient to use up *Essex's* forces On either hand, therefore, in Yorkshire and in the west, the Royalist armies were to fight their way inwards towards London, after which all three armies, converging on that place in due season, were to cut off its supplies and its sea-borne revenue and to starve the rebellion into surrender. The condition of this threefold advance was of course that the enemy should not be able to defeat the armies in detail, *i e*, that he should be fixed and held in the Thames valley; this secured, there was no purely military objection against operating in separate armies from the circumference towards the centre It was on the rock of local feeling that the king's plan came to grief Even after the arrival of the queen and her convoy, Newcastle had to allow her to proceed with a small force, and to remain behind with the main body, because of Lancashire and the West Riding, and above all because the port of Hull, in the hands of the *Fairfaxes,* constituted a menace that the Royalists of the East Riding refused to ignore Hopton's advance too, undertaken without the Cornish levies, was checked in the action of Sourton Down (Dartmoor) on April 25, and on the same day *Waller* captured Hereford *Essex* had already left Windsor to undertake the siege of Reading, the most important point in the circle of fortresses round Oxford, which after a vain attempt at relief surrendered to him on April 26 Thus the opening operations were unfavourable, not indeed so far as to require the scheme to be abandoned, but at least delaying the development until the campaigning season was far advanced

Victories of Hopton.—Affairs improved in May. The queen's long-expected convoy arrived at Woodstock on the 13th The

earl of Stamford's army, which had again entered Cornwall, was attacked in its selected position at Stratton and practically annihilated by Hopton (May 16). This brilliant victory was due above all to Sir Bevil Grenville and the lithe Cornishmen, who, though but 2,400 against 5,400 and destitute of artillery, stormed "Stamford Hill," killed 300 of the enemy, and captured 1,700 more with all their guns, colours and baggage Devon was at once overrun by the victors *Essex's* army, for want of material resources, had had to be content with the capture of Reading, and a Royalist force under Hertford and Prince Maurice (Rupert's brother) moved out as far as Salisbury to hold out a hand to their friends in Devonshire, while *Waller*, the only Parliamentary commander left in the field in the west, had to abandon his conquests in the Severn valley to oppose the further progress of his intimate friend and present enemy, Hopton Early in June Hertford and Hopton united at Chard and rapidly moved, with some cavalry skirmishing, towards Bath, where *Waller's* army lay. Avoiding the barrier of the Mendips, they moved round via Frome to the Avon. But *Waller*, thus cut off from London and threatened with investment, acted with great skill, and some days of manoeuvres and skirmishing followed, after which Hertford and Hopton found themselves on the north side of Bath facing *Waller's* entrenched position on the top of Lansdown Hill. This position the Royalists stormed on July 5

The battle of Lansdown was a second Stratton for the Cornishmen, but this time the enemy was of different quality and far differently led, and they had to mourn the loss of Sir Bevil Grenville and the greater part of their whole force At dusk both sides stood on the flat summit of the hill, still firing into one another with such energy as was not yet expended, and in the night *Waller* drew off his men into Bath "We were glad they were gone," wrote a Royalist officer, "for if they had not, I know who had within the hour" Next day Hopton was severely injured by the explosion of a wagon containing the reserve ammunition, and the Royalists, finding their victory profitless, moved eastward to Devizes, closely followed by the enemy On July 10 *Waller* took post on Roundway Down, overlooking Devizes, and captured a Royalist ammunition column from Oxford On the 11th he came down and invested Hopton's foot in Devizes itself, while the Royalist cavalry, Hertford and Maurice with them, rode away towards Salisbury But although the siege was pressed with such vigour that an assault was fixed for the evening of the 13th, the Cornishmen, Hopton directing the defence from his bed, held out stubbornly, and on the afternoon of July 13 Prince Maurice's horsemen appeared on Roundway Down, having ridden to Oxford, picked up reinforcements there, and returned at full speed to save their comrades *Waller's* army tried its best, but some of its elements were of doubtful quality and the ground was all in Maurice's favour The battle did not last long The combined attack of the Oxford force from Roundway and of Hopton's men from the town practically annihilated *Waller's* army Very soon afterwards Rupert came up with fresh Royalist forces, and the combined armies moved westward Bristol, the second port of the kingdom, was their objective, and in four days from the opening of the siege it was in their hands (July 26), *Waller* with the beaten remnant of his army at Bath being powerless to intervene The effect of this blow was felt even in Dorsetshire Within three weeks of the surrender Prince Maurice with a body of fast-moving cavalry overran that county almost unopposed.

Adwalton Moor.—Newcastle meanwhile had resumed operations against the clothing towns, this time with success. The *Fairfaxes* had been fighting in the West Riding since January with such troops from the Hull region as they had been able to bring across Newcastle's lines They and the townsmen together were too weak for Newcastle's increasing forces, and an attempt was made to relieve them by bringing up the Parliament's forces in Nottinghamshire, Derbyshire, Lincolnshire and the Eastern Association But local interests prevailed again, in spite of *Cromwell's* presence, and after assembling at Nottingham, the midland rebels quietly dispersed to their several counties (June 2). The *Fairfaxes* were left to their fate, and about the same time Hull itself narrowly escaped capture by the queen's forces through the treachery of *Sir John Hotham*, the governor, and his son, the commander of the Lincolnshire Parliamentarians. The latter had been placed under arrest at the instance of *Cromwell* and of *Colonel Hutchinson*, the governor of Nottingham Castle; he escaped to Hull, but both father and son were seized by the citizens and afterwards executed More serious than an isolated act of treachery was the far-reaching Royalist plot that had been detected in Parliament itself, for complicity in which Lord Conway, Edmund Waller the poet, and several members of both Houses were arrested The safety of Hull was of no avail for the West Riding towns, and the *Fairfaxes* underwent a decisive defeat at Adwalton (Atherton) Moor near Bradford on June 30. After this, by way of Lincolnshire, they escaped to Hull and reorganized the defence of that place The West Riding perforce submitted

The queen herself with a second convoy and a small army under Henry (Lord) Jermyn soon moved via Newark, Ashby-de-la-Zouch, Lichfield and other Royalist garrisons to Oxford, where she joined her husband on July 14 But Newcastle (now a marquis) was not yet ready for his part in the programme The Yorkshire troops would not march on London while the enemy was master of Hull, and by this time there was a solid barrier between the royal army of the north and the capital Roundway Down and Adwalton Moor were not after all destined to be fatal, though peace riots in London, dissensions in the Houses, and quarrels amongst the generals were their immediate consequences A new factor had arisen in the war—the Eastern Association.

Cromwell and the Eastern Association.—This had already intervened to help in the siege of Reading and had sent troops to the abortive gathering at Nottingham, besides clearing its own ground of "malignants" From the first *Cromwell* was the dominant influence Fresh from Edgehill, he had told *Hampden*, "You must get men of a spirit that is likely to go as far as gentlemen will go," not "old decayed serving-men, tapsters and such kind of fellows to encounter gentlemen that have honour and courage and resolution in them," and in January 1643 he had gone to his own county to "raise such men as had the fear of God before them and made some conscience of what they did" These men, once found, were willing, for the cause, to submit to a rigorous training and an iron discipline such as other troops, fighting for honour only or for profit only, could not be brought to endure The result was soon apparent As early as the 13th of May, *Cromwell's* regiment of horse—recruited from the horse-loving yeomen of the eastern counties—demonstrated its superiority in the field in a skirmish near Grantham, and in the irregular fighting in Lincolnshire during June and July these Puritan troopers distinguished themselves by long and rapid marches that may bear comparison with almost any in the history of the mounted arm When *Cromwell's* second opportunity came at Gainsborough on July 28, the "Lincolneer" horse who were under his orders were fired by the example of *Cromwell's* own regiment, and *Cromwell*, directing the whole with skill, and above all with energy, utterly routed the Royalist horse and killed their general, Charles Cavendish

In the meantime the army of *Essex* had been inactive After the fall of Reading a serious epidemic of sickness had reduced it to impotence On June 18 the Parliamentary cavalry was routed and *John Hampden* mortally wounded at Chalgrove Field near Chiselhampton, and when at last *Essex*, having obtained the desired reinforcements, moved against Oxford from the Aylesbury side, he found his men demoralized by inaction, and before the menace of Rupert's cavalry, to which he had nothing to oppose, he withdrew to Bedfordshire (July) He made no attempt to intercept the march of the queen's convoys, he had permitted the Oxford army, which he should have held fast, to intervene effectually in the midlands, the west and the south-west, and *Waller* might well complain that *Essex*, who still held Reading and the Chilterns, had given him neither active nor passive support in the critical days preceding Roundway Down Still only a few voices were raised to demand his removal, and he was

shortly to have an opportunity of proving himself in an active campaign. The centre and the right of the three Royalist armies had for a moment (Roundway to Bristol) united to crush *Waller*, but their concentration was short-lived Plymouth was to Hopton's men what Hull was to Newcastle's—they would not march on London until the menace to their homes was removed Further, there were dissensions among the generals which Charles was too weak to crush, and consequently the original plan reappears—the main Royalist army to operate in the centre, Hopton's (now Maurice's) on the right, Newcastle on the left towards London. While waiting for the fall of Hull and Plymouth, Charles naturally decided to make the best use of his time by reducing Gloucester, the one great fortress of the Parliament in the west

Siege and Relief of Gloucester.—This decision quickly brought on a crisis While the *earl of Manchester* (with *Cromwell* as his lieutenant-general) was appointed to head the forces of the Eastern Association against Newcastle, and *Waller* was given a new army wherewith again to engage Hopton and Maurice, the task of saving Gloucester from the king's army fell to *Essex*, who was heavily reinforced and drew his army together for action in the last days of August Resort was had to the press-gang to fill the ranks, recruiting for *Waller's* new army was stopped, and London sent six regiments of trained bands to the front, closing the shops so that every man should be free to take his part in what was thought to be the supreme trial of strength

On the 26th, all being ready, *Essex* started Through Aylesbury and round the north side of Oxford to Stow-on-the-Wold the army moved resolutely, not deterred by want of food and rest, or by the attacks of Rupert's and Wilmot's horse on its flank On Sept 5, just as Gloucester was at the end of its resources, the siege was suddenly raised and the Royalists drew off to Painswick, for *Essex* had reached Cheltenham and the danger was over Then, the field armies being again face to face and free to move, there followed a series of skilful manoeuvres in the Severn and Avon valleys, at the end of which the Parliamentary army gained a long start on its homeward road via Cricklade, Hungerford and Reading But the Royalist cavalry under Rupert, followed rapidly by Charles and the main body from Evesham, strained every nerve to head off *Essex* at Newbury, and after a sharp skirmish on Aldbourne Chase on Sept 18 succeeded in doing so On the 19th the whole Royal army was drawn up, facing west, with its right on Newbury and its left on Enborne Heath *Essex's* men knew that evening that they would have to break through by force—there was no suggestion of surrender

First Battle of Newbury, September 20, 1643.—The ground was densely intersected by hedges except in front of the Royalists' left centre (Newbury Wash) and left (Enborne Heath), and, practically, *Essex's* army was never formed in line of battle, for each unit was thrown into the fight as it came up its own road or lane On the left wing, in spite of the Royalist counterstrokes, the attack had the best of it, capturing field after field, and thus gradually gaining ground to the front Here *Lord Falkland* was killed On the Reading road itself *Essex* did not succeed in deploying on to the open ground on Newbury Wash, but victoriously repelled the royal horse when it charged up to the lanes and hedges held by his foot On the extreme right of the Parliamentary army, which stood in the open ground of Enborne Heath, took place a famous incident Here two of the London regiments, fresh to war as they were, were exposed to a trial as severe as that which broke down the veteran Spanish infantry at Rocroi in this same year Rupert and the Royalist horse again and again charged up to the squares of pikes, and between each charge his guns tried to disorder the Londoners, but it was not until the advance of the royal infantry that the trained bands retired, slowly and in magnificent order, to the edge of the heath The result of it all was that *Essex's* army had fought its hardest and failed to break the opposing line But the Royalists had suffered so heavily, and above all the valour displayed by the rebels had so profoundly impressed them, that they were glad to give up the disputed road and withdraw into Newbury. *Essex* thereupon pursued his march, Reading was reached on the 22nd after a small rearguard skirmish at Aldermaston, and so ended one of the most dramatic episodes of English history

Hull and Winceby.—Meanwhile the siege of Hull had commenced The Eastern Association forces under *Manchester* promptly moved up into Lincolnshire, the foot besieging Lynn (which surrendered on Sept. 16) while the horse rode into the northern part of the county to give a hand to the *Fairfaxes* Fortunately the sea communications of Hull were open On Sept 18 part of the cavalry in Hull was ferried over to Barton, and the rest under *Sir Thomas Fairfax* went by sea to Saltfleet a few days later, the whole joining *Cromwell* near Spilsby. In return, the old *Lord Fairfax*, who remained in Hull, received infantry reinforcements and a quantity of ammunition and stores from the Eastern Association On Oct 11 *Cromwell* and *Fairfax* together won a brilliant cavalry action at Winceby, driving the Royalist horse in confusion before them to Newark, and on the same day Newcastle's army around Hull, which had suffered terribly from the hardships of continuous siege work, was attacked by the garrison and so severely handled that next day the siege was given up Later, *Manchester* retook Lincoln and Gainsborough, and thus Lincolnshire, which had been almost entirely in Newcastle's hands before he was compelled to undertake the siege of Hull, was added in fact as well as in name to the Eastern Association

Elsewhere, in the reaction after the crisis of Newbury, the war languished The city regiments went home, leaving *Essex* too weak to hold Reading, which the Royalists reoccupied on Oct 3 At this the Londoners offered to serve again, and actually took part in a minor campaign around Newport Pagnell, which town Rupert attempted to fortify as a menace to the Eastern Association and its communications with London *Essex* was successful in preventing this, but his London regiments again went home, and *Waller's* new army in Hampshire failed lamentably in an attempt on Basing House (Nov 7), the London trained bands deserting *en bloc* Shortly afterwards Arundel surrendered to a force under Sir Ralph, now Lord Hopton (Dec 9)

The "Irish Cessation" and the Solemn League and Covenant.—Politically, these months were the turning-point of the war In Ireland, the king's lieutenant, by order of his master, made a truce with the Irish rebels (Sept 15) Charles's chief object was to set free his army to fight in England, but it was believed universally that Irish regiments—in plain words, papists in arms—would shortly follow Under these circumstances his act united against him nearly every class in Protestant England, above all brought into the English quarrel the armed strength of Presbyterian Scotland Yet Charles, still trusting to intrigue and diplomacy to keep Scotland in check, deliberately rejected the advice of Montrose, his greatest and most faithful lieutenant, who wished to give the Scots employment for their army at home Only ten days after the "Irish cessation," the Parliament at Westminster swore to the Solemn League and Covenant, and the die was cast It is true that even a semblance of Presbyterian theocracy put the "Independents" on their guard and definitely raised the question of freedom of conscience, and that secret negotiations were opened between the Independents and Charles on that basis, but they soon discovered that the king was merely using them as instruments to bring about the betrayal of Aylesbury and other small rebel posts All parties found it convenient to interpret the Covenant liberally for the present, and at the beginning of 1644 the Parliamentary party showed so united a front that even *Pym's* death (Dec 8, 1643) hardly affected its resolution to continue the struggle.

The troops from Ireland, thus obtained at the cost of an enormous political blunder, proved to be untrustworthy after all Those serving in Hopton's army were "mutinous and shrewdly infected with the rebellious humour of England" When *Waller's* Londoners surprised and routed a Royalist detachment at Alton (December 13, 1643), half the prisoners took the Covenant. Hopton had to retire, and on Jan 6, 1644 *Waller* recaptured Arundel. Byron's Cheshire army was in no better case. Newcastle's retreat from Hull and the loss of Gainsborough had completely changed

the situation in the midlands, *Brereton* was joined by the younger *Fairfax* from Lincolnshire, and the Royalists were severely defeated for a second time at Nantwich (January 25) As at Alton, the majority of the prisoners (amongst them Colonel George Monk) took the Covenant and entered the Parliamentary army. In Lancashire, as in Cheshire, Staffordshire, Nottinghamshire and Lincolnshire, the cause of the Parliament was in the ascendant. Resistance revived in the West Riding towns, *Lord Fairfax* was again in the field in the East Riding, and even Newark was closely besieged by *Sir John Meldrum* More important news came in from the north The advanced guard of the Scottish army had passed the Tweed on Jan 19 and the marquis of Newcastle with the remnant of his army would soon be attacked in front and rear at once.

Newark and Cheriton (March 1644).—As in 1643, Rupert was soon on his way to the north to retrieve the fortunes of his side Moving by the Welsh border, and gathering up garrisons and recruits snowball-wise as he marched, he went first to Cheshire to give a hand to Byron, and then, with the utmost speed, he made for Newark On March 20, 1644 he bivouacked at Bingham, and on the 21st he not only relieved Newark but routed the besiegers' cavalry On the 22nd *Meldrum's* position was so hopeless that he capitulated on terms But, brilliant soldier as he was, the prince was unable to do more than raid a few Parliamentary posts around Lincoln, after which he had to return his borrowed forces to their various garrisons and go back to Wales—laden indeed with captured pikes and muskets—to raise a permanent field army. Nor could he be in all places at once. Newcastle was clamorous for aid In Lancashire, only the countess of Derby, in Lathom House, held out for the king, and her husband pressed Rupert to go to her relief Once, too, the prince was ordered back to Oxford to furnish a travelling escort for the queen, who shortly after this gave birth to her youngest child and returned to France. The order was countermanded within a few hours, it is true, but Charles had good reason for avoiding detachments from his own army On March 29, Hopton had undergone a severe defeat at Cheriton near New Alresford In the preliminary manoeuvres and in the opening stages of the battle the advantage lay with the Royalists But Royalist indiscipline ruined everything A young cavalry colonel charged in defiance of orders, a fresh engagement opened, and at the last moment *Waller* snatched a victory out of defeat Worse than this was the news from Yorkshire and Scotland Charles had at last assented to Montrose's plan and promised him the title of marquis, but the first attempt to raise the Royalist standard in Scotland gave no omen of its later triumphs In Yorkshire *Sir Thomas Fairfax,* advancing from Lancashire through the West Riding, joined his father Selby was stormed on April 11, and thereupon Newcastle, who had been manoeuvring against the Scots in Durham, hastily drew back, sent his cavalry away, and shut himself up with his foot in York Two days later the Scottish general, *Alexander Leslie, Lord Leven,* joined the *Fairfaxes* and prepared to invest that city.

Plans of Campaign for 1644.—The original plan of the Parliamentary "Committee of Both Kingdoms," which directed the military and civil policy of the allies after the fashion of a modern cabinet, was to combine *Essex's* and *Manchester's* armies in an attack upon the king's army, Aylesbury being appointed as the place of concentration *Waller's* troops were to continue to drive back Hopton and to reconquer the west, *Fairfax* and the Scots to invest Newcastle's army, while in the midlands *Brereton* and the Lincolnshire rebels could be counted upon to neutralize, the one Byron, the others the Newark Royalists But *Waller,* once more deserted by his trained bands, was unable to profit by his victory of Cheriton, and retired to Farnham *Manchester,* too, was delayed because the Eastern Association was still suffering from the effects of Rupert's Newark exploit—Lincoln, abandoned by the rebels on that occasion, was not reoccupied till May 6. Moreover, *Essex* found himself compelled to defend his conduct and motives to the Committee of Both Kingdoms, and as usual was straitened for men and money. But though there were grave elements of weakness on the other side, the Royalists considered their own position to be hopeless. Prince Maurice was engaged in the fruitless siege of Lyme Regis, Gloucester was again a centre of activity and counterbalanced Newark, and the situation in the north was practically desperate Rupert himself came to Oxford (April 25) to urge that his new army should be kept free to march to aid Newcastle, who was now threatened—owing to the abandonment of the enemy's original plan—by *Manchester* as well as by *Fairfax* and *Leven.* There was no further talk of the concentric advance of three armies on London The fiery prince and the methodical earl of Brentford (Forth) were at one at least in recommending that the Oxford area with its own garrison and a mobile force in addition should be the pivot of the field armies' operations. Rupert, needing above all adequate time for the development of the northern offensive, was not in favour of abandoning any of the barriers to *Essex's* advance Brentford, on the other hand, thought it advisable to contract the lines of defence, and Charles, as usual undecided, agreed to Rupert's scheme and executed Brentford's Reading, therefore, was dismantled early in May, and Abingdon given up shortly afterwards

Cropredy Bridge.—It was now possible for the enemy to approach Oxford, and Abingdon was no sooner evacuated than (May 26) *Waller's* and *Essex's* armies united there—still, unfortunately for their cause, under separate commanders From Abingdon *Essex* moved direct on Oxford, *Waller* towards Wantage, where he could give a hand to *Massey,* the energetic governor of Gloucester Affairs seemed so bad in the west (Maurice with a whole army was still vainly besieging the single line of low breastworks that constituted the fortress of Lyme) that the king despatched Hopton to take charge of Bristol Nor were things much better at Oxford, the barriers of time and space and the supply area had been deliberately given up to the enemy, and Charles was practically forced to undertake extensive field operations with no hope of success save in consequence of the enemy's mistakes. The enemy, as it happened, did not disappoint him

The king, probably advised by Brentford, conducted a skilful war of manoeuvre in the area defined by Stourbridge, Gloucester, Abingdon and Northampton, at the end of which *Essex,* leaving *Waller* to the secondary work, as he conceived it, of keeping the king away from Oxford and reducing that fortress, marched off into the west with most of the general service troops to repeat at Lyme Regis his Gloucester exploit of 1643 At one moment, indeed, Charles (then in Bewdley) rose to the idea of marching north to join Rupert and Newcastle, but he soon made up his mind to return to Oxford. From Bewdley, therefore, he moved to Buckingham—the distant threat on London producing another evanescent citizen army drawn from six counties under Major-General *Browne*—and *Waller* followed him closely When the king turned upon *Browne's* motley host, *Waller* appeared in time to avert disaster, and the two armies worked away to the upper Cherwell Brentford and *Waller* were excellent strategists of the 17th century type, and neither would fight a pitched battle without every chance in his favour Eventually on June 29 the Royalists were successful in a series of minor fights about Cropredy Bridge, and the result was, in accordance with continental custom, admitted to be an important victory, though *Waller's* main army drew off unharmed In the meantime, *Essex* had relieved Lyme (June 15) and occupied Weymouth, and was preparing to go farther The two rebel armies were now indeed separate *Waller* had been left to do as best he could, and a worse fate was soon to overtake the cautious earl

Campaign of Marston Moor.—During these manoeuvres the northern campaign had been fought to an issue Rupert's courage and energy were more likely to command success in the English Civil War than all the conscientious caution of an Essex or a Brentford On May 16 he left Shrewsbury to fight his way through hostile country to Lancashire, where he hoped to re-establish the Derby influence and raise new forces Stockport was plundered on the 25th, the besiegers of Lathom House utterly defeated at Bolton on the 28th Soon afterwards he received a large reinforcement under General Goring, which included 5,000 of Newcastle's cavalry The capture of the almost defenceless town of Liverpool—undertaken as usual to allay local fears—did not delay Rupert more than three or four days, and he then turned

towards the Yorkshire border with greatly augmented forces. On June 14 he received a despatch from the king, the gist of which was that there was a time-limit imposed on the northern enterprise If York were lost or did not need his help, Rupert was to make all haste southward via Worcester. "If York be relieved and you beat the rebels' armies of both kingdoms, then, but otherways not, I may possibly make a shift upon the defensive to spin out time until you come to assist me."

Charles did manage to "spin out time" But it was of capital importance that Rupert had to do his work upon York and the allied army in the shortest possible time, and that, according to the despatch, there were only two ways of saving the royal cause, "having relieved York by beating the Scots," or marching with all speed to Worcester Rupert's duty, interpreted through the medium of his temperament, was clear enough Newcastle still held out, his men having been encouraged by a small success on June 17, and Rupert reached Knaresborough on the 30th At once *Leven, Fairfax* and *Manchester* broke up the siege of York and moved out to meet him But the prince, moving still at high speed, rode round their right flank via Boroughbridge and Thornton Bridge and entered York on the north side Newcastle tried to dissuade Rupert from fighting, but his record as a general was scarcely convincing as to the value of his advice. Rupert curtly replied that he had orders to fight, and the Royalists moved out towards Marston Moor (*q v*) on the morning of July 2, 1644. The Parliamentary commanders, fearing a fresh manoeuvre, had already begun to retire towards Tadcaster, but as soon as it became evident that a battle was impending they turned back The battle of Marston Moor began about four in the afternoon. It was the first real trial of strength between the best elements on either side, and it ended before night with the complete victory of the Parliamentary armies The Royalist cause in the north collapsed once for all, Newcastle fled to the continent, and only Rupert, resolute as ever, extricated 6,000 cavalry from the *débâcle* and rode away whence he had come, still the dominant figure of the war.

Independency.—The victory gave the Parliament entire control of the north, but it did not lead to the definitive solution of the political problem, and in fact, on the question of Charles's place in a new constitution, the victorious generals quarrelled even before York had surrendered Within three weeks of the battle the great army was broken up The Yorkshire troops proceeded to conquer the isolated Royalist posts in their country, the Scots marched off to besiege Newcastle-on-Tyne and to hold in check a nascent Royalist army in Westmorland Rupert in Lancashire they neglected entirely *Manchester* and *Cromwell*, already estranged, marched away into the Eastern Association There, for want of an enemy to fight their army was forced to be idle, and *Cromwell* and the ever-growing Independent element quickly came to suspect their commander of lukewarmness in the cause *Waller's* army, too, was spiritless and immobile. On July 2, despairing of the existing military system, he made to the Committee of Both Kingdoms the first suggestion of the New Model "My lords," he wrote, "till you have an army merely your own, that you may command, it is . impossible to do anything of importance" *Browne's* trained band army was perhaps the most ill-behaved of all—once the soldiers attempted to murder their own general Parliament in alarm set about the formation of a new general service force (July 12), but meantime both *Waller's* and *Browne's* armies (at Abingdon and Reading respectively) ignominiously collapsed by mutiny and desertion It was evident that the people at large, with their respect for the law and their anxiety for their own homes, were tired of the war

Only those men—such as *Cromwell*—who had set their hearts on fighting out the quarrel of conscience, kept steadfastly to their purpose *Cromwell* himself had already decided that the king himself must be deprived of his authority, and his supporters were equally convinced. But they were relatively few Even the Eastern Association trained bands had joined in the disaffection in *Waller's* army, and that unfortunate general's suggestion of a professional army, with all its dangers, indicated the only means of enforcing a peace such as *Cromwell* and his friends desired. There was this important difference, however, between *Waller's* idea and *Cromwell's* achievement—that the professional soldiers of the New Model were disciplined, led, and in all things inspired by "godly" officers. Godliness, devotion to the cause, and efficiency were indeed the only criteria *Cromwell* applied in choosing officers. Long before this he had warned the Scottish major-general *Lawrence Crawford* that the precise colour of a man's religious opinions mattered nothing compared with his devotion to them, and had told the committee of Suffolk, "I had rather have a plain russet-coated captain that knows what he fights for and loves what he knows than that which you call a 'gentleman' and is nothing else I honour a gentleman that is so indeed but seeing it was necessary the work must go on, better plain men than none" If "men of honour and birth" possessed the essentials of godliness, devotion and capacity, *Cromwell* preferred them, and as a fact only seven out of thirty-seven of the superior officers of the original New Model were not of gentle birth

Lostwithiel.—But all this was as yet in the future. *Essex's* military promenade in the west of England was the subject of immediate interest At first successful, this general penetrated to Plymouth, whence, securely based as he thought, he could overrun Devon Unfortunately for him he was persuaded to overrun Cornwall as well At once the Cornishmen rose, as they had risen under Hopton, and the king was soon on the march from the Oxford region, disregarding the armed mobs under *Waller* and *Browne* Their state reflected the general languishing of the war spirit on both sides, not on one only, as Charles discovered when he learned that Lord Wilmot, the lieutenant-general of his horse, was in correspondence with *Essex* Wilmot was of course placed under arrest, and was replaced by the dissolute General Goring But it was unpleasantly evident that even gay cavaliers of the type of Wilmot had lost the ideals for which they fought, and had come to believe that the realm would never be at peace while Charles was king Henceforward it will be found that the Royalist foot, now a thoroughly professional force, is superior in quality to the once superb cavalry, and that not merely because its opportunities for plunder, etc , are more limited

Materially, however, the immediate victory was undeniably with the Royalists After a brief period of manoeuvre, the Parliamentary army, now far from Plymouth found itself surrounded and starving at Lostwithiel, on the Fowey river, without hope of assistance The horse cut its way out through the investing circle of posts, *Essex* himself escaped by sea, but Major-General *Skippon*, his second in command, had to surrender with the whole of the foot on Sept. 2 The officers and men were allowed to go free to Portsmouth, but their arms, guns and munitions were the spoil of the victors. There was now no trustworthy field force in arms for the Parliament south of the Humber, for even the Eastern Association army was distracted by its religious differences, which had now at last come definitely to the front and absorbed the political dispute in a wider issue *Cromwell* already proposed to abolish the peerage, the members of which were inclined to make a hollow peace, and had ceased to pay the least respect to his general, *Manchester*, whose scheme for the solution of the quarrel was an impossible combination of Charles and Presbyterianism. *Manchester* for his part sank into a state of mere obstinacy, refusing to move against Rupert, even to besiege Newark, and actually threatened to hang Colonel *Lilburne* for capturing a Royalist castle without orders

Operations of Essex's, Waller's and Manchester's Armies.—After the success of Lostwithiel there was little to detain Charles's main army in the extreme west, and meanwhile Banbury, a most important point in the Oxford circle, and Basing House (near Basingstoke) were in danger of capture *Waller*, who had organized a small force of reliable troops, had already sent cavalry into Dorsetshire with the idea of assisting *Essex*, and he now came himself with reinforcements to prevent, so far as lay in his power, the king's return to the Thames valley. Charles was accompanied of course only by his permanent forces and by parts of Prince Maurice's and Hopton's armies—the Cornish

levies had as usual scattered as soon as the war receded from their borders. *Manchester* slowly advanced to Reading, *Essex* gradually reorganized his broken army at Portsmouth, while *Waller,* far out to the west at Shaftesbury, endeavoured to gain the necessary time and space for a general concentration in Wiltshire, where Charles would be far from Oxford and Basing and, in addition, outnumbered by two to one But the work of rearming *Essex's* troops proceeded slowly for want of money, and *Manchester* peevishly refused to be hurried either by his more vigorous subordinates or by the Committee of Both Kingdoms, saying that the army of the Eastern Association was for the guard of its own employers and not for general service He pleaded the renewed activity of the Newark Royalists as his excuse, forgetting that Newark would have been in his hands ere this had he chosen to move thither instead of lying idle for two months

As to the higher command, things had come to such a pass that, when the three armies at last united, a council of war, consisting of three army commanders, several senior officers, and two civilian delegates from the Committee, was constituted When the vote of the majority had determined what was to be done, *Essex,* as lord general of the Parliament's first army, was to issue the necessary orders for the whole. Under such conditions it was not likely that *Waller's* hopes of a great battle at Shaftesbury would be realized On Oct 8 he fell back, the royal army following him step by step and finally reaching Whitchurch on Oct. 20 *Manchester* arrived at Basingstoke on the 17th, *Waller* on the 19th and *Essex* on the 21st Charles had found that he could not relieve Basing (a mile or two from Basingstoke) without risking a battle with the enemy between himself and Oxford; his policy was still, as before Marston Moor, to "spin out time" until Rupert came back from the north; he therefore took the Newbury road and relieved Donnington Castle near Newbury on the 22nd Three days later Banbury too was relieved by a force which could now be spared from the Oxford garrison

But for once the council of war on the other side was for fighting a battle, and the Parliamentary armies, their spirits revived by the prospect of action and by the news of the fall of Newcastle and the defeat of a sally from Newark, marched briskly On the 26th they appeared north of Newbury on the Oxford road Like *Essex* in 1643, Charles found himself headed off from the shelter of friendly fortresses, but beyond this fact there is little similarity between the two battles of Newbury, for the Royalists in the first case merely drew a barrier across *Essex's* path On the present occasion the eager Parliamentarians made no attempt to force the king to attack them; they were well content to attack him in his chosen position themselves, especially as he was better off for supplies and quarters than they

Second Newbury.—The second battle of Newbury is remarkable as being the first great manoeuvre-battle (as distinct from "pitched" battle) of the Civil War A preliminary reconnaissance by the Parliamentary leaders (*Essex* was not present, owing to illness) established the fact that the king's infantry held a strong line of defence behind the Lambourn brook from Shaw (inclusive) to Donnington (exclusive), Shaw House and adjacent buildings being held as an advanced post In rear of the centre, in open ground just north of Newbury, lay the bulk of the royal cavalry. In the left rear of the main line, and separated from it by more than a thousand yards, lay Prince Maurice's corps at Speen, advanced troops on the high ground west of that village, but Donnington Castle, under its energetic governor Sir John Boys, formed a strong post covering this gap with artillery fire

The Parliamentary leaders had no intention of flinging their men away in a frontal attack on the line of the Lambourn, and a flank attack from the east side could hardly succeed owing to the obstacle presented by the confluence of the Lambourn and the Kennet, hence they decided on a wide turning movement via Chieveley, Winterbourne and Wickham Heath, against Prince Maurice's position—a decision which, daring and energetic as it was, led only to a modified success, for reasons which will appear The flank march, out of range of the castle, was conducted with punctuality and precision. The troops composing it were drawn from all three armies and led by the best fighting generals, *Waller, Cromwell,* and *Essex's* subordinates *Balfour* and *Skippon Manchester* at Clay Hill was to stand fast until the turning movement had developed, and to make a vigorous holding attack on Shaw House as soon as *Waller's* guns were heard at Speen But there was no commander-in-chief to co-ordinate the movements of the two widely separated corps, and consequently no co-operation *Waller's* attack was not unexpected, and Prince Maurice had made ready to meet him Yet the first rush of the rebels carried the entrenchments of Speen Hill, and Speen itself, though stoutly defended, fell into their hands within an hour, *Essex's* infantry recapturing here some of the guns they had had to surrender at Lostwithiel But meantime *Manchester,* in spite of the entreaties of his staff, had not stirred from Clay Hill He had made one false attack already early in the morning, and been severely handled, and he was aware of his own deficiencies as a general A year before this he would have asked for and acted upon the advice of a capable soldier, such as *Cromwell* or *Crawford,* but now his mind was warped by a desire for peace on any terms, and he sought only to avoid defeat pending a happy solution of the quarrel Those who sought to gain peace through victory were meanwhile driving Maurice back from hedge to hedge towards the open ground at Newbury, but every attempt to emerge from the lanes and fields was repulsed by the royal cavalry, and indeed by every available man and horse, for Charles's officers had gauged *Manchester's* intentions, and almost stripped the front of its defenders to stop *Waller's* advance Nightfall put an end to the struggle around Newbury, and then—too late—*Manchester* ordered the attack on Shaw House It failed completely in spite of the gallantry of his men, and darkness being then complete it was not renewed

In its general course the battle closely resembled that of Freiburg (*q v*), fought the same year on the Rhine But, if *Waller's* part in the battle corresponded in a measure to Turenne's, *Manchester* was unequal to playing the part of Condé, and consequently the results, in the case of the French won by three days' hard fighting, and even then comparatively small, were in the case of the English practically nil. During the night the royal army quietly marched away through the gap between *Waller's* and *Manchester's* troops The heavy artillery and stores were left in Donnington Castle, Charles himself with a small escort rode off to the north-west to meet Rupert, and the main body gained Wallingford unmolested An attempt at pursuit was made by *Waller* and *Cromwell* with all the cavalry they could lay hands on, but it was unsupported, for the council of war had decided to content itself with besieging Donnington Castle A little later, after a brief and half-hearted attempt to move towards Oxford, it referred to the Committee for further instructions Within the month Charles, having joined Rupert at Oxford and made him general of the Royalist forces *vice* Brentford, reappeared in the neighbourhood of Newbury Donnington Castle was again relieved (Nov 9) under the eyes of the Parliamentary army, which was in such a miserable condition that even *Cromwell* was against fighting, and some manoeuvres followed, in the course of which Charles relieved Basing House and the Parliamentary armies fell back, not in the best order, to Reading The season for field warfare was now far spent, and the royal army retired to enjoy good quarters and plentiful supplies around Oxford

The Self-denying Ordinance.—On the other side, the dissensions between the generals had become flagrant and public, and it was no longer possible for the Houses of Parliament to ignore the fact that the army must be radically reformed *Cromwell* and *Waller* from their places in parliament attacked *Manchester's* conduct, and their attack ultimately became, so far as *Cromwell* was concerned, an attack on the Lords, most of whom held the same views as *Manchester,* and on the Scots, who attempted to bring *Cromwell* to trial as an "incendiary" At the crisis of their bitter controversy *Cromwell* suddenly proposed to stifle all animosities by the resignation of all officers who were members of either House, a proposal which affected himself not less than *Essex* and *Manchester* The first "self-denying ordinance" was moved on Dec 9, and provided that "no member of either house

shall have or execute any office or command . . .," etc. This was not accepted by the Lords, and in the end a second "self-denying ordinance" was agreed to (April 3, 1645), whereby all the persons concerned were to resign, but without prejudice to their reappointment Simultaneously with this, the formation of the New Model was at last definitely taken into consideration The last exploit of *Waller,* who was not re-employed after the passing of the ordinance, was the relief of Taunton, then besieged by General Goring's army *Cromwell* served as his lieutenant-general on this occasion, and we have Waller's own testimony that he was in all things a wise, capable and respectful subordinate Under a leader of the stamp of *Waller, Cromwell* was well satisfied to obey, knowing the cause to be in good hands

Decline of the Royalist Cause.—A raid of Goring's horse from the west into Surrey and an unsuccessful attack on General Browne at Abingdon were the chief enterprises undertaken on the side of the Royalists during the early winter It was no longer "summer in Devon, summer in Yorkshire" as in January 1643 An ever-growing section of Royalists, amongst whom Rupert himself was soon to be numbered, were for peace, many scores of loyalist gentlemen, impoverished by the loss of three years' rents of their estates and hopeless of ultimate victory, were making their way to Westminster to give in their submission to the Parliament and to pay their fines The new plan, suggested probably by Rupert, had already been tried with strategical success in the summer campaign of 1644 As we have seen, it consisted essentially in using Oxford as the centre of a circle and striking out radially at any favourable target—"manoeuvring about a fixed point," as Napoleon called it It was significant of the decline of the Royalist cause that the "fixed point" had been in 1643 the king's field army, based indeed on its great entrenched camp, Banbury-Cirencester-Reading-Oxford, but free to move and to hold the enemy wherever met, while now it was the entrenched camp itself, weakened by the loss or abandonment of its outer posts, and without the power of binding the enemy if they chose to ignore its existence, that conditioned the scope and duration of the single remaining field army's enterprises

The New Model Ordinance.—For the present, however, Charles's cause was crumbling more from internal weakness than from the blows of the enemy Fresh negotiations for peace which opened on Jan 29 at Uxbridge (by the name of which place they are known to history) occupied the attention of the Scots and their Presbyterian friends, the rise of Independency and of *Cromwell* was a further distraction, and over the new army and the Self-denying Ordinance the Lords and Commons were seriously at variance But in February a fresh mutiny in *Waller's* command struck alarm into the hearts of the disputants The "treaty" of Uxbridge came to the same end as the treaty of Oxford in 1643, and a settlement as to army reform was achieved on Feb 15. Though it was only on March 25 that the second modified form of the ordinance was agreed to by both Houses, *Sir Thomas Fairfax* and *Philip Skippon* (who were not members of parliament) had been approved as lord general and major-general (of the infantry) respectively of the new army as early as Jan 21 The post of lieutenant-general and cavalry commander was for the moment left vacant, but there was little doubt as to who would eventually occupy it

Victories of Montrose.—In Scotland, meanwhile, Montrose was winning victories which amazed the people of the two kingdoms Montrose's royalism differed from that of Englishmen of the 17th century less than from that of their forefathers under Henry VIII and Elizabeth To him the king was the protector of his people against Presbyterian theocracy, scarcely less offensive to him than the Inquisition itself, and the feudal oppression of the great nobles Little as this ideal corresponded to the Charles of reality, it inspired in Montrose not merely romantic heroism but a force of leadership which was sufficient to carry to victory the nobles and gentry, the wild Highlanders and the experienced professional soldiers who at various times and places constituted his little armies His first unsuccessful enterprise has been mentioned above It seemed, in the early stages of his second attempt (August 1644), as if failure were again inevitable, for the gentry of the northern Lowlands were overawed by the prevailing party and resented the leadership of a lesser noble, even though he were the king's lieutenant over all Scotland. Disappointed of support where he most expected it, Montrose then turned to the Highlands At Blair Athol he gathered his first army of Royalist clansmen, and good fortune gave him also a nucleus of trained troops A force of disciplined experienced soldiers (chiefly Irish Macdonalds and commanded by Alastair of that name) had been sent over from Ireland earlier in the year, and, after ravaging the glens of their hereditary enemies the Campbells, had attempted without success, now here, now there, to gather the other clans in the king's name. Their hand was against every man's, and when he finally arrived in Badenoch, Alastair Macdonald was glad to protect himself by submitting to the authority of the king's lieutenant

There were three hostile armies to be dealt with, besides—ultimately—the main Covenanting army far away in England The duke of *Argyll,* the head of the Campbells, had an army of his own clan and of Lowland Covenanter levies, Lord *Elcho* with another Lowland army lay near Perth, and Lord *Balfour of Burleigh* was collecting a third (also composed of Lowlanders) at Aberdeen Montrose turned upon *Elcho* first, and found him at Tippermuir near Perth on the 1st of September 1644 The Royalists were about 3,000 strong and entirely foot, only Montrose himself and two others being mounted, while *Elcho* had about 7,000 of all arms But *Elcho's* townsmen found that pike and musket were clumsy weapons in inexperienced hands, and, like Mackay's regulars at Killiecrankie fifty years later, they wholly failed to stop the rush of the Highland swordsmen Many hundreds were killed in the pursuit, and Montrose slept in Perth that night, having thus accounted for one of his enemies

Balfour of Burleigh was to be his next victim, and he started for Aberdeen on the 4th As he marched, his Highlanders slipped away to place their booty in security But the Macdonald regulars remained with him, and as he passed along the coast some of the gentry came in, though the great clan of the Gordons was at present too far divided in sentiment to take his part Lord *Lewis Gordon* and some Gordon horse were even in *Balfour's* army. On the other hand, the earl of Airlie brought in forty-four horsemen, and Montrose was thus able to constitute two wings of cavalry on the day of battle The Covenanters were about 2,500 strong and drawn up on a slope above the How Burn just outside Aberdeen (Sept 13, 1644) Montrose, after clearing away the enemy's skirmishers, drew up his army in front of the opposing line, the foot in the centre, the forty-four mounted men, with musketeers to support them, on either flank The hostile left-wing cavalry charged piecemeal, and some bodies of troops did not engage at all On the other wing, however, Montrose was for a moment hard pressed by a force of the enemy that attempted to work round to his rear But he brought over the small band of mounted men that constituted his right wing cavalry, and also some musketeers from the centre, and destroyed the assailants, and when the ill-led left wing of the Covenanters charged again, during the absence of the cavalry, they were mown down by the close-range volleys of Macdonald's musketeers Shortly afterwards the centre of *Balfour's* army yielded to pressure and fled in disorder Aberdeen was sacked by order of Montrose, whose drummer had been murdered while delivering a message under a flag of truce to the magistrates

Inverlochy.—Only *Argyll* now remained to be dealt with The Campbells were fighting men from birth, like Montrose's own men, and had few townsmen serving with them Still there were enough of the latter and of the impedimenta of regular warfare with him to prevent *Argyll* from overtaking his agile enemy, and ultimately after a "hide-and-seek" in the districts of Rothiemurchus, Blair Athol, Banchory and Strathbogie, Montrose stood to fight at Fyvie Castle, repulsed *Argyll's* attack on that place and slipped away again to Rothiemurchus There he was joined by Camerons and Macdonalds from all quarters for a grand raid on the Campbell country, he himself wished to march into the Lowlands, well knowing that he could not achieve the decision in the Grampians, but he had to bow, not for the first time nor the last, to local importunity The raid was duly executed, and the Camp-

bells' boast, "It's a far cry to Loch Awe," availed them little In December and January the Campbell lands were thoroughly and mercilessly devastated, and Montrose then retired slowly to Loch Ness, where the bulk of his army as usual dispersed to store away its plunder.

Argyll, with such Highland and Lowland forces as he could collect after the disaster, followed Montrose towards Lochaber, while the Seaforths and other northern clans marched to Loch Ness. Caught between them, Montrose attacked the nearest The Royalists crossed the hills into Glen Roy, worked thence along the northern face of Ben Nevis, and descended like an avalanche upon *Argyll's* forces at Inverlochy (Feb 2, 1645) As usual, the Lowland regiments gave way at once—Montrose had managed in all this to keep with him a few cavalry—and it was then the turn of the Campbells *Argyll* escaped in a boat, but his clan, as a fighting force, was practically annihilated, and Montrose, having won four victories in these six winter months, rested his men and exultingly promised Charles that he would come to his assistance with a brave army before the end of the summer

Organization of the New Model Army.—To return to the New Model Its first necessity was regular pay, its first duty to serve wherever it might be sent Of the three armies that had fought at Newbury only one, *Essex's,* was in a true sense a general service force, and only one, *Manchester's,* was paid with any regularity *Waller's* army was no better paid than *Essex's* and no more free from local ties than *Manchester's* It was therefore broken up early in April, and only 600 of its infantry passed into the New Model *Essex's* men, on the other hand, wanted but regular pay and strict officers to make them excellent soldiers, and their own major-general, *Skippon,* managed by tact and his personal popularity to persuade the bulk of the men to rejoin *Manchester's* army, in which *Cromwell* had been the guiding influence from first to last, was naturally the backbone of the New Model Early in April *Essex, Manchester* and *Waller* resigned their commissions, and such of their forces as were not embodied in the new army were sent to do local duties, for minor armies were still maintained, General *Poyntz's* in the north midlands, General *Massey's* in the Severn valley, a large force in the Eastern Association, General *Browne's* in Buckinghamshire, etc , besides the Scots in the north.

The New Model originally consisted of 14,400 foot and 7,700 horse and dragoons Of the infantry only 6,000 came from the combined armies, the rest being new recruits furnished by the press The Puritans had by now disappeared almost entirely from the ranks of the infantry *Per contra* the officers and sergeants and the troopers of the horse were the sternest Puritans of all, the survivors of three years of a disheartening war There was considerable trouble during the first months of *Fairfax's* command, and discipline had to be enforced with unusual sternness As for the enemy, Oxford was openly contemptuous of "the rebels' new brutish general" and his men, who seemed hardly likely to succeed where *Essex* and *Waller* had failed But the effect of the Parliament's having "an army all its own" was soon to be apparent

First Operations of 1645.—On the Royalist side the campaign of 1645 opened in the west, whither the young prince of Wales (Charles II) was sent with Hyde (later earl of Clarendon), Hopton and others as his advisers General (Lord) Goring, however, now in command of the Royalist field forces in this quarter, was truculent, insubordinate and dissolute, though on the rare occasions when he did his duty he displayed a certain degree of skill and leadership, and the influence of the prince's counsellors was but small As usual, operations began with the sieges necessary to conciliate local feeling Plymouth and Lyme were blocked up, and Taunton again invested The reinforcement thrown into the last place by *Waller* and *Cromwell* was dismissed by *Blake* (then a colonel in command of the fortress and afterwards the great admiral of the Commonwealth), and after many adventures rejoined *Waller* and *Cromwell* The latter generals, who had not yet laid down their commissions, then engaged Goring for some weeks, but neither side having infantry or artillery, and both finding subsistence difficult in February and March and in country that had been fought over for two years past, no results were to be expected Taunton still remained unrelieved, and Goring's horse still rode all over Dorsetshire when the New Model at last took the field

Rupert's Northern March.—In the midlands and Lancashire the Royalist horse, as ill-behaved even as Goring's men, were directly responsible for the ignominious failure with which the king's main army began its year's work Prince Maurice was joined at Ludlow by Rupert and part of his Oxford army early in March, and the brothers drove off *Brereton* from the siege of Beeston Castle and relieved the pressure on Lord Byron in Cheshire So great was the danger of Rupert's again invading Lancashire and Yorkshire that all available forces in the north, English and Scots, were ordered to march against him But at this moment the prince was called back to clear his line of retreat on Oxford The Herefordshire and Worcestershire peasantry, weary of military exactions, were in arms, and though they would not join the Parliament, and for the most part dispersed after stating their grievances, the main enterprise was wrecked. This was but one of many ill-armed crowds—"Clubmen" as they were called—that assembled to enforce peace on both parties A few regular soldiers were sufficient to disperse them in all cases, but their attempt to establish a third party in England was morally as significant as it was materially futile The Royalists were now fighting with the courage of despair; those who still fought against Charles did so with the full determination to ensure the triumph of their cause, and with the conviction that the only possible way was the annihilation of the enemy's forces, but the majority were so weary of the war that the earl of *Manchester's* Presbyterian royalism—which had contributed so materially to the prolongation of the struggle—would probably have been accepted by four-fifths of all England as the basis of a peace It was, in fact, in the face of almost universal opposition that *Fairfax* and *Cromwell* and their friends at Westminster guided the cause of their weaker comrades to complete victory

Cromwell's Raid.—Having without difficulty rid himself of the Clubmen, Rupert was eager to resume his march into the north It is unlikely that he wished to join Montrose, though Charles himself favoured that plan, but he certainly intended to fight the Scottish army, more especially as after Inverlochy it had been called upon to detach a large force to deal with Montrose. But this time there was no Royalist army in the north to provide infantry and guns for a pitched battle, and Rupert had perforce to wait near Hereford till the main body, and in particular the artillery train, could come from Oxford and join him It was on the march of the artillery train to Hereford that the first operations of the New Model centred The infantry was not yet ready to move, in spite of all *Fairfax's* and *Skippon's* efforts, and it became necessary to send the cavalry by itself to prevent Rupert from gaining a start *Cromwell,* then under *Waller's* command, had come to Windsor to resign his commission as required by the Self-denying Ordinance Instead, he was placed at the head of a brigade of his own old soldiers, with orders to stop the march of the artillery train On April 23 he started from Watlington north-westward At dawn on the 24th he routed a detachment of Royalist horse at Islip On the same day, though he had no guns and only a few firearms in the whole force, he terrified the governor of Bletchingdon House into surrender Riding thence to Witney, *Cromwell* won another cavalry fight at Bampton-in-the Bush on the 27th, and attacked Faringdon House, though without success, on the 29th Thence he marched at leisure to Newbury He had done his work thoroughly He had demoralized the Royalist cavalry, and, above all, had carried off every horse on the country-side To all Rupert's entreaties Charles could only reply that the guns could not be moved till May 7, and he even summoned Goring's cavalry from the west to make good his losses

Divergent Purposes.—*Cromwell's* success thus forced the king to concentrate his various armies in the neighbourhood of Oxford, and the New Model had, so *Fairfax* and *Cromwell* hoped, found its target But the Committee of Both Kingdoms on the one side, and Charles, Rupert and Goring on the other, held different views On May 1 *Fairfax,* having been ordered to relieve Taunton, set out from Windsor for the long march to that place, meeting *Cromwell* at Newbury on the 2nd, he directed the lieu-

tenant-general to watch the movements of the king's army, and himself marched on to Blandford, which he reached on May 7. Thus *Fairfax* and the main army of the Parliament were marching away in the west while *Cromwell's* detachment was left, as *Waller* had been left the previous year, to hold the king as best he could.

On the very evening that *Cromwell's* raid ended, the leading troops of Goring's command destroyed part of *Cromwell's* own regiment near Faringdon, and on the 3rd Rupert and Maurice appeared with a force of all arms at Burford. Yet the Committee of Both Kingdoms, though aware on the 29th of Goring's move, only made up its mind to stop *Fairfax* on the 3rd, and did not send off orders till the 5th. These orders were to the effect that a detachment was to be sent to the relief of Taunton, and that the main army was to return *Fairfax* gladly obeyed, but long before he came up to the Thames valley the situation was again changed Rupert, now in possession of the guns and their teams, urged upon his uncle the resumption of the northern enterprise, calculating that with *Fairfax* in Somersetshire, Oxford was safe Charles accordingly marched out of Oxford on the 7th towards Stow-on-the-Wold, on the very day, as it chanced, that *Fairfax* began his return march from Blandford But Goring and most of the other generals were for a march into the west, in the hope of dealing with *Fairfax* as they had dealt with *Essex* in 1644 The armies therefore parted as *Essex* and *Waller* had parted at the same place in 1644, Rupert and the king to march northward, Goring to return to his independent command in the west Rupert, not unnaturally wishing to keep his influence with the king and his authority as general of the king's army unimpaired by Goring's notorious indiscipline, made no attempt to prevent the separation, which in the event proved wholly unprofitable The flying column from Blandford relieved Taunton long before Goring's return to the west, and Colonel *Weldon* and Colonel *Graves,* its commanders, set him at defiance even in the open country As for *Fairfax,* he was out of Goring's reach preparing for the siege of Oxford

Charles in the Midlands.—On the other side also the generals were working by data that had ceased to have any value. *Fairfax's* siege of Oxford, ordered by the Committee on the 10th of May, and persisted in after it was known that the king was on the move, was the second great blunder of the year and was hardly redeemed, as a military measure, by the visionary scheme of assembling the Scots, the Yorkshiremen and the midland forces to oppose the king It is hard to understand how, having created a new model army "all its own" for general service, the Parliament at once tied it down to a local enterprise, and trusted an improvised army of local troops to fight the enemy's main army. In reality the Committee seems to have been misled by false information to the effect that Goring and the governor of Oxford were about to declare for the Parliament, but had they not despatched *Fairfax* to the relief of Taunton in the first instance the necessity for such intrigues would not have arisen. However, *Fairfax* obeyed orders, invested Oxford, and, so far as he was able without a proper siege train, besieged it for two weeks, while Charles and Rupert ranged the midlands unopposed At the end of that time came news so alarming that the Committee hastily abdicated their control over military operations and gave *Fairfax* a free hand "Black Tom" gladly and instantly abandoned the siege and marched northward to give battle to the king

Meanwhile Charles and Rupert were moving northward On May 11 they reached Droitwich, whence after two days' rest they marched against *Brereton* The latter hurriedly raised the sieges he had on hand, and called upon Yorkshire and the Scottish army there for aid But only the old Lord *Fairfax* and the Yorkshiremen responded *Leven* had just heard of new victories won by Montrose, and could do no more than draw his army and his guns over the Pennine chain into Westmorland in the hope of being in time to bar the king's march on Scotland via Carlisle

Dundee.—After the destruction of the Campbells at Inverlochy, Montrose had cleared away the rest of his enemies without difficulty He now gained a respectable force of cavalry by the adhesion of Lord Gordon and many of his clan, and this reinforcement was the more necessary as detachments from *Leven's* army under *Baillie* and *Hurry*—disciplined infantry and cavalry—were on the march to meet him. The Royalists marched by Elgin and through the Gordon country to Aberdeen, and thence across the Esk to Coupar-Angus, where *Baillie* and *Hurry* were encountered. A war of manoeuvre followed, in which they thwarted every effort of the Royalists to break through into the Lowlands, but in the end retired into Fife. Montrose thereupon marched into the hills with the intention of reaching the upper Forth and thence the Lowlands, for he did not disguise from himself the fact that there, and not in the Highlands, would the quarrel be decided, and was sanguine—over-sanguine, as the event proved—as to the support he would obtain from those who hated the kirk and its system But he had called to his aid the semi-barbarous Highlanders, and however much the Lowlands resented a Presbyterian inquisition, they hated and feared the Highland clans beyond all else He was equally disappointed in his own army For a war of positions the Highlanders had neither aptitude nor inclination, and at Dunkeld the greater part of them went home. If the small remnant was to be kept to its duty, plunder must be found, and the best objective was the town of Dundee With a small force of 750 foot and horse Montrose brilliantly surprised that place on April 4, but *Baillie* and *Hurry* were not far distant, and before Montrose's men had time to plunder the prize they were collected to face the enemy

Montrose's retreat from Dundee was considered a model operation by foreign students of the art of war (then almost as numerous as now), and what surprised them most was that Montrose could rally his men after a sack had begun The retreat itself was remarkable enough. *Baillie* moved parallel to Montrose on his left flank towards Arbroath, constantly heading him off from the hills and attempting to pin him against the sea Montrose, however, halted in the dark so as to let *Baillie* get ahead of him and then turned sharply back, crossed *Baillie's* track, and made for the hills. *Baillie* soon realized what had happened and turned back also, but an hour too late By the 6th the Royalists were again safe in the broken country of the Esk valley But Montrose cherished no illusions as to joining the king at once; all he could do, he now wrote, was to neutralize as many of the enemy's forces as possible.

Auldearn.—For a time he wandered in the Highlands seeking recruits But soon he learned that *Baillie* and *Hurry* had divided their forces, the former remaining about Perth and Stirling to observe him, the latter going north to suppress the Gordons Strategy and policy combined to make *Hurry* the objective of the next expedition But the soldier of fortune who commanded the Covenanters at Aberdeen was no mean antagonist Marching at once with a large army (formed on the nucleus of his own trained troops and for the rest composed of clansmen and volunteers) *Hurry* advanced to Elgin, took contact with Montrose there, and, gradually and skilfully retiring, drew him into the hostile country round Inverness Montrose fell into the trap, and *Hurry* took his measures to surprise him at Auldearn so successfully that (May 9) Montrose, even though the indiscipline of some of *Hurry's* young soldiers during the night march gave him the alarm, had barely time to form up before the enemy was upon him But the best strategy is of no avail when the battle it produces goes against the strategist, and Montrose's tactical skill was never more conspicuous than at Auldearn Alastair Macdonald with most of the Royalist infantry and the Royal standard was posted to the right (north) of the village to draw upon himself the weight of *Hurry's* attack, only enough men were posted in the village itself to show that it was occupied, and on the south side, out of sight, was Montrose himself with a body of foot and all the Gordon horse It was the prototype, on a small scale, of Austerlitz Macdonald resisted sturdily while Montrose edged away from the scene of action, and at the right moment and not before, though Macdonald had been driven back on the village and was fighting for life amongst the gardens and enclosures, Montrose let loose Lord Gordon's cavalry. These, abandoning for once the pistol tactics of their time, charged home with the sword The enemy's right wing cavalry was scattered in an instant, the nearest infantry was promptly ridden down, and soon *Hurry's* army had ceased to exist

Campaign of Naseby.—If the news of Auldearn brought *Leven* to the region of Carlisle, it had little effect on his English allies. *Fairfax* was not yet released from the siege of Oxford, in spite of the protests of the Scottish representatives in London. *Massey,* the active and successful governor of Gloucester, was placed in command of a field force on May 25, but he was to lead it against, not the king, but Goring At that moment the military situation once more changed abruptly. Charles, instead of continuing his march on to Lancashire, turned due eastward towards Derbyshire. The alarm at Westminster when this new development was reported was such that *Cromwell,* in spite of the Self-Denying Ordinance, was sent to raise an army for the defence of the Eastern Association. Yet the Royalists had no intentions in that direction. Conflicting reports as to the condition of Oxford reached the royal headquarters in the last week of May, and the eastward march was made chiefly to "spin out time" until it could be known whether it would be necessary to return to Oxford, or whether it was still possible to fight *Leven* in Yorkshire—his move into Westmorland was not yet known—and invade Scotland by the easy east coast route.

Goring's return to the west had already been countermanded and he had been directed to march to Harborough, while the South Wales Royalists were also called in towards Leicester. Later orders (May 26) directed him to Newbury, whence he was to feel the strength of the enemy's positions around Oxford. It is hardly necessary to say that Goring found good military reasons for continuing his independent operations, and marched off towards Taunton regardless of the order He redressed the balance there for the moment by overawing *Massey's* weak force, and his purse profited considerably by fresh opportunities for extortion, but he and his men were not at Naseby Meanwhile the king, at the geographical centre of England, found an important and wealthy town at his mercy. Rupert, always for action, took the opportunity, and Leicester was stormed and thoroughly pillaged on the night of May 30–31 There was the usual panic at Westminster, but, unfortunately for Charles, it resulted in *Fairfax* being directed to abandon the siege of Oxford and given *carte blanche* to bring the Royal army to battle wherever it was met

On his side the king had, after the capture of Leicester, accepted the advice of those who feared for the safety of Oxford —Rupert, though commander-in-chief, was unable to insist on the northern enterprise—and had marched to Daventry, where he halted to throw supplies into Oxford Thus *Fairfax* in his turn was free to move, thanks to the insubordination of Goring, who would neither relieve Oxford nor join the king for an attack on the New Model The Parliamentary general moved from Oxford towards Northampton so as to cover the Eastern Association. On June 12 the two armies were only a few miles apart, *Fairfax* at Kislingbury, Charles at Daventry, and, though the Royalists turned northward again on the 13th to resume the Yorkshire project under the very eyes of the enemy, *Fairfax* followed close On the night of the 13th Charles slept at Lubenham, *Fairfax* at Guilsborough *Cromwell,* just appointed lieutenant-general of the New Model, had ridden into camp on the morning of the 13th with fresh cavalry from the eastern counties, Colonel *Rossiter* came up with more from Lincolnshire on the morning of the battle, and it was with an incontestable superiority of numbers and an overwhelming moral advantage that *Fairfax* fought at Naseby (*q v*) on June 14 The result of the battle, this time a decisive battle, was the annihilation of the royal army. Part of the cavalry escaped, a small fraction of it in tolerable order, but the guns and the baggage train were taken, and, above all, the splendid Royal infantry were killed or taken prisoners to a man

Effects of Naseby.—After Naseby, though the war dragged on for another year, the king never succeeded in raising an army as good as, or even more numerous than, that which *Fairfax's* army had so heavily outnumbered on June 14. That the fruits of the victory could not be gathered in a few weeks was due to a variety of hindrances rather than to direct opposition—to the absence of rapid means of communication, the paucity of the forces engaged on both sides relatively to the total numbers under arms, and from time to time to the political exigencies of the growing quarrel between Presbyterians and Independents. As to the latter, within a few days of Naseby, the Scots rejoiced that the "back of the malignants was broken," and demanded reinforcements as a precaution against "the insolence of others," *i e., Cromwell* and the Independents—"to whom alone the Lord has given the victory of that day" *Leven* had by now returned to Yorkshire, and a fortnight after Naseby, after a long and honourable defence by Sir Thomas Glemham, Carlisle fell to *David Leslie's* besieging corps. Leicester was reoccupied by *Fairfax* on the 18th, and on the 20th *Leven's* army, moving slowly southward, reached Mansfield

This move was undertaken largely for political reasons, *i e* , to restore the Presbyterian balance as against the victorious New Model *Fairfax's* army was intended by its founders to be a specifically English army and *Cromwell* for one would have employed it against the Scots almost as readily as against malignants. But for the moment the advance of the northern army was of the highest military importance, for *Fairfax* was thereby set free from the necessity of undertaking sieges. Moreover, the publication of the king's papers taken at Naseby gave *Fairfax's* troops a measure of official and popular support which a month before they could not have been said to possess, for it was now obvious that they represented the armed force of England against the Irish, Danes, French, Lorrainers, etc , whom Charles had for three years been endeavouring to let loose on English soil Even the Presbyterians abandoned for the time any attempt to negotiate with the king, and advocated a vigorous prosecution of the war

Fairfax's Western Campaign.—This, in the hands of *Fairfax* and *Cromwell,* was likely to be effective While the king and Rupert, with the remnant of their cavalry, hurried into South Wales to join Sir Charles Gerard's troops and to raise fresh infantry, *Fairfax* decided that Goring's was the most important Royalist army in the field, and turned to the west, reaching Lechlade on the 26th, less than a fortnight after the battle of Naseby One last attempt was made to dictate the plan of campaign from Westminster, but the Committee refused to pass on the directions of the Houses, and he remained free to deal with Goring as he desired Time pressed, Charles in Monmouthshire and Rupert at Bristol were well placed for a junction with Goring, which would have given them a united army 15,000 strong Taunton, in spite of *Massey's* efforts to keep the field, was again besieged, and in Wilts and Dorset numerous bands of Clubmen were on foot which the king's officers were doing their best to turn into troops for their master But the process of collecting a fresh royal army was slow, and Goring and his subordinate, Sir Richard Grenville, were alienating the king's most devoted adherents by their rapacity, cruelty and debauchery Moreover, Goring had no desire to lose the independent command he had extorted at Stow-on-the-Wold in May Still, it was clear that he must be disposed of as quickly as possible, and *Fairfax* requested the Houses to take other measures against the king (June 26) This they did by paying up the arrears due to *Leven's* army and bringing it to the Severn valley On July 8 *Leven* reached Alcester, bringing with him a Parliamentarian force from Derbyshire under *Sir John Gell* The design was to besiege Hereford.

Langport.—By that time *Fairfax* and Goring were at close quarters The Royalist general's line of defence faced west along the Yeo and the Parrett between Yeovil and Bridgwater, and thus barred the direct route to Taunton. *Fairfax,* however, marched from Lechlade via Marlborough and Blandford—hindered only by Clubmen—to the friendly posts of Dorchester and Lyme, and with these as his centre of operations he was able to turn the headwaters of Goring's river-line via Beaminster and Crewkerne The Royalists at once abandoned the south and west side of the rivers—the siege of Taunton had already been given up—and passed over to the north and east bank Bridgwater was the right of this second line as it had been the left of the first; the new left was at Ilchester Goring could thus remain in touch with Charles in South Wales through Bristol,

and the siege of Taunton having been given up there was no longer any incentive for remaining on the wrong side of the water-line.

But his army was thoroughly demoralized by its own licence and indiscipline, and the swift, handy and resolute regiments of the New Model made short work of its strong positions. On July 7, demonstrating against the points of passage between Ilchester and Langport, *Fairfax* secretly occupied Yeovil The post at that place, which had been the right of Goring's first position, had, perhaps rightly, been withdrawn to Ilchester when the second position was taken up, and *Fairfax* repaired the bridge without interruption Goring showed himself unequal to the new situation He might, if sober, make a good plan when the enemy was not present to disturb him, and he certainly led cavalry charges with boldness and skill But of strategy in front of the enemy he was incapable On the news from Yeovil he abandoned the line of the Yeo as far as Langport without striking a blow, and *Fairfax,* having nothing to gain by continuing his détour through Yeovil, came back and quietly crossed at Long Sutton, west of Ilchester (July 9). Goring had by now formed a new plan. A strong rear-guard was posted at Langport and on high ground east and north-east of it to hold *Fairfax,* and he himself with the cavalry rode off early on the 8th to try and surprise Taunton This place was no longer protected by *Massey's* little army, which *Fairfax* had called up to assist his own But *Fairfax* who was not yet across Long Sutton bridge, heard of Goring's raid in good time, and sent *Massey* after him with a body of horse.

Massey surprised a large party of the Royalists at Ilminster on the 9th, wounded Goring himself, and pursued the fugitives up to the south-eastern edge of Langport On the 10th *Fairfax's* advanced guard, led by Major *Bethel* of *Cromwell's* own regiment, brilliantly stormed the position of Goring's rearguard east of Langport, and the cavalry of the New Model, led by *Cromwell* himself, swept in pursuit right up to the gates of Bridgwater, where Goring's army, dismayed and on the point of collapse, was more or less rallied Thence Goring himself retired to Barnstaple His army, under the regimental officers, defended itself in Bridgwater resolutely till July 23, when it capitulated The fall of Bridgwater gave *Fairfax* complete control of Somerset and Dorset from Lyme to the Bristol channel Even in the unlikely event of Goring's raising a fresh army, he would now have to break through towards Bristol by open force, and a battle between Goring and *Fairfax* could only have one result. Thus Charles had perforce to give up his intention of joining Goring—his recruiting operations in South Wales had not been so successful as he hoped, owing to the apathy of the people and the vigour of the local Parliamentary leaders—and to resume the northern enterprise begun in the spring

Schemes of Lord Digby.—This time Rupert would not be with him. The prince, now despairing of success and hoping only for a peace on the best terms procurable, listlessly returned to his governorship of Bristol and prepared to meet *Fairfax's* impending attack The influence of Rupert was supplanted by that of Lord Digby. As sanguine as Charles and far more energetic, he was for the rest of the campaign the guiding spirit of the Royalists, but as a civilian he offended the officers by constituting himself a sort of confidential military secretary to the king, and he was distrusted by all sections of Royalists for his reckless optimism The resumption of the northern enterprise, opposed by Rupert and directly inspired by Digby, led to nothing Charles marched by Bridgnorth, Lichfield and Ashbourne to Doncaster, where, on Aug. 18, he was met by great numbers of Yorkshire gentlemen with promises of fresh recruits For a moment the outlook was bright, for the Derbyshire men with *Gell* were far away at Worcester with *Leven,* the Yorkshire Parliamentarians engaged in besieging Scarborough Castle, Pontefract and other posts But two days later he heard that *David Leslie* with the cavalry of *Leven's* army was coming up behind him, and that, the Yorkshire sieges being now ended, Major-General *Poyntz's* force lay in his front It was now impossible to wait for the new levies, and reluctantly the king turned back to Oxford, raiding Huntingdonshire and other parts of the hated Eastern Association *en route.*

Montrose's Last Victories.—*David Leslie* did not pursue him. Montrose, though the king did not yet know it, had won two more battles, and was practically master of all Scotland After Auldearn he had turned to meet *Baillie's* army in Strathspey, and by superior mobility and skill forced that commander to keep at a respectful distance He then turned upon a new army which *Lindsay,* titular earl of Crawford, was forming in Forfarshire, but that commander betook himself to a safe distance, and Montrose withdrew into the Highlands to find recruits (June) The victors of Auldearn had mostly dispersed on the usual errand, and he was now deserted by most of the Gordons, who were recalled by the chief of their clan, the marquess of Huntly, in spite of the indignant remonstrances of Huntly's heir, Lord Gordon, who was Montrose's warmest admirer *Baillie* now approached again, but he was weakened by having to find trained troops to stiffen *Lindsay's* levies, and a strong force of the Gordons had now been persuaded to rejoin Montrose

The two armies met in battle near Alford on the Don; little can be said of the engagement save that Montrose had to fight cautiously and tentatively as at Aberdeen, not in the decision-forcing spirit of Auldearn, and that in the end *Baillie's* cavalry gave way and his infantry was cut down as it stood Lord Gordon was amongst the Royalist dead (July 2) The plunder was put away in the glens before any attempt was made to go forward, and thus the Covenanters had leisure to form a numerous, if not very coherent, army on the nucleus of *Lindsay's* troops *Baillie,* much against his will, was continued in the command, with a council of war (chiefly of nobles whom Montrose had already defeated, such as *Argyll, Elcho* and *Balfour*) to direct his every movement Montrose, when rejoined by the Highlanders, moved to meet him, and in the last week of July and the early part of August there were manoeuvres and minor engagements round Perth About Aug 7 Montrose suddenly slipped away into the Lowlands, heading for Glasgow Thereupon another Covenanting army began to assemble in Clydesdale But it was clear that Montrose could beat mere levies, and *Baillie,* though without authority and despairing of success, hurried after him Montrose then, having drawn *Baillie's* Fifeshire militia far enough from home to ensure their being discontented, turned upon them on Aug 14 near Kilsyth *Baillie* protested against fighting, but his aristocratic masters of the council of war decided to cut off Montrose from the hills by turning his left wing

The Royalist general seized the opportunity, and his advance caught them in the very act of making a flank march (August 15) The head of the Covenanters' column was met and stopped by the furious attack of the Gordon infantry, and Alastair Macdonald led the men of his own name and the Macleans against its flank A breach was made in the centre of *Baillie's* army at the first rush and then Montrose sent in the Gordon and Ogilvy horse The leading half of the column was surrounded, broken up and annihilated The rear half, seeing the fate of its comrades, took to flight, but in vain, for the Highlanders pursued *à outrance.* Only about one hundred Covenanting infantry out of six thousand escaped Montrose was now indeed the king's lieutenant in all Scotland

Fall of Bristol.—But Charles was in no case to resume his northern march *Fairfax* and the New Model, after reducing Bridgwater, had turned back to clear away the Dorsetshire Clubmen and to besiege Sherborne Castle On the completion of this task, it had been decided to besiege Bristol, and on Aug 23—while the king's army was still in Huntingdon, and Goring was trying to raise a new army to replace the one he had lost at Langport and Bridgwater—the city was invested In these urgent circumstances Charles left Oxford for the west only a day or two after he had come in from the Eastern Association raid Calculating that Rupert could hold out longest, he first moved to the relief of Worcester, around which place *Leven's* Scots, no longer having *Leslie's* cavalry with them to find supplies, were more occupied with plundering their immediate neighbourhood for food than with the siege works Worcester was relieved on Sept. 1 by the king *David Leslie* with all his cavalry was already on the march to meet Montrose, and *Leven* had no alternative but to draw off

his infantry without fighting. Charles entered Worcester on the 8th, but he found that he could no longer expect recruits from South Wales. Worse was to come. A few hours later, on the night of the 9th–10th, *Fairfax's* army stormed Bristol Rupert had long realized the hopelessness of further fighting—the very summons to surrender sent in by *Fairfax* placed the fate of Bristol on the political issue—the lines of defence around the place were too extensive for his small force, and on the 11th he surrendered on terms He was escorted to Oxford with his men, conversing as he rode with the officers of the escort about peace and the future of his adopted country.

Charles, almost stunned by the suddenness of the catastrophe, dismissed his nephew from all his offices and ordered him to leave England, and for almost the last time called upon Goring to rejoin the main army—if a tiny force of raw infantry and disheartened cavalry can be so called—in the neighbourhood of Raglan. But before Goring could be brought to withdraw his objections Charles had again turned northward towards Montrose A weary march through the Welsh hills brought the royal army on Sept. 22 to the neighbourhood of Chester Charles himself with one body entered the city, which was partially invested by the Parliamentarian colonel *Michael Jones,* and the rest under Sir Marmaduke Langdale was sent to take *Jones's* lines in reverse But at the opportune moment *Poyntz's* forces, which had followed the king's movements since he left Doncaster in the middle of August, appeared in rear of Langdale, and defeated him in the battle of Rowton Heath (Sept 24), while at the same time a sortie of the king's troops from Chester was repulsed by *Jones* Thereupon the royal army withdrew to Denbigh, and Chester, the only important seaport remaining to connect Charles with Ireland, was again besieged

Philiphaugh.—Nor was Montrose's position, even after Kilsyth, encouraging, in spite of the persistent rumours of fighting in Westmorland that reached Charles and Digby. Glasgow and Edinburgh were indeed occupied, and a parliament summoned in the king's name But Montrose had now to choose between Highlanders and Lowlanders The former, strictly kept away from all that was worth plundering, rapidly vanished, even Alastair Macdonald going with the rest Without the Macdonalds and the Gordons, Montrose's military and political resettlement of Scotland could only be shadowy, and when he demanded support from the sturdy middle classes of the Lowlands, it was not forgotten that he had led Highlanders to the sack of Lowland towns. Thus his new supporters could only come from amongst the discontented and undisciplined Border lords and gentry, and long before these moved to join him the romantic conquest of Scotland was over

On Sept 6 *David Leslie* had recrossed the frontier with his cavalry and some infantry he had picked up on the way through northern England Early on the morning of the 13th he surprised Montrose at Philiphaugh near Selkirk The king's lieutenant had only 650 men against 4,000, and the battle did not last long Montrose escaped with a few of his principal adherents, but his little army was annihilated Of the veteran Macdonald infantry, 500 strong that morning, 250 were killed in the battle and the remainder put to death after accepting quarter. The Irish, even when they bore a Scottish name, were, by Scotsmen even more than Englishmen, regarded as beasts to be knocked on the head After Naseby the Irishwomen found in the king's camp were branded by order of *Fairfax;* after Philiphaugh more than 300 women, wives or followers of Macdonald's men, were butchered Montrose's Highlanders at their worst were no more cruel than the sober soldiers of the kirk

Digby's Northern Expedition.—Charles received the news of Philiphaugh on Sept. 28, and gave orders that the west should be abandoned, the prince of Wales should be sent to France, and Goring should bring up what forces he could to the Oxford region On Oct 4 Charles himself reached Newark (whither he had marched from Denbigh after revictualling Chester and suffering the defeat of Rowton Heath). The intention to go to Montrose was of course given up, at any rate for the present, and he was merely waiting for Goring and the Royalist militia of the west—each in its own way a broken reed to lean upon. A hollow reconciliation was patched up between Charles and Rupert, and the court remained at Newark for over a month Before it set out to return to Oxford another Royalist force had been destroyed

On Oct 14, receiving information that Montrose had raised a new army, the king permitted Langdale's northern troops to make a fresh attempt to reach Scotland At Langdale's request Digby was appointed to command in this enterprise, and, civilian though he was, he led it boldly and skilfully. His immediate opponent was *Poyntz,* who had followed the king step by step from Doncaster to Chester and back to Welbeck, and he succeeded on the 15th in surprising *Poyntz's* entire force of foot at Sherburn *Poyntz's* cavalry were soon after this reported approaching from the south, and Digby hoped to trap them also. At first all went well and body after body of the rebels was routed But by a singular mischance the Royalist main body mistook the Parliamentary squadrons in flight through Sherburn for friends, and believing all was lost took flight also Thus Digby's cavalry fled as fast as *Poyntz's* and in the same direction, and the latter, coming to their senses first, drove the Royalist horse in wild confusion as far as Skipton Lord Digby was still sanguine and from Skipton he actually penetrated as far as Dumfries

But whether Montrose's new army was or was not in the Lowlands, it was certain that *Leven* and *Leslie* were on the Border, and the adventure soon came to an end Digby, with the mere handful of men remaining to him, was driven back into Cumberland, and on Oct 24, his army having entirely disappeared, he took ship with his officers for the Isle of Man *Poyntz* had not followed him beyond Skipton, and was now watching the king from Nottingham, while *Rossiter* with the Lincoln troops was posted at Grantham The king's chances of escaping from Newark were becoming smaller day by day, and they were not improved by a violent dispute between him and Rupert, Maurice, Lord Gerard and Sir Richard Willis, at the end of which these officers and many others rode away to ask the Parliament for leave to go over-seas The pretext of the quarrel mattered little, the distinction between the views of Charles and Digby on the one hand and Rupert and his friends on the other was fundamental—to the latter peace had become a political as well as a military necessity

Meanwhile South Wales, with the single exception of Raglan Castle, had been overrun by the Parliamentarians Everywhere the Royalist posts were falling The New Model, no longer fearing Goring, had divided, *Fairfax* reducing the garrisons of Dorset and Devon, *Cromwell* those of Hampshire Amongst the latter was the famous Basing House, which was stormed at dawn on Oct 14 and burnt to the ground *Cromwell,* his work finished, returned to headquarters, and the army wintered in the neighbourhood of Crediton

End of the First War.—The military events of 1646 call for no comment. The only field army remaining to the king was Goring's, and though Hopton, who sorrowfully accepted the command after Goring's departure, tried at the last moment to revive the memories and the local patriotism of 1643, it was of no use to fight against the New Model with the armed rabble that Goring turned over to him Dartmouth surrendered on Jan 18, Hopton was defeated at Torrington on Feb 16, and surrendered the remnant of his worthless army on March 14 Exeter fell on April 13 Elsewhere, Hereford was taken on Dec 17, 1645, and the last battle of the war was fought and lost at Stow-on-the-Wold by Lord Astley on March 21, 1646 Newark and Oxford fell respectively on May 6 and June 24 On August 31 Montrose escaped from the Highlands On the 19th of the same month Raglan Castle surrendered, and the last Royalist post of all, Harlech Castle, maintained the useless struggle until March 13, 1647. Charles himself, after leaving Newark in November 1645, had spent the winter in and around Oxford, whence, after an adventurous journey, he came to the camp of the Scottish army at Southwell on May 5, 1646

SECOND CIVIL WAR (1648–52)

The close of the First Civil War left England and Scotland in

the hands potentially of any one of the four parties or any combination of two or more that should prove strong enough to dominate the rest. Armed political Royalism was indeed at an end, but Charles, though practically a prisoner, considered himself and was, almost to the last, considered by the rest as necessary to ensure the success of whichever amongst the other three parties could come to terms with him Thus he passed successively into the hands of the Scots, the Parliament and the New Model, trying to reverse the verdict of arms by coquetting with each in turn (From this point onwards the names of the Scots Covenanters, formerly the allies of the Parliamentarians, but now their opponents are not italicized) The Presbyterians and the Scots, after Cornet *Joyce* of *Fairfax's* horse seized upon the person of the king for the army (June 3, 1647), began at once to prepare for a fresh civil war, this time against Independency, as embodied in the New Model—henceforward called the Army. After making use of its sword, its opponents attempted to disband it, to send it on foreign service, to cut off its arrears of pay, with the result that it was exasperated beyond control, and remembering not merely its grievances but also the principle for which it had fought, soon became the most powerful political party in the realm From 1646 to 1648 the breach between army and parliament widened day by day until finally the Presbyterian party, combined with the Scots and the remaining Royalists, felt itself strong enough to begin a second civil war

The English War.—In February 1648 Colonel Poyer, the Parliamentary governor of Pembroke Castle, refused to hand over his command to one of *Fairfax's* officers, and he was soon joined by some hundreds of officers and men, who mutinied, ostensibly for arrears of pay, but really with political objects At the end of March, encouraged by minor successes, Poyer openly declared for the king Disbanded soldiers continued to join him in April, all South Wales revolted, and eventually he was joined by Major-General Laugharne, his district commander, and Colonel Powel. In April also news came that the Scots were arming and that Berwick and Carlisle had been seized by the English Royalists *Cromwell* was at once sent off at the head of a strong detachment to deal with Laugharne and Poyer, but before he arrived Laugharne had been severely defeated by Colonel *Horton* at St Fagans (May 8)

The English Presbyterians found it difficult to reconcile their principles with their allies when it appeared that the prisoners taken at St Fagans bore "We long to see our King" on their hats, very soon in fact the English war became almost purely a Royalist revolt, and the war in the north an attempt to enforce a mixture of Royalism and Presbyterianism on Englishmen by means of a Scottish army. The former were disturbers of the peace and no more Nearly all the Royalists who had fought in the First Civil War had given their parole not to bear arms against the Parliament, and many honourable Royalists, foremost amongst them the old Lord Astley, who had fought the last battle for the king in 1646, refused to break their word by taking any part in the second war Those who did so, and by implication those who abetted them in doing so, were likely to be treated with the utmost rigour if captured, for the army was in a less placable mood in 1648 than in 1645, and had already determined to "call Charles Stuart, that man of blood, to an account for the blood he had shed." On May 21 Kent rose in revolt in the king's name. A few days later a most serious blow to the Independents was struck by the defection of the navy, from command of which they had removed Vice-Admiral Batten, as being a Presbyterian Though a former lord high admiral, the earl of Warwick, also a Presbyterian, was brought back to the service, it was not long before the navy made a purely Royalist declaration and placed itself under the command of the prince of Wales

But *Fairfax* had a clearer view and a clearer purpose than the distracted Parliament He moved quickly into Kent, and on the evening of June 1 stormed Maidstone by open force, after which the local levies dispersed to their homes, and the more determined Royalists, after a futile attempt to induce the City of London to declare for them, fled into Essex In Cornwall, Northamptonshire, North Wales and Lincolnshire the revolt collapsed as easily Only in South Wales, Essex and the north of England was there serious fighting. In the first of these districts *Cromwell* rapidly reduced all the fortresses except Pembroke, where Laugharne, Poyer and Powel held out with the desperate courage of deserters. In the north, Pontefract was surprised by the Royalists, and shortly afterwards Scarborough Castle declared for the king *Fairfax,* after his success at Maidstone and the pacification of Kent, turned northward to reduce Essex, where, under their ardent, experienced and popular leader Sir Charles Lucas, the Royalists were in arms in great numbers He soon drove the enemy into Colchester, but the first attack on the town was repulsed and he had to settle down to a long and wearisome siege *en règle.* A Surrey rising, remembered only for the death of the young and gallant Lord Francis Villiers in a skirmish at Kingston (July 7), collapsed almost as soon as it had gathered force, and its leaders, the duke of Buckingham and the earl of Holland, escaped, after another attempt to induce London to declare for them, to St Albans and St. Neots, where Holland was taken prisoner. Buckingham escaped overseas.

Lambert in the North.—By July 10 therefore the military situation was well defined *Cromwell* held Pembroke, *Fairfax* Colchester, *Lambert* Pontefract under siege; elsewhere all serious local risings had collapsed, and the Scottish army had crossed the Border It is on the adventures of the latter that the interest of the war centres It was by no means the veteran army of *Leven,* which had long been disbanded For the most part it consisted of raw levies, and as the kirk had refused to sanction the enterprise of the Scottish parliament, David Leslie and thousands of experienced officers and men declined to serve. The duke of Hamilton proved to be a poor substitute for Leslie; his army, too, was so ill provided that as soon as England was invaded it began to plunder the countryside for the bare means of sustenance

Major-General *Lambert,* a brilliant young general of 29, was more than equal to the situation He had already left the sieges of Pontefract and Scarborough to Colonel *Rossiter,* and hurried into Cumberland to deal with the English Royalists under Sir Marmaduke Langdale With his cavalry he got into touch with the enemy about Carlisle and slowly fell back, fighting small rearguard actions to annoy the enemy and gain time, to Bowes and Barnard Castle Langdale did not follow him into the mountains, but occupied himself in gathering recruits and supplies of material and food for the Scots *Lambert,* reinforced from the midlands, reappeared early in June and drove him back to Carlisle with his work half finished About the same time the local horse of Durham and Northumberland were put into the field by *Sir A. Hesilrige,* governor of Newcastle, and under the command of Colonel *Robert Lilburne* won a considerable success (June 30) at the river Coquet This reverse, coupled with the existence of Langdale's force on the Cumberland side, practically compelled Hamilton to choose the west coast route for his advance, and his army began slowly to move down the long *couloir* between the mountains and the sea The campaign which followed is one of the most brilliant in English history

Campaign of Preston.—On July 8 the Scots, with Langdale as advanced guard, were about Carlisle, and reinforcements from Ulster were expected daily *Lambert's* horse were at Penrith, Hexham and Newcastle, too weak to fight and having only skilful leading and rapidity of movement to enable them to gain time Far away to the south *Cromwell* was still tied down before Pembroke, *Fairfax* before Colchester Elsewhere the rebellion, which had been put down by rapidity of action rather than sheer weight of numbers, smouldered, and Prince Charles and the fleet cruised along the Essex coast *Cromwell* and *Lambert,* however, understood each other perfectly, while the Scottish commanders quarrelled with Langdale and each other Appleby Castle surrendered to the Scots on July 31, whereat *Lambert,* who was still hanging on to the flank of the Scottish advance, fell back from Barnard Castle to Richmond so as to close Wensleydale against any attempt of the invaders to march on Pontefract All the restless energy of Langdale's horse was unable to dislodge him from the passes or find out what was behind that impenetrable cavalry screen

The crisis was now at hand. *Cromwell* had received the surrender of Pembroke on the 11th, and had marched off, with his men unpaid, ragged and shoeless, at full speed through the midlands Rains and storms delayed his march, but he knew that Hamilton in the broken ground of Westmorland was still worse off Shoes from Northampton and stockings from Coventry met him at Nottingham, and, gathering up the local levies as he went, he made for Doncaster, where he arrived on Aug. 8, having gained six days in advance of the time he had allowed himself for the march. He then called up artillery from Hull, exchanged his local levies for the regulars who were besieging Pontefract, and set off to meet *Lambert* On the 12th he was at Wetherby, *Lambert* with horse and foot at Otley, Langdale at Skipton and Gargrave, Hamilton at Lancaster, and Sir George Monro with the Scots from Ulster and the Carlisle Royalists (organized as a separate command owing to friction between Monro and the generals of the main army) at Hornby On the 13th, while *Cromwell* was marching to join *Lambert* at Otley, the Scottish leaders were still disputing as to whether they should make for Pontefract or continue through Lancashire so as to join Lord Byron and the Cheshire Royalists

Preston Fight.—On the 14th *Cromwell* and *Lambert* were at Skipton, on the 15th at Gisburn, and on the 16th they marched down the valley of the Ribble towards Preston with full knowledge of the enemy's dispositions and full determination to attack him They had with them horse and foot not only of the army, but also of the militia of Yorkshire, Durham, Northumberland and Lancashire, and withal were heavily outnumbered, having only 8,600 men against perhaps 20,000 of Hamilton's command But the latter were scattered for convenience of supply along the road from Lancaster, through Preston, towards Wigan, Langdale's corps having thus become the left flank guard instead of the advanced guard Langdale called in his advanced parties, perhaps with a view to resuming the duties of advanced guard, on the night of the 13th, and collected them near Longridge It is not clear whether he reported *Cromwell's* advance, but, if he did, Hamilton ignored the report, for on the 17th Monro was half a day's march to the north, Langdale east of Preston, and the main army strung out on the Wigan road, Major-General Baillie with a body of foot, the rear of the column, being still in Preston Hamilton, yielding to the importunity of his lieutenant-general, the earl of Callendar, sent Baillie across the Ribble to follow the main body just as Langdale, with 3,000 foot and 500 horse only, met the first shock of *Cromwell's* attack on Preston Moor Hamilton, like Charles at Edgehill, passively shared in, without directing, the battle, and, though Langdale's men fought magnificently, they were after four hours' struggle driven to the Ribble Baillie attempted to cover the Ribble and Darwen bridges on the Wigan road, but *Cromwell* had forced his way across both before nightfall Pursuit was at once undertaken, and not relaxed until Hamilton had been driven through Wigan and Winwick to Uttoxeter and Ashbourne There, pressed furiously in rear by *Cromwell's* horse and held up in front by the militia of the midlands, the remnant of the Scottish army laid down its arms on Aug 25

Various attempts were made to raise the Royalist standard in Wales and elswhere, but Preston was the death-blow On Aug 28, starving and hopeless of relief, the Colchester Royalists surrendered to Lord *Fairfax* The victors in the Second Civil War were not merciful to those who had brought war into the land again On the evening of the surrender of Colchester, Sir Charles Lucas and Sir George Lisle were shot Laugharne, Poyer and Powel were sentenced to death, but Poyer alone was executed on April 25, 1649, being the victim selected by lot Of five prominent Royalist peers who had fallen into the hands of the Parliament, three, the duke of Hamilton, the earl of Holland and Lord Capel, one of the Colchester prisoners and a man of high character, were beheaded at Westminster on March 9 Above all, after long hesitations, even after renewal of negotiations, the army and the Independents "purged" the House of their ill-wishers, and created a court for the trial and sentence of the king The more resolute of the judges nerved the rest to sign the death-warrant, and Charles was beheaded at Whitehall on Jan 30

Cromwell in Ireland.—The campaign of Preston was undertaken under the direction of the Scottish parliament, not the kirk, and it needed the execution of the king to bring about a union of all Scottish parties against the English Independents Even so, Charles II in exile had to submit to long negotiations and hard conditions before he was allowed to put himself at the head of the Scottish armies The marquis of Huntly was executed for taking up arms for the king on March 22, 1649 Montrose, under Charles's directions, made a last attempt to rally the Scottish Royalists early in 1650 But Charles merely used Montrose as a threat to obtain better conditions for himself from the Covenanters, and when the noblest of all the Royalists was defeated (Carbisdale, April 27), delivered up to his pursuers (May 4), and executed (May 21, 1650), he was not ashamed to give way to the demands of the Covenanters, and to place himself at the head of Montrose's executioners His father, whatever his faults, had at least chosen to die for an ideal, the Church of England Charles II now proposed to regain the throne by allowing Scotland to impose Presbyterianism on England, and dismissed all the faithful Cavaliers who had followed him to exile

Meanwhile, Ireland, in which a fresh war, with openly anti-English and anti-Protestant objects, had broken out in 1648, was thoroughly reduced to order by *Cromwell,* who beat down all resistance by his skill, and even more by his ruthless severity, in a brief campaign of nine months (battle of Rathmines near Dublin, won by Colonel *Michael Jones*, Aug 2, 1649, storming of Drogheda, Sept 11, and of Wexford, Oct 11, by *Cromwell;* capture of Kilkenny, March 28, 1650, and of Clonmel, May 10) *Cromwell* returned to England at the end of May 1650, and on June 26 *Fairfax,* who had been anxious and uneasy since the execution of the king, resigned the command-in-chief of the army to his lieutenant-general The pretext, rather than the reason, of *Fairfax's* resignation was his unwillingness to lead an English army to reduce Scotland

The Invasion of Scotland.—This important step had been resolved upon as soon as it was clear that Charles II would come to terms with the Covenanters From this point the Second Civil War becomes a war of England against Scotland Here at least the Independents carried the whole of England with them No Englishman cared to accept a settlement at the hands of a victorious foreign army, and on June 28, five days after Charles II had sworn to the Covenant, the new lord general was on his way to the Border to take command of the English army About the same time a new militia act was passed that was destined to give full and decisive effect to the national spirit of England in the great final campaign of the war Meanwhile the motto *frappez fort, frappez vite* was carried out at once by the regular forces On July 19, 1650 *Cromwell* made the final arrangements at Berwick-on-Tweed Major-General *Harrison,* a gallant soldier and an extreme Independent, was to command the regular and auxiliary forces left in England, and to secure the Commonwealth against Royalists and Presbyterians *Cromwell* took with him *Fleetwood* as lieutenant-general and *Lambert* as major-general, and his forces numbered about 10,000 foot and 5,000 horse His opponent David Leslie (his comrade of Marston Moor) had a much larger force, but its degree of training was inferior, it was more than tainted by the political dissensions of the people at large, and it was, in great part at any rate, raised by forced enlistment On July 22 *Cromwell* crossed the Tweed He marched on Edinburgh by the sea coast, through Dunbar, Haddington and Musselburgh, living almost entirely on supplies landed by the fleet which accompanied him—for the country itself was incapable of supporting even a small army—and on the 29th he found Leslie's army drawn up and entrenched in a position extending from Leith to Edinburgh

Operations Around Edinburgh.—The same day a sharp but indecisive fight took place on the lower slopes of Arthur's Seat, after which *Cromwell,* having felt the strength of Leslie's line, drew back to Musselburgh Leslie's horse followed him up sharply, and another action was fought, after which the Scots assaulted Musselburgh without success Militarily Leslie had the best of

it in these affairs, but it was precisely this moment that the kirk party chose to institute a searching three days' examination of the political and religious sentiments of his army The result was that the army was "purged" of 80 officers and 3,000 soldiers as it lay within musket shot of the enemy *Cromwell* was more concerned, however, with the supply question than with the distracted army of the Scots On Aug 6 he had to fall back as far as Dunbar to enable the fleet to land supplies in safety, the port of Musselburgh being unsafe in the violent and stormy weather which prevailed He soon returned to Musselburgh and prepared to force Leslie to battle In preparation for an extended manoeuvre three days' rations were served out Tents were also issued, perhaps for the first time in the civil wars, for it was a regular professional army, which had to be cared for, made comfortable and economized, that was now carrying on the work of the volunteers of the first war

Even after *Cromwell* started on his manoeuvre, the Scottish army was still in the midst of its political troubles, and, certain though he was that nothing but victory in the field would give an assured peace, he was obliged to intervene in the confused negotiations of the various Scottish parties At last, however, Charles II made a show of agreeing to the demands of his strange supporters, and Leslie was free to move *Cromwell* had now entered the hill country, with a view to occupying Queensferry and thus blocking up Edinburgh Leslie had the shorter road and barred the way at Corstorphine Hill (Aug 21) *Cromwell*, though now far from his base, manoeuvred again to his right, Leslie meeting him once more at Gogar (Aug 27) The Scottish lines at that point were strong enough to dismay even *Cromwell*, and the manoeuvre on Queensferry was at last given up It had cost the English army severe losses in sick, and much suffering in the autumn nights on the bleak hillsides

Dunbar.—On the 28th *Cromwell* fell back on Musselburgh, and on the 31st, after embarking his non-effective men to Dunbar, Leslie followed him up, and wished to fight a battle at Dunbar on Sunday, Sept 1 But again the kirk intervened, this time to forbid Leslie to break the Sabbath, and the unfortunate Scottish commander could only establish himself on Doon Hill (*see* DUNBAR) and send a force to Cockburnspath to bar the Berwick road He had now 23,000 men to *Cromwell's* 11,000, and proposed, *faute de mieux*, to starve *Cromwell* into surrender But the English army was composed of "ragged soldiers with bright muskets," and had a great captain of undisputed authority at their head Leslie's, on the other hand, had lost such discipline as it had ever possessed, and was now, under outside influences, thoroughly disintegrated *Cromwell* wrote home, indeed, that he was "upon an engagement very difficult," but, desperate as his position seemed, he felt the pulse of his opponent and steadily refused to take his army away by sea He had not to wait long It was now the turn of Leslie's men on the hillside to endure patiently privation and exposure, and after one night's bivouac, Leslie, too readily inferring that the enemy was about to escape by sea, came down to fight The battle of Dunbar (*q v*) opened in the early morning of Sept 3 It was the most brilliant of *Cromwell's* victories Before the sun was high in the heavens the Scottish army had ceased to exist

Royalism in Scotland.—After Dunbar it was easy for the victorious army to overrun southern Scotland, more especially as the dissensions of the enemy were embittered by the defeat of which they had been the prime cause The kirk indeed put Dunbar to the account of its own remissness in not purging their army more thoroughly, but, as *Cromwell* wrote on Sept 4, the kirk had "done its do" "I believe their king will set up on his own score," he continued, and indeed, now that the army of the kirk was destroyed and they themselves were secure behind the Forth and based on the friendly Highlands, Charles and the Cavaliers were in a position not only to defy *Cromwell*, but also to force the Scottish national spirit of resistance to the invader into a purely Royalist channel *Cromwell* had only received a few drafts and reinforcements from England, and for the present he could but block up Edinburgh Castle (which surrendered on Christmas eve), and try to bring up adequate forces and material for the siege of Stirling—an attempt which was frustrated by the badness of the roads and the violence of the weather The rest of the early winter of 1650 was thus occupied in semi-military, semi-political operations between detachments of the English army and certain armed forces of the kirk party which still maintained a precarious existence in the western Lowlands, and in police work against the moss-troopers of the Border counties Early in February 1651, still in the midst of terrible weather, *Cromwell* made another resolute but futile attempt to reach Stirling This time he himself fell sick, and also his losses had to be made good by drafts of recruits from England, many of whom came most unwillingly to serve in the cold wet bivouacs that had been reported The tents were evidently issued for regular marches, not for cross-country manoeuvres against the enemy These manoeuvres, as we have seen, often took several days The *bon général ordinaire* of the 17th and 18th centuries framed his manoeuvres on a smaller scale so as not to expose his expensive and highly trained soldiers to discomfort and the consequent temptation to desert

The English Militia.—About this time there occurred in England two events which had a most important bearing on the campaign The first was the detection of a widespread Royalist-Presbyterian conspiracy—how widespread no one knew, for those of its promoters who were captured and executed certainly formed but a small fraction of the whole number *Harrison* was ordered to Lancashire in April to watch the north Welsh, Isle of Man and Border Royalists, and military precautions were taken in various parts of England The second was the revival of the militia Since 1644 there had been no general employment of local forces, the quarrel having fallen into the hands of the regular armies by force of circumstances The New Model, though a national army, resembled Wellington's Peninsular army more than the soldiers of the French Revolution and the American Civil War It was now engaged in prosecuting a war of aggression against the hereditary foe over the Border—strictly the task of a professional army with a national basis The militia was indeed raw and untrained Some of the Essex men "fell flat on their faces on the sound of a cannon" In the north of England *Harrison* complained to *Cromwell* of the "badness" of his men, and the lord general sympathized, having "had much such stuff" sent him to make good the losses in trained men His recruits were unwilling drafts for foreign service, but in England the new levies were trusted to defend their homes, and the militia was soon triumphantly to justify its existence on the day of Worcester

Inverkeithing.—While David Leslie organized and drilled the king's new army beyond the Forth, *Cromwell* was, slowly and with frequent relapses, recovering from his illness The English army marched to Glasgow in April, then returned to Edinburgh The motives of the march and that of the return are alike obscure, but it may be conjectured that, the forces in England under *Harrison* having now assembled in Lancashire, the Edinburgh-Newcastle-York road had to be covered by the main army Be this as it may, *Cromwell's* health again broke down and his life was despaired of Only late in June were operations actively resumed between Stirling and Linlithgow At first *Cromwell* sought without success to bring Leslie to battle, but he stormed Callendar House near Falkirk on July 13, and on July 16 he began the execution of a brilliant and successful manoeuvre A force from Queensferry, covered by the English fleet, was thrown across the Firth of Forth to Northferry *Lambert* followed with reinforcements, and defeated a detachment of Leslie's army at Inverkeithing, on the 20th Leslie drew back at once, but managed to find a fresh strong position in front of Stirling, whence he defied *Cromwell* again.

At this juncture *Cromwell* prepared to pass his whole army across the firth. His contemplated manoeuvre of course gave up to the enemy all the roads into England, and before undertaking it the lord general held a consultation with *Harrison*, as the result of which that officer took over the direct defence of the whole Border But his mind was made up even before this, for on the day he met *Harrison* at Linlithgow three-quarters of his whole army had already crossed into Fife Burntisland, surrendered to

Lambert on the 29th, gave *Cromwell* a good harbour upon which to base his subsequent movements On July 30 the English marched upon Perth, and the investment of this place, the key to Leslie's supply area, forced the crisis at once Whether Leslie would have preferred to manoeuvre *Cromwell* from his vantage-ground or not is immaterial; the young king and the now predominant Royalist element at headquarters seized the long-awaited opportunity at once, and on the 31st, leaving *Cromwell* to his own devices, the royal army marched southward to raise the royal standard in England.

The Third Scottish Invasion of England.—Then began the last and most thrilling campaign of the Great Rebellion Charles II expected complete success In Scotland, *vis-à-vis* the extreme Covenanters, he was a king on conditions, and he was glad enough to find himself in England with some thirty solidly organized regiments under Royalist officers and with no regular army in front of him He hoped, too, to rally not merely the old faithful Royalists, but also the overwhelming numerical strength of the English Presbyterians to his standard His army was kept well in hand, no excesses were allowed, and in a week the Royalists covered 150 m On Aug 8 the troops were given a well-earned rest between Penrith and Kendal

But the Royalists were mistaken in supposing that the enemy was taken aback by their new move Everything had been foreseen both by *Cromwell* and by the Council of State in Westminster The latter had called out the greater part of the militia on the 7th Lieutenant-General *Fleetwood* began to draw together the midland contingents at Banbury, the London trained bands turned out for field service no fewer than 14,000 strong Every suspected Royalist was closely watched, and the magazines of arms in the country-houses of the gentry were for the most part removed into the strong places On his part *Cromwell* had quietly made his preparations Perth passed into his hands on Aug 2, and he brought back his army to Leith by the 5th Thence he despatched *Lambert* with a cavalry corps to harass the invaders *Harrison* was already at Newcastle picking the best of the county mounted troops to add to his own regulars On the 9th Charles was at Kendal, *Lambert* hovering in his rear, and *Harrison* marching swiftly to bar his way at the Mersey *Fairfax* emerged for a moment from his retirement to organize the Yorkshire levies, and the best of these as well as of the Lancashire, Cheshire and Staffordshire militias were directed upon Warrington, which point *Harrison* reached on the 15th, a few hours in front of Charles's advanced guard *Lambert,* too, slipping round the left flank of the enemy, joined *Harrison,* and the English fell back (16th), slowly and without letting themselves be drawn into a fight, along the London road

Campaign of Worcester.—*Cromwell* meanwhile, leaving *Monk* with the least efficient regiments to carry on the war in Scotland, had reached the Tyne in seven days, and thence, marching 20 m a day in extreme heat—with the country people carrying their arms and equipment—the regulars entered Ferrybridge on the 19th, at which date *Lambert, Harrison* and the north-western militia were about Congleton The lord general had during his march thrown out successively two flying columns under Colonel *Lilburne* to deal with the Lancashire Royalists under the earl of Derby *Lilburne* entirely routed the enemy at Wigan on Aug 25 It seemed probable that a great battle would take place between Lichfield and Coventry about Aug 25 or 26, and that *Cromwell, Harrison, Lambert* and *Fleetwood* would all take part in it But the scene and the date of the *dénouement* were changed by the enemy's movements Shortly after leaving Warrington the young king had resolved to abandon the direct march on London and to make for the Severn valley, where his father had found the most constant and the most numerous adherents in the first war, and which had been the centre of gravity of the English Royalist movement of 1648 Sir Edward Massey, formerly the Parliamentary governor of Gloucester, was now with Charles, and it was hoped that he would induce his fellow-Presbyterians to take arms The military quality of the Welsh border Royalists was well proved, that of the Gloucestershire Presbyterians not less so, and, based on Gloucester and Worcester as his father had been based on Oxford, Charles II hoped, not unnaturally, to deal with an Independent minority more effectually than Charles I had done with a Parliamentary majority of the people of England But even the pure Royalism which now ruled in the invading army could not alter the fact that it was a Scottish army, and it was not an Independent faction but all England that took arms against it

Charles arrived at Worcester on Aug 22, and spent five days in resting the troops, preparing for further operations, and gathering and arming the few recruits who came in It is unnecessary to argue that the delay was fatal, it was a necessity of the case foreseen and accepted when the march to Worcester had been decided upon, and had the other course, that of marching on London via Lichfield, been taken the battle would have been fought three days earlier with the same result. As affairs turned out *Cromwell* merely shifted the area of his concentration two marches to the south-west, to Evesham Early on the 28th *Lambert* surprised the passage of the Severn at Upton, 6 m below Worcester, and in the action which followed Massey was severely wounded *Fleetwood* followed *Lambert* The enemy was now only 16,000 strong and disheartened by the apathy with which they had been received in districts formerly all their own *Cromwell,* for the first and last time in his military career, had a two-to-one numerical superiority

The "Crowning Mercy."—He took his measures deliberately *Lilburne* from Lancashire and Major *Mercer* with the Worcestershire horse were to secure Bewdley Bridge on the enemy's line of retreat *Lambert* and *Fleetwood* were to force their way across the Teme (a little river on which Rupert had won his first victory in 1642) and attack St John's, the western suburb of Worcester *Cromwell* himself and the main army were to attack the town itself On Sept 3, the anniversary of Dunbar, the programme was carried out exactly *Fleetwood* forced the passage of the Teme, and the bridging train (which had been carefully organized for the purpose) bridged both the Teme and the Severn Then *Cromwell* on the left bank and *Fleetwood* on the right swept in a semicircle 4 m long up to Worcester Every hedgerow was contested by the stubborn Royalists, but *Fleetwood's* men would not be denied, and *Cromwell's* extreme right on the eastern side of the town repelled, after three hours' hard fighting, the last desperate attempt of the Royalists to break out It was indeed, as a German critic, Hoenig, has pointed out, the prototype of Sedan Everywhere the defences were stormed as darkness came on, regulars and militia fighting with equal gallantry, and the few thousands of the Royalists who escaped during the night were easily captured by *Lilburne* and *Mercer,* or by the militia which watched every road in Yorkshire and Lancashire Even the country people brought in scores of prisoners, for officers and men alike, stunned by the suddenness of the disaster, offered no resistance

Charles escaped after many adventures, but he was one of the few men in his army who regained a place of safety The Parliamentary militia were sent home within a week *Cromwell,* who had ridiculed "such stuff" six months ago, knew them better now "Your new raised forces," he wrote to the House, "did perform singular good service, for which they deserve a very high estimation and acknowledgment" Worcester resembled Sedan in much more than outward form Both were fought by "nations in arms," by citizen soldiers who had their hearts in the struggle, and could be trusted not only to fight their hardest but to march their best Only with such troops would a general dare to place a deep river between the two halves of his army or to send away detachments beforehand to reap the fruits of victory, in certain anticipation of winning the victory with the remainder The sense of duty which the raw militia possessed in so high a degree, ensured the arrival and the action of every column at the appointed time and place The result was, in brief, one of those rare victories in which a pursuit is superfluous—a "crowning mercy," as *Cromwell* called it There is little of note in the closing operations *Monk* had completed his task by May 1652, and Scotland, which had twice attempted to impose its will on England, found itself reduced to the position of an English province under martial law

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GREAT SALT LAKE, a large body of shallow, briny water in north-western Utah, U S A, situated about 4,200 ft above sea-level The lake was first accurately described by John C. Frémont in 1845, and was carefully surveyed in 1849 and 1850 by Capt Howard Stansbury. The lake and the surrounding region were studied in 1890 by G. K. Gilbert, who gave a detailed description of it and of an earlier and greater lake, Lake Bonneville (*see* UTAH) that covered its site and a large adjacent area

Great Salt Lake has no outlet and is fed chiefly by the Jordan, Weber and Bear rivers, which flow from the mountains east and south-east of the lake Since 1850 its area has varied from 1,750 to about 1,500 sq.m, its present area, and its mean depth has varied from 25 to 15 feet. The seasonal variation in its level, due to melting snow on the mountains, is about 16 inches The inflow of water and the area of the lake have been diminished by irrigation, which increases evaporation. The salinity of the lake increases as its area decreases The water has contained from 14 to 23% of saline matter, principally sodium chloride Its average salinity is now nearly six times that of the ocean It contains also sodium sulphate and other minerals. Although the waters of the Jordan, Weber and Bear rivers are considered fresh, they carry into the lake enough mineral matter to keep its water nearly at the point of saturation

When the temperature of the water falls below 20° F the salt begins to be precipitated Salt is obtained from the lake and marketed profitably, but not in quantities large enough to reduce perceptibly the salinity of the water The lake contains several islands and is crossed west of Ogden by the Southern Pacific railway, over what is called the Lucin cut-off, a trestle and a gravel fill about 27 m long Its bed consists mainly of sand, but along its shores there are crusts of common salt, sodium sulphate and gypsum The specific gravity of the water is so great that a swimmer can not sink in it. In the lake are a few species of seaweed (algae), the larvae of two genera of flies (*Ephydra* and *Tipula*), an insect belonging to the genus *Corixa* and a brine shrimp (*Artemia*).

Lake Bonneville was more than 1,000 ft. above the level of Great Salt Lake, and lasted long enough to form beaches that can still be plainly traced Below the Bonneville terraces there are others, the most conspicuous of which form what is called the Provo shore line, which is 625 ft above the present level of Great Salt Lake

See I C Russell, *Lakes of North America* (New York, 1895); J E. Talmage, *The Great Salt Lake, Present and Past* (Salt Lake City, 1900), G K Gilbert sketch in U S Geological Survey *Bulletin 612*, pp 94–96 (Washington 1915) (G McL Wo)

GREAT SERPENT MOUND. A remarkable prehistoric earthwork, so called from its shape, on a narrow crescentic spur, about 100 ft high, flanked by Brush creek and East creek, in Adams county, Ohio Commencing with the partly obliterated head, at the very point of the spur, and proceeding to the tail, one comes to an enlargement, suggestive of the enlarged neck of the cobra, formed by an outer wall on each side beginning at the small head and uniting in the rear Within this area is a wall, oval in plan, enclosing a low mound 15 ft in diameter In each side of the outer wall is an opening or gateway, and behind the interior oval is a slightly curved cross-wall From the union of the main walls to the end of the tail the serpent body is represented by a single embankment, fairly uniform in size, but diminishing gradually toward the tip, having serpentine bends and ending with a coil of two complete turns Following the curves and bends the entire length of the structure is 1,330 ft and its width 15 to 20 feet The height of the embankment probably never exceeded 4 feet The most reasonable suggestion respecting the enlargement and its inner oval is that when the neck and head are restored, the oval marks the position of the heart of the reptile and in all probability was the place where were performed the ceremonies in connection with the strange structure

GREAT SLAVE LAKE (ATHAPUSCOW), a lake of Mackenzie district, Canada It is situated between 60° 50′ and 62° 55′ N and 108° 40′ and 117° W, at an altitude of 391 ft above the sea It is 325 m long, from 15 to 50 m wide, and includes an area of 9,770 sq m The water is very clear and deep Its coast line is irregular and deeply indented by large bays, and its north-eastern shores are rugged and mountainous The western shores

are well wooded, chiefly with spruce, but the northern and eastern are dreary and barren. It is navigable from about the 1st of July to the end of October The bulk of its water empties by the Mackenzie river into the Arctic Ocean. It was discovered in 1771 by Samuel Hearne

GREAT SOUTHERN OCEAN, the name given to the belt of water which extends almost continuously round the globe between the parallel of 40° S and the Antarctic Circle (66½° S) The fact that the southern extremity of South America is the only land extending into this belt gives it special physical importance in relation to tides and currents, and its position with reference to the Antarctic Ocean and continent makes it convenient to regard it as a separate ocean from which the Atlantic, Pacific and Indian Oceans may be said to radiate (*See* OCEAN)

GREAT WAR, THE, 1914-1918: *see* WORLD WAR.

GREAT WESTERN RAILWAY COMPANY. A British railway company, which was incorporated in 1835 to construct a line of railway between Bristol and London, now serves the territory embraced within a triangle bounded by lines drawn from London to Liverpool, Liverpool to Penzance, and Penzance to London Its headquarters are at Paddington station, which is the London terminus of the railway The capital of the company exceeds 152 millions sterling and its trains run over 8,916 miles of track along which there are about 1,500 stations and halts The rolling stock consists of approximately 4,000 locomotives, 10,000 passenger train vehicles, and 88,000 freight train vehicles The staff numbers 110,849 During the year 1927 the railway carried 130 million passengers and 78 million tons of freight The fastest "start to stop" train run in the British Isles (Swindon to London) runs at 61 8 m p h and the famous "non-stop" run by the Cornish Riviera express (London to Plymouth, 225¾ m) is accomplished in four hours

The locomotive, carriage and wagon works of the railway are at Swindon About 13,000 persons are employed there, and the annual wage bill is over £2,000,000 The company operates steamship services between Fishguard and Ireland and to the Channel Islands (F J C P)

GREBE, the name for aquatic birds of the family *Podicipedidae,* containing several genera including *Podiceps* and *Centropelma* Grebes are distinguished by the rudimentary tail, the legs placed far back on the body for diving, the flattened tarsi to diminish water resistance, and the elongated toes furnished with broad lobes of skin in lieu of webs

Of the five European species, *P ruficollis* is the well-known little grebe or dabchick, which has a wide range in the Old World The great crested grebe (*P cristatus*) is also a wide-ranging species The subarctic red-necked grebe (*P grisegena*) inhabits Europe and America, as does *P auritus,* the horned or Slavonian grebe Various other species inhabit North America, among which may be mentioned the western grebe (*Aechmophorus occidentalis*) with a long slender neck and black and white plumage; and the pied-billed grebe (*Podilymbus podiceps*), the best known grebe in eastern U S A Several more are found in South America, of which the most remarkable is the flightless *C. micropterus* of Lake Titicaca

The plumage, short and close, is usually some shade of brown above, white and glossy below. All species of *Podiceps* are good flyers The nest consists of a mass of water-weeds, in a shallow cup on which the chalky white eggs are laid, the parent covering them before leaving the nest The eggs are usually quite wet, but the heat of the decaying vegetation helps to keep the temperature up The young are clad in striped black, white, and brown down

The parents are often seen carrying the young on their back If danger threatens they take them under their wings and dive with them.

Most species develop special nuptial adornments in the spring in both sexes, in the form of crests or tufts, and very remarkable mutual courtship ceremonies have been described (*see* COURTSHIP OF ANIMALS)

GRECO, EL: *see* THEOTOCOPULI

GREECE, in the modern sense, is a state which obtained its independence from Turkey by force of arms in the earlier part of the 19th century, and was declared a kingdom in 1830. Initially it consisted of a small area within the narrowed and dissected tongue of land which prolongs the Balkan peninsula to the south, together with some of the islands of the Aegean Sea It did not include even the greater part of the lands where Greeks predominated in the population, and where the Greek mode of life was that best adapted to the natural conditions Nor, as the sequel showed, did it contain productive areas enough to form the economic basis of an independent unit in the modern world In the period between the date of the founding of the kingdom and 1923, when by the Treaty of Lausanne new changes were made in the frontiers, the Greek state underwent a progressive, though not uninterrupted, process of territorial expansion Although that expansion took place at the expense of Turkey, it was not, as might be supposed, only a process of "redeeming" more and more Greeks from the control of Turkish overlords Such an extension over lands occupied predominantly by peoples of Greek sympathies did occur, though it was not complete In addition, particularly in the period which opened with the Balkan wars of 1912–3, there was a spread into areas, such as Macedonia and Thrace, where the Greek element was far from being the only one, and where the national sympathies of the existing inhabitants were not regarded as of prime importance The possession of these areas did, however, offer certain well-marked economic advantages, in particular they include plains and basins capable of large-scale grain production The result is that the Greece whose frontiers were delimited by a long series of treaties, culminating in that of Lausanne, is not geographically a unit

Modern Position.—Almost as important are the facts that, by the beginning of the year 1925, all the lands included within the Hellenic Republic, which was established in 1924, were inhabited by a predominantly Greek population, and that only comparatively small numbers of Greeks lived outside their limits This was the result of vast migrations which, beginning with the Balkan wars, culminated in the period 1922–4, when some 1,350,000 Greek refugees were ejected from Asia Minor, and had to find homes within the Greek state Many of these have been settled in Greek Macedonia and Greek Thrace, from which large numbers of Turks were removed to Anatolia There had been earlier migrations within the peninsula also which had reduced the number of non-Greek peoples within these areas

These enforced movements, which brought most of the scattered Greeks of the Near East within the ring-fence of the enlarged Greek state, were a complete reversal of a long historical process, for, from the Classical Period onwards, the lands which are geographically Greek have always been centres of dispersion, a movement inwards towards a centre is quite a new phenomenon in Greek history The two outstanding features of Greece as delimited in the post-war period are thus that it contains a predominantly Greek population settled within an area not all of which is suitable for the characteristic modes of life, or has a tradition of Greek culture Further, while in the earlier stages of its existence Modern Greece contained a proportion only of the Greeks of the Mediterranean area, the majority of these now live within its borders Before the years when frontiers in what had been Turkish lands began to change with startling rapidity, there were two groups of Greeks, those of the kingdom, and those living in other lands to whom the kingdom represented an idealised motherland Since the end of 1924 the numbers of the latter have been greatly diminished and the two groups are faced with the need of living together within a limited and yet diverse territory

Greece has an area of about 50,000 sq miles, not much less than that of England, and an estimated population of about 6¼ millions It is thus scantily peopled, as indeed one would expect from its generally mountainous and barren nature In the island of Crete it extends south of lat 35°, and in Thrace approaches though it does not reach lat 42° Its northern limit thus reaches the latitude of Rome, its southern that of Sfax on the east coast of Tunisia, and the Peloponnesus or Morea corresponds in position to the island of Sicily The first Greece, that of 1830, lay wholly in latitudes corresponding to those of the extreme south of peninsular Italy and the island of Sicily

Original Greece.—That original Greece consisted of (1) The Peloponnesus, the almost insular prolongation of the Greek peninsula proper, to which it is attached only by the low and narrow Isthmus of Corinth, now cut through by the Corinth Canal; (2) a part of the Greek peninsula proper, (3) certain of the Aegean islands. Till the troubled period which began with the Balkan wars the additions were comparatively small The most notable were the Ionian islands (1864), and the plain of Thessaly (1878), in the northern transitional area where the Greek peninsula begins to merge into the wider one to the north The last period brought the addition of more islands, including the large one of Crete, and of the northern continental strip from the line of the lower Maritsa westward to the shores of the Ionian Sea It brought also the bid for a part of the western shore of Asia Minor, and the failure of that bid, with the resultant expulsion of the Asiatic Greeks. Up to 1913 Turkey was the enemy, and the struggle was in essence one to free from its grasp territories which from the Turkish standpoint were purely marginal and relatively insignificant In the later period not only was Turkey fighting for her existence but the Greek advance to the north brought them into direct contact—and sometimes conflict—with the Balkan nations of Serbia and Bulgaria and the incipient Albanian nation Nor were these states the only ones In so complex and interlocked a grouping of political units as is Modern Europe no set of small states can be allowed to work out its destiny unhampered by external interference; at every stage the greater powers took a hand if not always in the fray at least in the settlements.

The frontiers of Greece were thus fixed as the result of the interaction of two sets of forces, the Greek national spirit acting from within and the pressure of other peoples imposing checks from without. That national spirit again was in origin a response to a definite and highly peculiar set of natural conditions which prevail in parts of the areas surrounding the Aegean Any account of the geography of the Greek lands should start from the region where these conditions show their fullest development, and where therefore the characteristically Greek spirit may be expected in its most typical form.

The Greek Islands.—There can be no doubt as to the position of this region From the very beginnings of history that particular type of culture which for convenience we call Greek, using the word in a very wide and generalised form, has been maritime, and certain islands and island groups have printed it with its most distinctive features One island group in particular must be noted To the south of the Aegean, forming a broken bridge between the Greek mainland and Asia Minor, lies a roughly circular archipelago of small islands, the Cyclades Nearly in the centre of the group lies the small island of Syros (Syra) with the very much smaller and rocky island of Delos to the east of it Much further to the south, separated by an island-free stretch of sea, lies an island festoon, forming an interrupted semi-circle between the extreme south of the Peloponnesus and the south-east of Asia Minor Crete, the central, and by far the largest island of the festoon, may, in relation to the Cyclades, be regarded as "continental" It has an area of 3,328 sq miles, while Naxos, the largest of the Cyclades, extends only to 173 sq m, Syros to 31 sq m and the islet of Little Delos only covers about 1 sq m If Crete was the seat of the development of the first great Aegean civilization, that of the Minoan period, yet it may be said that the culture type received a great part of its specific imprint in the smaller islands

Particularly significant in this connection is the way in which Syros (Syra) and Delos leap into prominence at successive periods of history In the Aegean Copper Age (3000–2400 B C) the Cyclades, with Syros as the commercial capital, were a great centre of Aegean trade That trade had a varied basis In the first place the islands contain a variety of useful rocks and minerals, some of which have a limited distribution of Mediterranean Lands Particularly notable are the obsidian of Melos, so important in early days since the flint of other parts of Europe is absent in Mediterranean Lands; the marble of Paros and Naxos and the latter's emery; the metallic ores of Seriphos of which the small supplies of copper were especially valuable in early days; and the widely distributed potter's clay Second the number and arrangement of the islands, combined with the nature of the prevailing winds, made primitive navigation easy. Commodities with which to trade, and an environment which encouraged the growth of a sea-faring population, might not have sufficed, however, to give the men of Syros (Syra) and the other islands their significance as traders and middlemen had it not been for subsidiary causes Among these were such facts as that the resources of the islands are strictly limited, even when supplemented by fishing, so that a powerful motive existed for developing sea-trade; that ease of navigation is not limited to the archipelago but is characteristic of a wider surrounding area; and that the lands which can thus be reached have both greater and more varied resources. Thus there was not only the possibility of multiple contacts with other peoples, but a willingness to learn, a susceptibility to new ideas, were conditions of survival. Even in the Copper Age the islanders had learnt to stimulate trade by working up their own raw material, and their weapons, their pottery, their marble vases and figurines were widely distributed

That first predominance of Syros (Syra) as a Cycladean centre was lost as Crete rose to greatness in the Bronze Age, and the main seaways shifted further south. It has, however, been generally true that whenever there is no part of the surrounding area of outstanding importance then the advantages of the central position of the Cyclades display themselves by the rise of a great mart within Thus during the earlier part of the 19th century, when Athens and its port of Piraeus were slowly recovering from the effects of Turkish misrule, it was on Syra that one of the chief ports of the Eastern Mediterranean was established Its importance only declined as the Piraeus developed Delos, sacred formerly to Apollo, whose reputed birthplace it was, but of no importance except for its harbour, shows similar conditions In the 5th century B C it was the centre of the marine confederacy established under the presidency of Athens Some centuries later it became a great trade centre, especially for the slave trade During the Turkish period both Syra and Delos became centres of piracy, piracy being a natural development under unfavourable conditions in areas which in happier times are foci of legitimate trade. That the same qualities which made the Aegean folk great sea-traders made them also effective pirates is shown by the characteristic habit of building the villages on sites relatively remote from the sea and out of sight from it—so as to offer no temptation to the passing sea-brigand, and give to the inhabitants a chance of a warning before an attack.

Greek Culture and its Geographical Basis.—If then the Cyclades may be regarded as the source from which some of the essential elements of Greek culture flowed, a question arises as to the characters to which they owe this distinction Not, it seems clear, only to the island position combined with Mediterranean relief, natural vegetation and climate; for a similar combination occurs in, *e g*, the Dalmatian islands where an indigenous culture of high standard did not arise Nor can it be associated directly with the Mediterranean crop plants and methods of cultivation, for the plants can be grown, by identical methods, in many other parts of the Mediterranean Lands Nor can the importance of the varied, if limited, mineral resources be over-emphasised, for Sardinia and Corsica show that parts of the western Mediterranean have equally varied and more extensive deposits The root of the matter is to be sought in the combination of ease of movement over the sea, and the diversity and natural advantages of the regions which could be reached by sea-routes. Both require fuller analysis.

The Aegean is characterised both by its multiplicity of islands and by the articulation of its eastern and western shores Of the islands the Cyclades and the southern semi-circle have been already noted The Northern Sporades, or "scattered islands," may be mentioned as another group which, with Lemnos and other islands to the north-east, form a third broken bridge between the European and Asiatic shores, of special importance because it leads, as it were, to the entrance to the Dardanelles and thus to the Black Sea In addition to these linking belts both shores show a multiplicity of coastal islands and peninsulas The former, as is notably the case with the large island of Euboea off the coast

of Greece, may be separated by channels so narrow as to appear part of the mainland; the latter are complex and diversified, enclosing sheltered gulfs and bays Everywhere, that is to say, the land is deeply inter-penetrated by the sea; everywhere havens innumerable are available. Here then is no empty, inhospitable sea.

Further, the climate is highly favourable to the sailor, at least during the summer season Fog is rare and the bright sunshine means that the alternation of land and sea breezes takes place with great regularity The land breeze will take the mariner out of his haven in the early morning before the sun has come to its strength, and the sea breeze can be used to bring him back to his own or another harbour These alternating air currents prevail in the neighbourhood of land, that is, aid the sailor at the two critical points of his course But in the open the dominant summer winds, particularly in July and August, are those northerly ones which the Ancient Greeks called Etesian In the Aegean the Etesian wind has a north-easterly direction, and its late summer strength is important because it brings home adventurers who have gone in search of the corn, the fish and the furs of the Black Sea Lands. More than this, the wind sets going currents which, flowing from north to south in the centre, with a return in the opposite direction along the coasts, facilitate to-and-fro journeys Finally, winds and currents alike bring traffic from the Cyclades to Crete But Crete is already outside the Aegean air circulation, and more exposed to the winds which blow down the west coast of the Greek peninsula and are chiefly north-westerly Those winds carry ships towards Egypt and the Asiatic margin

Crete faces northward to the Aegean world and to the wider and contrasted worlds which can be reached from its north-eastern corner, eastward lie the copper island of Cyprus and the Syrian shore, southward is Africa and that great centre of early civilization, Egypt It was certainly the great intermediary by which the culture of the Orient was transmitted to Europe, but it was through the intervention of the smaller Aegean islands that that culture was adapted and diversified, introduced into the coastal areas of the adjacent mainlands and became essentially Greek

The Greek Lands.—Beginning then with this conception of Greek culture as an island product, limited in its development on the smaller islands by want of space, and spreading inevitably into those parts of the surrounding lands which were sufficiently penetrated by the sea to show certain island features, we are in a position to make an intelligible survey of the areas politically Greek

1 *The Islands*.—The islands form naturally a first division While the Cyclades and the Northern Sporades formed part of the first Greece of 1830, and the Ionian islands, from Corfu in the north through the currant-producing islands ending in Zante, formerly a British protectorate, were ceded in 1863 and handed over in 1864, the fate of the others was not decided till the first quarter of the present century Crete was ceded by Turkey finally in 1913 The previous year, during the war between Turkey and Italy, the large island of Rhodes, off south-western Asia Minor, and the twelve smaller neighbouring islands forming the Dodecanese, were occupied by the latter power, and remain in its possession Greek claims to the remaining Aegean islands have been admitted with the exception of Imbros, Tenedos and the small Rabbit islands, retained by Turkey as a necessary part of the defences of the Dardanelles With these exceptions all the Aegean islands are now politically Greek

They have always been very definitely Greek so far as population is concerned, for the possible modes of life, including cultivation of the garden type, fishing and sea-trading are those for which the Greeks show more aptitude than any other of the Near Eastern peoples Nor is there, as in parts of the Greek mainland, any considerable stretch of territory where these occupations are excluded, which might invite settlement by non-Greek peoples In many cases also the islands enjoyed a relative freedom during the Turkish period which helped to maintain a national spirit, and enabled the islanders to carry on their traditional role of guardians and disseminators of the characteristic culture. Even the migrations constantly tending to take place—inward as conditions proved particularly intolerable on the mainlands east or west, outward, as when Athens and the Piraeus were able to take over much of the trade of Syra—were but a repetition of those which had occurred throughout historical time

The Ionian islands include Corfu, Leukas (Santa Maura), Cephalonia, Ithaka and Zante, with others They owe their importance primarily to the fact that Cephalonia, Ithaka and Zante, with parts of the adjacent mainland, constitute the main currant-producing area of the world The plant requires for complete success a delicate combination of conditions of soil and climate, the former requiring to be dry, stony and lime-containing, and this comparatively small strip of country is very favourable It is hardly too much to say that at the outset Modern Greece had its basis in the currant trade, hence the intense desire for the incorporation of the Ionian islands But dependence on a luxury product of this kind involves great risk, especially when the area of production is so small, for a long period the whole economic life of Greece depended on the currant crop, itself limited to a small part of the state territories, and there forming practically the only crop

The question at once arises why the typical Mediterranean products, which form important articles of export from such countries as Italy, Spain and the Atlas lands, were not also available in quantity in Greece Such products are yielded by many of the islands, both Ionian and Aegean, in considerable amount On the other hand production, in relation to home demand, is generally limited on the mainland, so that much of that demand has to be met by island produce, thus reducing the surplus available for export

In detail it may be noted that the olive, though widespread, is most extensively grown in the Peloponnesus and the Ionian islands Olive oil stands third in the list of exports, but by value it ranks much lower than currants, owing to the fact that it is used universally in the Greek lands, and not all of these can supply their own needs Wine is even more widely produced, though again the islands rank high among the producing areas Some, such as Cephalonia in the Ionian group, and Santorin, Melos and Naxos in the Cyclades, yield wines which are of value in external commerce, but most of the Greek wines are of poor quality, and rendered distasteful to non-Greek palates by the addition of resin obtained from the Aleppo pine This addition increases its keeping and, it is said, also its thirst-quenching qualities, but practically limits its consumption to Greek lands Oranges and other citrus fruits are produced especially in Corfu, where the moist climate and mild winters are very favourable, also in some of the Cyclades, such as Naxos, in the Peloponnesus, especially the south, as well as in Chios and Crete But as we have seen the last two did not become Greek till the present century, and production on the Greek mainland is generally not extensive, except in the south of the Peloponnesus The line marking the northern limit of the tree in the mainland runs surprisingly far south, for it crosses Attica, some 5° lat south of the orange-producing region of the French Riviera This is associated with the absence of any transverse mountain range in the Greek peninsula to give protection from continental winds Greece as a whole is thus not one of the great orange-exporting countries of the Mediterranean, and this is true generally of other fruits, despite their wide extension, particularly in the islands

The crop which ranks in the post-war period as most important so far as the export trade is concerned is, curiously enough, tobacco, exports of tobacco greatly exceeding those of currants If the Greek extension northwards had as one of its prime motives the desire to obtain cereal-producing lands to supplement the small yield of the Greek lands proper, another reason, equally important, was the need of obtaining areas which would produce tobacco as an article of export Parts of Macedonia are particularly well suited to tobacco production, but it is very interesting to find that the cultivation of the plant is spreading in the islands, sometimes at the expense of the vine This must be regarded as a reflex effect on the old lands of the acquisition of the new, for the cultivation of "Turkish" tobacco was well established

in the northern areas before it became Greek. In the Cyclades, Amorgos produces tobacco for export, and great efforts are being made to extend its cultivation to Chios.

Generally it may be said that the islands produce among them all the characteristic Greek crops, but with the exception of currants, olive oil and as yet small amounts of tobacco, the greater part of their agricultural produce is absorbed by the home market If peace can be preserved, however, it is to be expected that the islands off the west coast of Asia Minor which became Greek at the last settlement, may increase their productivity to a notable extent Chios, which is reputed to be the most fertile of all the Aegean islands, and showed a considerable increase of population at the census of 1920, is a case in point.

2 *The Peloponnesus.*—This may be compared to a hand, attached to the arm-like Greek peninsula by an almost severed wrist. The thumb is formed by the Argolis peninsula, and while the fifth finger is missing, the other three are represented by elongated promontories, separated by the Gulfs of Laconia and Messenia. Between the most easterly of these promontories and the Argolis peninsula, with its girdle of islands, lies the Gulf of Nauplia To the north the Gulf of Patras, widening beyond the narrows of the Strait of Lepanto into the Gulf of Corinth, is separated from the head of the Gulf of Aegina, or Saronic Gulf, by the isthmus of Corinth, about 3½ m. wide at its narrowest point, and falling to some 260 ft. above sea-level Since even in ancient times small boats could be dragged across the portage of the isthmus, the Peloponnesus was always potentially an island, and with the piercing of the Corinth canal it has become actually insular Further, no point within it is much more than 30 m from the nearest sea

It is all the more curious to find that in the life of the area the sea has counted for relatively little, and that in some respects it is more "continental," more Balkan, than are the parts of Central Greece lying to the north of the Gulf of Corinth. The appearance of an Albanian element in the population may be associated with the presence of a central upland block, repeating many of the characters of the mountains which traverse the whole western side of the Balkan peninsula. But a small-scale relief map shows, particularly to the west, to the north and to the east at the head of the Gulf of Nauplia, coastal plains, and these one would expect to be in close connection with the sea But except to the north, where the Gulf of Corinth with its ports gives free access to seaways, and, if to a more limited extent, in the east where Argolis juts out into the Aegean, pointing to the Cyclades and Crete, a certain remoteness from the main currents of Greek life, a remoteness summed up in the ancient contrast between Athens and Sparta, is characteristic. This has its geographical basis in the difficulty in making effective contact with the sea Good ports are few and not always well placed in relation to areas of settlement The land also tends to fall into series of compartments, more or less sharply separated from one another Even where, as in the case of the basin of Sparta, these take the form of fertile lowlands relatively near the coast, there are barriers to free communication which, however insignificant in themselves, have acted as checks to the transport of goods Generally we may say that the characteristic settlement of mainland Greece, well exemplified by Athens, consists of three elements, a rock of refuge, a productive plain and a port on the margin of the plain. But in the Peloponnesus the third element is either absent, or has only rarely a close relation to the other two

The central upland is mainly though not wholly included in the modern department of Arcadia, and is surrounded by a peripheral zone in which lowland basins alternate with mountains and uplands. This peripheral belt is included in the departments of Corinth and Argolis to the north-east and Achaia and Elis to the north-west, with those of Laconia and Messenia to the south. Along the northern border of Arcadia lie three mountain groups, all rising well above 7,000 ft , forming, from west to east, Olonos, Chelmo and Ziria To the south of this mountain belt there stretches in eastern Arcadia an upland area of markedly karstic characters. Owing to the presence of the limestone rocks the streams tend to flow underground for much of their course, the water disappearing into great chasms, so that there is no surface flow to the sea All the usual features of karst lands are present. Thus where the surface is covered by non-porous material, derived from impure limestone rocks after the carbonate has been removed in solution, water is held up in lakes, such as those of Peneus and Stymphalus, or in swamps The water level in the swamps varies with the height of the underground water-table, and maize can be sown on the wet land, to ripen as the water drains away in full summer Springs are also abundant at the base of the rocks which surround the *polyen*, or basins, with their covering of red earth These basins tend to occur in rows, and in classical times each was the site of a settlement, placed where spring water was available, and maintained by the produce of the lands. To-day only Tripolitsa *is* of any importance, and it contains but 14,000 inhabitants It lies on the railway which crosses the Peloponnesus diagonally, connecting Corinth with the port of Kalamata on the Messenian Gulf The basins generally yield wheat and maize in the damper areas, with vines on the drier slopes and fruit-trees, which are of the Central European rather than the Mediterranean type because of the elevation (over 1,800 ft) The aloofness of this part of Arcadia is thus well marked.

Western Arcadia, despite the fact that a greater variety of rocks is present, limestones ceasing to predominate, is in scarcely better case. It has a normal river system, being drained by the Alpheus and its numerous tributaries This has encroached to some extent on the gathering ground of the Eurotas, the only other considerable river of the Peloponnesus, which flows southward through the basin of Sparta to the Gulf of Laconia The Alpheus, after leaving Arcadia, enters the Ionian Sea through Elis and Achaia It does not, however, connect western Arcadia with the sea, for both the main stream and its tributaries pass through steep-sided gorges, which form a great obstacle to communication Though there are fertile sections on the course of the streams, western Arcadia as a whole is a poor country, mostly devoted to stock-raising, especially of sheep, and with remnants only of its ancient forests

To the north-west lies the department of Elis and Achaia, hilly in the interior but with a fairly extensive coastal plain This forms an important part of the currant-producing lands of Greece, but in classical times was aloof and neglected The ancient town of Olympia, on the lower Alpheus, reminds us that it was neutral ground, on which the various Greek peoples could meet in friendly rivalry Patras (62,000) has taken over under modern conditions the earlier function of Corinth, to which it is connected by a railway It is the largest town in the Peloponnesus

Passing eastwards along the Gulf we come to the terraced area of Corinth, typically Greek in that the productive lands lie in close relation to the sea In early days Corinth had a double importance in its command both of a seaway and a land route So long as the journey round Cape Matapan in the south represented a dangerous adventure, its possible avoidance by the isthmus portage had a value which it lost with improvements in methods of navigation. The town at the same time guarded the road into the Peloponnesus from the north

The Argolis peninsula is for the most part barren and mountainous, though the islands and some fertile areas at its extremity had importance in classical times. Its great interest, however, lies in the fertile though dry Argos basin at the head of the Gulf This plain, despite the low rainfall due to the sheltered position, and the limited possibilities of irrigation, has always been important. It is on the road to the north, for a pass leads over to Corinth; the ruins of Mycene and Tiryns recall the fact that it is within reach of Crete, while the modern town of Argos stands on the site of the ancient one. The port of Nauplia (7,000) was the first capital of Modern Greece.

The hill country of central Arcadia is continued southwards into two ranges which form the promontories bounding the Gulf of Laconia. The eastern range, the Malevo or Parnon, does not rise much above 6,000 ft., but the western, the Taygetus, bears in Hagios Elias (7,904 ft) the culminating point of the Peloponn-

nesus, and is peculiarly bare, barren and rocky. Between the two what was probably once a continuation of the Gulf has been filled up by the waste brought down by the Eurotas river. It is not, however, a continuous plain, for a rocky bar, cut through by the stream in a gorge, divides the upper basin, containing the town of Sparta, from a swampy and unhealthy, though fertile coastal plain. The basin of Sparta, now as always the heart of Laconia, is small, under 50 sq m. in extent, ringed round by mountains, but fertile and well-watered by the springs which bubble up at the base of the encircling rocks. The nearest road to the sea is by a difficult route across the Taygetus to the Messenian port of Kalamata, while the apparently direct route by the river is impeded by the rocky bar already mentioned. Further the Gulf coast is unsuited for the establishment of a good port, and the insignificant one of Gythion is some distance to the west of the Eurotas mouth The Aegean coast of the eastern promontory is steep and inhospitable Sparta has thus always been isolated, and despite the fertility of its basin, which yields olives with oranges and other fruits, it is now merely a small town.

Messenia is a softened, more open repetition of Laconia, with a westward outlook The river Psamios represents as it were the Eurotas, and there is a similar if less marked division into an upper and a lower basin But in addition to Kalamata (25,000) within the Gulf of Messenia, there are ports on the western coast, which is not inaccessible, for the mountains of Messenia are lower and less continuous than those of Laconia Pylos or Navarino, on the western coast of the most westerly promontory, has a fine harbour, little used because of the small hinterland. In Messenia the climate is milder and moister than in Laconia and much of the region is of great productivity. Currants are extensively produced, also mulberry trees, olives, figs, oranges and there are even some date palms Kalamata is the capital and has important oil and wine industries

3 *Central Greece*—This region extends from the great depression marked by the Gulfs of Corinth and Aegina to where the transverse Othrys range forms the southern boundary of the plains of Thessaly It presents at first sight an appearance of great complexity, especially on the east, where the great island of Euboea is separated from the mainland by the Gulf of Petalia and by a series of channels which at Chalkis narrow to the width of a river But three quite simple sets of facts give the key to the structure In the centre is a mountain backbone, forming the continuation of the Pindus range Its constituent elements have a general north-to-south direction, and are broken off sharply to the south in the region of the narrows which separate the wider Gulfs of Patras and Corinth Eastwards three ridges come off this main chain nearly at right angles The most northerly is the already-mentioned Othrys range. Then comes Mt Oeta (7,080 ft), which is continued into a lower ridge extending in a south-easterly direction through Phocis Further south a longer ridge may be regarded as having its origin in Mt Parnassus (8,064 ft), and being continued through Helicon and the lower mountains which separate the lowlands of Attica from those of Boeotia The ridge then bends southward to end in the promontory of Sunium Parnassus is separated by a narrow valley, containing the temple town of Delphi, from the loftier Giona (8,242 ft.) to the west, the highest mountain of the first Greece

These two sets of mountain ridges may be regarded as forming the skeleton of Central Greece The third important structural element is constituted by a series of transverse depressions, partly filled up by recent deposits, and then forming the sites of the chief settlements since early days They are best considered in relation to the transverse ridges, along whose margins they lie The most southerly is the plain of Attica, lying at the base of the ridge which extends south-eastwards from Parnassus Bordering as it does the Gulf of Aegina it shows a wonderful combination of advantages. North of the ridge, and south of that which forms a continuation of the Oeta massif, lies the plain of Boeotia It is less favourably placed than that of Attica, in particular because it does not confront the open sea but only the channels due to the presence of the island of Euboea. It is, however, fairly extensive, and the draining of the former L Copais has notably increased the area of cultivatable ground. A further point of interest is that the depression to which it owes its origin is as it were continued beyond the central backbone, on the western side of the peninsula. There, in south-western Aetolia, is a lowland traversed by the river Aspropotamus, and the lagoon coast of Missolonghi tells the same story of faulting and depression. At the base of the Othrys range, again, a third area of depression is traversed by the river Spercheios which enters the Gulf of Lamia. This has likewise its counterpart on the west in the Gulf of Arta with its surrounding lowland.

All these three areas of depression include fertile lands, producing the usual Greek crops, all contain modern towns, sometimes replacing old ones but often on the same site But the plain of Attica with the town of Athens may be taken as illustrating the main features.

The plain consists essentially of the basins of Athens and Eleusis, both fertile Very important are the limestone hills which rise above the surface of the plain, one of which forms the Acropolis Since, further, the limestones overlie non-porous rocks, and springs tend to gush out at the junction, there was, at least in early days, an adequate water-supply The topography of the hills to the north, combined with the nature of the double isthmus of Megara and Corinth, separated by an intervening hill belt, forces the land road from the north to pass through the plain. Even more important is the wealth of ports on the north coast of the Gulf of Aegina and on its islands If modern sea-traffic is concentrated on the Piraeus, in early times it was of much importance that the men of Attica could not only reach the sea at many points, but that the sea once reached was rich in sheltered havens

Athens, at the time of the foundation of Modern Greece, was a miserable village, while the Piraeus consisted of only a few huts. Within a period of less than one hundred years it grew to be a great modern town with a population approaching 400,000. As compared with Patras, the other chief port of the old Greece, and that from which a considerable part of the exports is sent out, the Piraeus receives 60% of the total import trade of Greece. If on the one hand the regular steamship services with Constantinople and Smyrna go far to explain the direction of Greek ambitions, the extent of the connections throughout the whole Mediterranean Sea helps to explain that intense interest in politics with which the modern Greeks are reproached. The linking of the town to the main railway system of Europe has not altered the fact that its prime importance is a centre of sea-traffic and that in a part of the world where political frontiers have shown great instability It is but natural that the modern men of Athens should be more intent on discussing ways and means of taking advantage of the constant changes in the surrounding lands than in cultivating a garden now too small to provide much for the dense population which occupies it.

Athens and the Piraeus form now practically a twin city, which shows the beginnings at least of considerable industries The tendency for these to be established near the port is due to the fact that whether they depend mainly upon home-produced raw material or that obtained from non-Greek lands, this tends to be sea-borne Among the industries which are developing rapidly are textiles, including cotton, woollen and silk goods: leather goods; soap and candles, based on local supplies of olive oil, metallurgical industries, based largely on island products; chemicals, including fertilisers, phosphates being largely imported from Tunisia, the beginnings of an engineering industry, and so forth.

4 *Northern Greece*—North of a line from the Gulf of Arta to the crest of the Othrys range a material change occurs in the characters of the lands It has been expressed by saying that to the south is the land of olive groves, to the north that of oak forests· to the south are skies eternally blue, to the north those dimmed by cloud in summer no less than in winter As a picturesque statement of a contrast the statement may serve, for already there is something continental in the landscape, a replacement of the Greek multiplicity of detail by broader structural features No minute study of the map is needed to bring out the fundamental division into an eastern and a western sec-

tion. The western, mountainous, aloof, backward, forms Epirus, "the continent," passing without natural division line into Southern Albania Eastward, mountains and hills ring round the broad plains of Thessaly, productive but giving a less full life to their cultivators than do the smaller basins of Central Greece; largely cut off from the sea despite their extensive river system, accessible, if with some difficulty, both from the north and the south by land, forming granaries eagerly fought for and held with tenacity by often alien overlords Even the productivity itself is clouded by a doubt. The multifarious crops of the true Greek lands have the great advantage that no natural calamity can diminish the yield of all throughout the long growing season. But Thessaly, with its wider spaces, its fewer but more extensively cultivated crops, shares already the continental risk of crop failure, for the weather prevailing during a short period determines whether there shall be famine or plenty

Little need be said of Epirus It is mainly an upland, karstic area, fitted especially for sheep-rearing, and showing all the usual karstic features There is a considerable Albanian, and also a Vlach element in the population, but neither people presents a "racial" problem, as their members are easily assimilated by the Greeks The coast is inhospitable so that there are no ports of any significance, and internal communication, as usual in karstic areas, is difficult. As exceptions to the general statement that the land is mainly fitted for pastoral industries, the fairly extensive plains which fringe the north shore of the Gulf of Arta may be noted There are also upland basins which include fertile lands, the most important being that in which stands Jannina, the departmental capital It is placed on the shores of a considerable lake, which has the usual karstic feature of varying greatly in extent and depth at the different seasons of the year, as the level of the ground water in the surrounding limestones varies As usual maize is grown on the lands which are submerged in winter and dry out in full summer, the fact is interesting because it must mean that such areas can support a denser population than in the days before the discovery of America brought this useful cereal to the Old World

Thessaly consists essentially of two lowland basins, the western centring round Trikkala (24,000) and the eastern round Larissa (27,000) The two basins are linked by the Peneios river which cuts through the rocky ridge which separates them But after its north-easterly course through the Larissa plain the river is constrained to cut through the wider and higher upland which separates the plain from the sea This it does in the beautiful Vale of Tempe, lying between the great massif of Mt Olympus (9,793 ft) to the north, and the much lower Ossa to the south Still further south the same ridge bears Pelion on its surface, and is continued into the Magnesian peninsula, which bends round in a hook-shaped promontory, almost enclosing the circular Gulf of Volo That Gulf is itself a depression comparable to the two plains, but smaller and flooded with sea-water, and it has a similar upland rim. By its northern side stands the port of Volo, communicating by passes across the rim both with Trikkala and with Larissa, and thus serving both The main railway is forced close to the coast by the Olympus massif, but thereafter traverses the Larissa plain and enters Central Greece after crossing the Othrys range

Olympus itself is an outpost of the Macedonian upland, and separates the basins of Thessaly from the more important plain which centres round the great port of Salonika. Geographically, indeed, Thessaly, with its great estates, worked by poverty-stricken peasants, who still keep memories of the Turkish period, marks the transition to troubled Macedonia, with all its unsolved problems Politically also it may be said that the inclusion of Thessaly within Modern Greece provided part of the stimulus which led to the Greek advance into Macedonia and Thrace, regarded as stages on the way to Constantinople.

5 *Greek Macedonia and Thrace.*—These new and truly continental lands, which have not yet adjusted themselves to the changed conditions resulting from the Turkish retreat, may be said to have their heart in the plain of Salonika Structurally the plain is comparable to Thessaly, but a Thessaly with a difference Nor does that difference consist mainly, as one might suppose, in the open access to the sea, symbolised by the size of the town and port of Salonika. Salonika (263,000), second only in size to Athens, and the only other large town of the republic, did not in the days before the Greek occupation owe its importance to the surrounding plain, fertile and potentially productive as that plain is It was the convergence of internal lines of communication upon the plain, the distant rather than the immediate hinterland, which determined the rise of a notable port here. Even the existing railway connections—to Belgrade via Uskub to the north; to Monastir to the north-west, to Constantinople to the east; to Athens via Larissa to the south—hardly give an adequate picture of the extent to which it is the natural outlet of the greater part of the Balkan peninsula. It is a point of convergence of land-ways as Athens is a centre of sea-ways Its significance is increased by the fact that the other north Aegean ports are poor in themselves, and have only difficult access to the interior. Prior to the Balkan wars the racial patchwork of Turkish Macedonia was reflected in the jumble of nationalities in Salonika, where Jews of Spanish descent formed the largest single element in a community which included representatives of all the Balkan peoples and foreigners in addition. It was described indeed as a kind of permanent fair, set up in a convenient spot, but having little relation to its immediate surroundings Though some 70,000 Jews are said to remain, the population is now mainly Greek, and, as we have already seen, this is true also of the comparatively narrow strip which extends eastward to the Maritsa line From a large part of its former hinterland Salonika, despite the Yugoslav Free Zone, is now cut off by political frontiers

The Salonika plain is traversed by the Lower Vardar and its numerous tributaries, and it is to the size of the river that it owes its importance, owing to the way in which the main stream and the tributaries open up lines of communication Otherwise it does not differ greatly, save in size, from the similar but smaller basins further east, such as those of Seres and Drama Each member of the series shows much the same features—a low region, floored by waste from the surrounding hills, usually marshy and malarious, but suitable for the production of wheat and tobacco, particularly in the Drama basin, with maize, rice in the marshy areas, cotton and other crops The higher, drier lands around yield vines and fruit-trees, mulberry trees for silkworm rearing and so forth Even within the uplands proper, particularly that very extensive tract of upland which extends westward from the edge of the Salonika plain, basins occur in which a certain amount of cultivation can be carried on

Salonika lies well to the east of the marshy Vardar delta, in a little bay at the base of the mountainous and trident-shaped Khalkidike peninsula The most easterly of the prongs of the trident, that of Athos, bears the monasteries and hermitages of Mount Athos, forming an ecclesiastical quasi-republic, a relic of mediaeval Byzantinism on the edge of a world which is rapidly growing modern All the monks belong to the Orthodox Church, but though Greek communities predominate, Russian, Serbian and Bulgarian ones also occur The religious, to the number of about 5,000 (1920 census), till their own lands, and through the Turkish period were guardians of the Byzantine tradition Many of the monasteries are rich, owning fiefs on the mainland, and the usual accusations of ignorance, idleness and intrigue have been brought against their occupants But there is certainly something of the picturesque in this apposition of a modern and intensely realistic town, the object of many ambitions, and a remnant of the idealism of the Middle Ages.

A depression, marked by lakes, leads directly eastwards from Salonika across the base of the Khalkidike peninsula, but the main railway finds an exit at the north-eastern angle of the plain, and enters the lower Struma valley, which forms the productive basin of Seres. This has no port of its own, but the next basin, that of Drama, though not drained seawards by a river, has a fair port in Kavala, greatly coveted by the Bulgars Opposite lies the wooded island of Thasos. From Drama the railway, by a somewhat difficult route over the rim of the basin, reaches the valley of the Mesta river, often regarded as forming the eastern

limit of Macedonia. Beyond, in Western or Greek Thrace, lies a lowland area with a fairly dense population and having as port the poor harbour of Dedeagats, which was for a time Bulgarian The Lower Maritsa forms the boundary with Turkey, but the town of Adrianople has been returned to that Power

Here then, against a meaningless river frontier, ends a Greece which is inhabited by Greeks and yet not wholly Greek, a Greece blocked in its ambition of an advance to Constantinople, which has seen its nationals expelled from those parts of coastal Asia Minor where they formed the most progressive element in the population What the future may hold none can say; but there can be no doubt of the interest of the problems involved Here we have a culture of essentially island origin renewing through the ages the perpetual effort to find a broader basis on the adjacent mainlands, continually falling back as the peoples of the interior of those mainlands react As a new element in that oft-renewed struggle we have the modern conception of the national state, with its supposedly homogeneous population, its needs for surplus wealth to be expended in armaments An apparently simple solution, based on the famous principle of nationality, has been arrived at—Greece has obtained new lands capable of yielding a surplus, the extra-territorial Greeks have been thrust within them, the non-Greek peoples removed Is the solution a real one? Is there not a profound irony in the thought that part of the stimulus which led to its adoption came from an overseas land whose inhabitants have taken as their own basal principle that not race—whatever race may mean—not country of origin, but a life lived in common within a definite part of the earth's surface is what makes a nation? (M I N)

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DEFENCE

The complicated tale of Greek diplomacy and military action in the World War is told elsewhere The victory of the allies over the central powers and the defeat of the Turkish armies in the field was followed by a Greek military occupation in Asia Minor during the long delay which ensued in concluding a peace treaty with Turkey During that period the Greek army suffered disaster ending in hurried embarkation at Smyrna, as the result of an offensive against the reconstituted Turkish army From that disaster recovery has been slow, and delayed by political changes and unrest With an area of 140,135 square kilometres, Greece now has land frontiers extending only for 1,121 kilometres, but a very long coast-line with numerous harbours and inlets rendering the country particularly vulnerable to inroads from the sea, a point that has been realized since the influence of sea-power over the military situation in Greece was illustrated by the battle of Navarino (1827).

Present-day Army: Recruitment and Service.—Every citizen is now liable to military service, extending from Jan 1 in the year of his 20th birthday to the same date in the year of his 49th birthday Certain exemptions are allowed for family or professional reasons, or for physical unfitness Voluntary enlistment is permitted, from the 18th birthday, to those not deprived of civil rights The annual enrolment of recruits in the northern provinces takes place in April, in the southern provinces in October There are 33 recruiting districts, each for one regiment of infantry. These are grouped in divisional or brigade recruiting areas, and these again into army-corps recruiting regions. Service with the colours in the regular army is for 18 months, followed by 19½ years in the first, and 8 years in the second reserve Recruiting in the *gendarmerie*, which is organized and trained on a military basis and is under the ministry of war for these purposes, is by voluntary enlistment for 3 years of men under 30, by re-enlistments, or by the voluntary enlistment between the ages of 19 and 25 of young men holding a leaving certificate from a secondary school, or a diploma of law These become respectively non-commissioned or commissioned officers in the *gendarmerie* in due course Their numbers do not exceed about 400 out of each class of army recruits

Strength and Organization.—The budget effectives in the Greek army in 1927 numbered 67,121, including 7,121 officers (38 Generals, 136 Colonels) The organization on a peace footing provides for 4 army corps (headquarters at Athens, Larissa, Salonika and Kavalla) 9 infantry divisions are with the army corps, and 2 divisions and an extra brigade directly under the ministry of war There are also 2 cavalry divisions and an air force An infantry regiment contains 2 battalions, each of four companies, of which one is a machine-gun company A cavalry regiment is divided into two half-regiments each of 2 squadrons and a machine-gun group There are 11 regiments of mountain artillery armed with guns and howitzers of various patterns (Schneider, Schneider-Danglis, and Skoda) of calibres from 65mm to 105mm, 4 regiments of field artillery (75 mm Schneider, 77mm Krupp), and 3 regiments of heavy artillery armed with Schneider and Skoda guns and howitzers of 150 to 155mm calibre The Engineers include 3 regiments of sappers, 1 telegraph and 1 railway regiment and a pontoon battalion There are also the usual services and departments, medical, supply and transport, pay, veterinary, etc

The minister of war is the supreme head of the army in time of peace His ministry includes a secretariat and departments, each under a director, for dealing with the separate arms and services, including a director for the *gendarmerie* The minister is assisted by a chief of the general staff, with deputy and 4 departments, under whom there are 11 permanent inspectors of the different branches of the army

For army officers there is a higher military training centre to train Colonels and Lieut-colonels for higher command, a military academy for Majors and Captains for service on the staff (2 years course), and a special school for officers of each arm of the service (5 to 6 months course) There is also a Military academy for cadets (4 years course), and one for non-commissioned officers aspiring to commissions (2 years course) There are special schools for army medical services, for reserve officers and for physical training, a school for army artificers and a preparatory school for non-commissioned officers The *gendarmerie* has its own special school (2 years course)

In the war ministry there is a department of aviation, under a director The air force itself is at present (1928) being reorganized There are 3 air regiments, an independent flying group, an air-park and a flying school An air regiment contains two air-groups, each of 2 flights and an aircraft-park The types of machines in use at present are the Bréguet XIV and XIX, the Mars and the Henriot

See also the League of Nations *Armaments Year-book* (1928) (G G A)

Navy.—The history of the Greek Navy is intimately associated with that of the nation, and the rise and fall of ancient Greece is a classic example of the value of sea power In modern times the varying fortunes of Greece have been largely the outcome of political unrest which has been reflected in the vacillating attitude of successive governments towards the fleet

Within the eight years 1921–28, successive Hellenic Governments have appealed for and been granted the assistance of three separate British naval missions The work of two of these missions was somewhat suddenly terminated by a change of those governments' policy, whereby much of the good derived from the labour of the British advisers was lost

Of late, however, with the assistance of the third mission, there has been a fairly steady effort to make the fleet more efficient None of the ships are very modern, but some of the more important of them have been refitted, whilst training is being brought into line with British methods, so far as they can be made applicable

In 1928 the Greek Navy consisted of two battleships, bought

from the United States in 1914, the "Kilkis" (*ex* "Mississippi") and "Lemnos" (*ex* "Idaho"), completed in 1908, since reconditioned; three very old battleships used as training schools; one armoured cruiser "Giorgios Averoff" (1910); one cruiser mine-layer; 11 destroyers; 12 torpedo and patrol boats; six submarines and some small auxiliary vessels (E A.)

GOVERNMENT AND ADMINISTRATION

ECONOMY AND FINANCE

Area and Population.—The area of Greece at the beginning of the twentieth century was about 24,400 square miles. The Balkan wars of 1912–13 resulted in the addition of New Greece, consisting of Macedonia, Epirus, Crete and a number of islands in the Aegean, with an area of about 21,600 square miles, making the total area of the country about 46,000 square miles in 1914 After the World War, Greece occupied Thrace and a part of the vilayet of Aidin in Asia Minor, and these occupations were confirmed by the treaties of Neuilly and Sèvres. But, as the result of the Asia Minor campaign, Greece in 1922 evacuated Asia Minor and Eastern Thrace in favour of Turkey, and by the treaty of Lausanne in 1923, she also retroceded Imbros and Tenedos The area of Greece after these changes, is (1928) about 49,000 sq m

The population of Old Greece (census of 1907) was 2,631,952, and that of New Greece (census of 1913) was 2,101,014 A census taken in 1920 gave the total population as 5 536,375, including Thrace. An estimate which allows, on the one hand, for the subsequent loss of territory and for the transfer of the Muslim inhabitants of Greece to Turkey, and, on the other hand, for the influx of some 1,400,000 refugees from Turkey after the war in Asia Minor, and for natural increase, would place the population in 1928 in the neighbourhood of 6,400,000

The various racial migrations which have been brought about by the wars from 1912 onwards, whether voluntary or compulsory, involving the transfer, in either direction, of nearly 2,500,000 Greeks, Bulgarians and Turks, have had the result of introducing homogeneity in the regions affected, where before there was great diversity Thus the proportion of Greeks in the population of Macedonia and Western Thrace, which stood at 43 and 36 per cent before the Balkan wars, was in 1925, 88 and 62 per cent

Of Greek populations abroad the most important now remaining are those in Constantinople, the Dodecanese, Cyprus, Egypt and the United States Fresh emigration to the latter country has been reduced to insignificant proportions by the restrictions imposed in 1921. The remittances to the mother country from Greeks established abroad form a considerable item in the annual trade balance

Agriculture.—Greece is mainly an agricultural country, about three quarters of its population being occupied in agricultural pursuits. Owing however to its mountainous conformation, only 22 per cent of the area is cultivated, while 32 per cent is occupied by meadows and pasturage and 13 per cent by woods and forests

The greater part of the cultivated area is devoted to cereals, of which, however, the production is far from sufficient for the consumption of the country Considerable surfaces are also taken up by olive trees and vines, while certain districts are affected to the two valuable products, tobacco and currants, for which Greece is specially known and which form the staple of her export. Figs, oranges and other fruit are plentiful Cotton and rice are cultivated on a small scale ,

Minerals.—The country has a large variety of mineral deposits, but they are worked only to a moderate extent. The principal minerals are lignite, iron, iron pyrites, magnesite, chromite, lead and Naxos emery, as well as the famous marbles. Marine salt is produced in large quantities for home consumption

Industry.—The development of industry on a large scale is hindered by lack of a native coal supply and by scarcity of capital But high protective duties and the influx of refugee labour have combined with other factors to give it a considerable impetus of recent years. In order of importance, the first place is occupied by the manufacture of alimentary products, olive oil, wine, spirits, flour, confectionery, etc. Next in order are cotton, wool, silk, jute and other textiles, among which the carpet industry deserves special mention as having been introduced by the refugees from Turkey. Soap, chemicals, leather, cigarettes and building materials are manufactured in considerable quantity and there are numerous minor industries.

Labour is protected by special legislation dealing with hours, the health and security of workmen, compensation for accidents, wage disputes, employment of women and children, etc , and the resolutions of the Washington Labour Conference are observed

Commerce and Transport.—The principal articles of export are tobacco, currants, olive oil and wine Cereals take the first place among the imports, followed by textiles, coal, sugar and a variety of other commodities. The imports largely exceed the exports, the difference being accounted for by shipping and commercial profits, by remittances from Greeks in other countries, by interest on investments held abroad, and by the influx of public and private capital into the country

The railway system has been linked up with those of Europe since 1916, via Salonika-Nish-Belgrade Commercial air services connecting Athens with Brindisi and Constantinople were established in 1927; and the mercantile marine is considerable, its range of activity extending far beyond the limits of the special commerce of the country, thus contributing in no small degree to the national resources

Public Finance.—Taxation is heavy, and import and consumption duties form the mainstay of the revenue, in contrast with the yield from direct taxes which is relatively small The public debt charge absorbs about one third of the total A large part of the debt is secured by assigned revenues under the control of the International Financial Commission, established in 1898

The economic situation of Greece during the early years of the present century, up to the outbreak of the Balkan War in 1912, was marked by a steady if moderate progress Industrial enterprises for local purposes were established in considerable number Communications by road and railway were extended, and large additions were made to the mercantile marine The premium on gold gradually declined, and finally disappeared in 1909 By the Valaoritis law of 1910, providing for the automatic issue and withdrawal of notes against gold or foreign exchange, the currency was definitely stabilized at par on the gold exchange system, to the great advantage of the general economy and the credit of the country

The state of the public finances, though less satisfactory, also showed signs of improvement at the latter end of the period A series of deficits from 1907 to 1909 had to be met out of a portion of the proceeds of a new foreign loan raised for this and other purposes in 1910 At the same time, a programme of fresh taxation was introduced, including income tax and succession duties, with the result that the accounts up to 1912 showed a substantial surplus of revenue over expenditure The varying interest on the old gold loans, payable out of surplus revenues in the hands of the International Financial Commission, marked a sensible upward progress

The Balkan Wars of 1912 and 1913 threw a considerable strain on the resources and finances of Greece, which was, however, relieved in some measure by the material assistance rendered by Greeks abroad Immediate war expenses were defrayed chiefly out of the balance of the 1910 loan and the proceeds of various provisional loans, which were liquidated by means of a new consolidated loan issued in 1914, and taken up for the greater part in Paris and London. This loan was secured on the revenues assigned to the International Financial Commission, an institution which, though regarded as an encroachment on the sovereign rights of the country, has been found useful on repeated occasions as a means of providing security for fresh loans The economic strength of Greece was greatly enhanced by the acquisition of territories of both actual and potential value, including the important port of Salonika, the rich tobacco-growing districts of Drama and Kavalla and extensive fertile areas in Macedonia.

The World War.—After the outbreak of the World War, and during the period of neutrality of Greece, which lasted from 1914 until 1917, there was a considerable accumulation of private wealth

in the form of foreign balances, arising out of shipping and other profits which it was difficult, owing to war restrictions, to realize in actual goods. At the same time the country suffered severely from internal conflicts, from the economic blockade of Old Greece in 1916–7 and from the prolonged mobilization and war preparations. Noteworthy economic events during this period were. the law of 1915 facilitating the formation of co-operative societies; the connection, in 1916, of the railway system of Greece with those of Europe; and the agrarian legislation of 1917, which provided for the expropriation of large estates in favour of the peasants, and at the same time prohibited the alienation or mortgage of the peasants' holdings and their subdivision at death

The entry of Greece into the War in 1917 involved a large increase in military and naval expenditure Fresh taxation was imposed, including a tax on War profits, and a certain sum was raised by an internal loan and by the issue of National Defence bills. But the bulk of the funds required was provided by advances in kind from the Allied Powers and by credits opened by the latter for expenditure in Greece, against which payments were effected in notes by the Greek Government These credits were treated as cover for the note issue The very considerable expansion in the paper currency which resulted from these arrangements did not cause at first too heavy a demand for exchange, for the factors which contributed to strengthen the foreign balances during the period of neutrality continued to operate until the end of the War Thus the internal war expenditure of Greece and part of that of the Allies as well, was defrayed for the time being out of the resources of the country.

With the close of the War, however, and the suppression of restrictions on trade, the accumulated purchasing power of the country made itself felt in a large demand for foreign goods Large purchases of Greek and other securities were made in foreign markets, and the depreciating currencies of Europe offered an attractive field for the speculator The resultant pressure on the exchange funds of the note-issue was so great that before the end of 1919 the available reserves were exhausted, the exchanges began to fall away from the gold parity, and the Valaoritis law became a dead letter In the course of 1920 a portion of the Allied credits was realized, but this was quickly absorbed by purchases of supplies, and the excess of imports reached unprecedented proportions.

Effects of the Graeco-Turkish War.—At the same time, the Govt found itself involved in fresh liabilities in connection with the military operations in Asia Minor To raise the considerable funds required, recourse was had to a large internal lottery loan, to issues of National Defence bills, to loans from the National Bank and, finally, to inflationary issues of paper money. The fall in the exchanges was accelerated by the withdrawal of financial support and credits by the Allies on the return of King Constantine in 1920. By the end of that year the drachma had lost 60% of its gold value. This depreciation of the currency reacted unfavourably on the budget, while the prosecution of the Asia Minor campaign entailed ever-increasing expenditure In 1921 and 1922 issues of paper money and National Defence bills were effected on a large scale, without authority from the International Financial Commission, taxes were raised and a forced loan was extracted from note-holders by compelling them to surrender one-half of each note in exchange for a government bond The disaster in Asia Minor in 1922 reduced the finances and credit of the country to the lowest ebb, and by the end of the year its securities were quoted on the international markets at prices yielding 20% to the investor, while the drachma had lost 94% of its gold value. This collapse of the monetary unit, with the concomitant rise in the price-level, profoundly disturbed economic conditions throughout the country, and caused serious losses among particular sections of the community. The bulk of the public debt being on a gold basis, the real charge of its service on the state finances was not greatly reduced by the depreciation. (*See* also DRACHMA)

Refugee Settlement.—The influx from Asia Minor and Thrace of a vast number of destitute refugees threw a fresh burden on the resources of the country, and enlisted the sympathy and assistance of foreign countries, especially of England and America Under the auspices of the League of Nations an independent refugee settlement commission was set up in 1923, for the establishment of the refugees, and a refugee loan was issued in 1924, in London, New York and Athens, guaranteed by revenues assigned to the International Financial Commission Meanwhile, the Govt made strenuous efforts to put its finances in order Considerable fresh taxation was imposed in 1923, including a capital levy to be spread over five years, which has given very mediocre results. The floating debt was largely increased in 1923 and 1924. A fresh uncovered issue of paper money was made in 1923, and at the same time a law was passed authorizing further issues against cover in funds abroad. The exchange, after violent fluctuations, settled down in 1924 to about one-tenth of the gold parity By 1925 the public finances had so far recovered that the Govt was able to allocate special revenues to the reduction of the floating debt, and to present a balanced budget

But this equilibrium was disturbed by fresh expenditure, for military and other purposes, under the Pangalos regime, and by a renewed fall in the exchanges, due to an inflationary banking policy. In 1926, a second forced loan was raised from note-holders, who were compelled to surrender one quarter of each note in exchange for a government bond, and a third forced loan from holders of National Defence bills, who had to accept a ten-year bond in exchange for one half of these bills at maturity. But such measures, while providing temporary relief for the situation, did nothing to correct the current deficit, which, in spite of additional taxation, continued to increase The exchanges took a fresh turn for the worse, the drachma falling to one eighteenth of its gold parity, as a result of the general lack of confidence, which made itself felt also in the domain of commerce and industry Severe money stringency prevailed, the rate of interest rose to very high levels, and many concerns found themselves in difficulties due to overtrading and immobilization of capital during the previous few years.

Financial Reconstruction.—The new coalition Govt which came into power in Dec 1926 took vigorous measures to redress the financial situation By means of fresh taxation, reductions in expenditure and postponement of certain liabilities, the Budget estimates were balanced The aid of the League of Nations was invoked with a view to obtaining a loan for the liquidation of arrears, the further settlement of refugees and the stabilization of the currency. The approval of the League was given to a loan for this threefold object, subject to the adoption of a scheme of banking and monetary reform, involving the establishment of an independent central bank of issue on modern lines and the introduction of a new fiduciary system The loan was issued on advantageous terms early in 1928, the main portion being taken up in London and New York Meanwhile the war debts to Great Britain and the United States were funded on terms satisfactory to the country, the settlement of the latter being coupled with the grant of a new loan from the United States Govt to supplement that floated under the auspices of the League of Nations. The effects of this successful financial policy made themselves felt in all directions The prestige and credit of the country enjoyed a marked enhancement The exchanges recovered and remained stable at about one fifteenth of gold parity Renewal of confidence showed itself in the attraction of capital from abroad, in easier rates of interest, and in an improvement in the state of commerce and industry

General Survey.—The country as a whole showed remarkable powers of recuperation after a period of ten years of war, defrayed largely out of her own resources, and culminating in a great national disaster The refugee population tended to become an asset instead of a burden The expropriation of agricultural properties for the benefit of refugee and other peasants was accelerated, on terms very unfavourable to the owners, by special legislation. The settlement of refugees on the land extended the cultivated area and increased the production of crops, while large numbers found employment in other occupations and gave an impetus to the nascent industries of the country. The consuming power of the population increased both absolutely and per capita.

The mercantile marine, which had been reduced by nearly two thirds during the war through sales and enemy action, was restored to its original strength. There was a considerable expansion in building, industrial and other enterprise. Numerous projects were undertaken, with the aid of foreign capital, for the improvement of railways, roads and works of development Finally, 1928 found Greece in process of achieving financial stability, though burdened with an increased public debt and future liabilities, which involved heavy taxation and severe restriction of expenditure. The extrication of the country from its embarrassments was due in no small measure to the beneficent intervention of the League of Nations

Statistical Comparisons.—The following statistical table summarizes the changes in some of the salient economic and financial features of Greece over the interval from 1914 to 1927–28 The figures in drachmas must be considered in relation to the depreciation of the currency.

	1914	1926–28	
Area (sq m)	46,000	1928	49,200
Population	4,800,000	1928	6,400,000
Production of cereals (tons)	847,000	1927 (est)	927,000
,, ,, tobacco ,,	25,000	1927 (est)	44,000
,, ,, currants ,,	158,000	1927 (est)	119,000
,, ,, lignite ,,	20,000	1926	153,000
Exports (drachmas)	178,500,000	1926	5,429,700,000
Imports ,,	318,800,000	1926	10,004,939,000
Joint stock companies	68	1927	520
Capital of do (drachmas)	363,000,000	1927	4,676,000,000
Cooperative societies	5	1926	5,100
Letters carried	29,810,000	1926	70,698,000
Railways open (miles)	1,366	1927	1,689
,, passengers carried	12,347,000	1926	41,201,000
,, goods carried (tons)	770,000	1926	1,803,000
Mercantile Marine (Steamships) gross tonnage	830,000	1927	1,052,000
Bank deposits (drachmas)	474,000,000	1927	7,402,000,000
Note circulation ,,	253,000,000	1927	4,966,000,000
Public debt, gold (£)	43,900,000	1927	73,000,000
,, currency (drachmas)	173,600,000	1927	8,599,000,000
Ordinary revenue ,,	207,700,000	1927	8,078,000,000
Cost of living in Athens Index No	100	1928 Jan	1,986
Exchange on London (drachmas per £)	25	1928 Jan	368

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HISTORY; ANCIENT TO 146 B.C.: (1) GENERAL

The present article is not intended to supply an "Outline of Greek History." The plan followed in these volumes, in which the subject of Greek history is treated of in a large number of separate articles, allows of the narrative of events being given in a more satisfactory form under such headings as ATHENS, SPARTA, PELOPONNESIAN WAR (*qq v*) The character of the history itself suggests a further reason why a general article upon Greek history should not be confined to, or even attempt, a narrative of events. A sketch of Greek history is not possible in the sense in which a sketch of Roman history, or even of English history, is possible Greek history is not the history of a single state. When Aristotle composed his work upon the constitutions of the Greek states, he found it necessary to extend his survey to no less than 158 states Greek history is thus concerned with more than 150 separate and independent political communities Nor is it even the history of a single country. The area occupied by the Greek race extended from the Pyrenees to the Caucasus, and from southern Russia to northern Africa. It is inevitable, therefore, that a mere narrative should give a false perspective. Such a sketch is apt to resolve itself into the history of a few great movements and of a few leading states, and to confine itself, at any rate for the greater part of the period dealt with, to the history of Greece in the narrower sense, *i e*, of the Greek peninsula For the identification of Greece with Greece proper there may be some degree of excuse when we come to the 5th and 4th centuries In the period that lies behind the year 500 B C. Greece proper forms but a small part of the Greek world In the 7th and 6th centuries we must look outside Greece for the most active life of the Greek people and the most brilliant manifestations of the Greek spirit The present article, therefore, will be concerned with the causes and conditions of events, rather than with the events themselves; it will attempt analysis rather than narrative

(2) THE MINOAN AND MYCENAEAN AGES

When does Greek history begin? Whatever may be the answer that is given to this question, it will be widely different from any that could have been proposed half a century ago Then the question was, How late does Greek history begin? To-day the question is, How early does it begin? Grote suggested that the first Olympiad (776 B C) should be taken as the starting-point of the history of Greece, in the proper sense of the term "history " At the present moment the tendency would seem to be to go back as far as the 3rd or 4th millennium B C in order to reach a starting-point The results of archaeological research during the last 50 years have produced this startling change in the attitude of historical science towards the problem When Grote published the first volumes of his *History of Greece* (1846) archaeology was in its infancy Its results, so far as they affected the earlier periods of Greek history, were scanty, and its methods were unscientific The methods have been gradually perfected by numerous workers in the field, but the results, which have so profoundly modified our conceptions of the early history of the Aegean area, are principally due to the discoveries of two men, Heinrich Schliemann and Sir Arthur Evans A full account of these discoveries will be found elsewhere (*see* AEGEAN CIVILIZATION and CRETE) Schliemann's labours began with the excavations on the site of Troy in the years 1870–73 He passed on to the excavations at Mycenae in 1876 and to those at Tiryns in 1884 The discoveries of these years revealed to us the Mycenaean age, and carried back the history to the middle of the 2nd millennium The discoveries of Sir Arthur Evans in the island of Crete belong to a later period The work of excavation was begun in 1900, and was carried on in subsequent years It has revealed to us the Minoan age, and enabled us to trace back the development and origins of the civilization for a further period of 1,000 or 1,500 years

The Evidence of Excavation.—If, then, by "Greek history" is to be understood the history of the lands occupied in later times by the Greek race (*i e*, the Greek peninsula and the Aegean basin), the beginnings of the history must be carried back some 2,000 years before Grote's proposed starting-point If, however, "Greek history" is taken to mean the history of the Greek people, the determination of the starting-point is far from easy For archaeology does not as yet supply any certain answer to the question of race Were the creators of the Minoan and Mycenaean civilization Greeks or were they not? In some degree the Minoan evidence has modified the answer suggested by the Mycenaean. The two chief difficulties in the way of attributing either the Minoan or the Mycenaean civilization to an Hellenic people are connected respectively with the script and the religion The excavations at Cnossus have yielded thousands of tablets written in the linear script There is also evidence that a script, although a different script, was in use among the Mycenaeans as well. If Greek was the language spoken at Cnossus and Mycenae, how is it that all attempts to decipher the scripts have hitherto failed? The Cretan excavations, again, have taught us a great deal as to the religion of the Minoan

age; they have, at the same time, thrown a new light upon the evidence supplied by Mycenaean sites It is no longer possible to ignore the contrast between the cults of the Minoan and Mycenaean ages, and the religious conceptions which they imply, and the cults and religious conceptions prevalent in the historical period. On the other hand, the argument derived from Mycenaean art, in which we seem to trace a freedom of treatment which is akin to the spirit of later Greek art, and is in complete contrast to the spirit of Oriental art, has received striking confirmation from the remains of Minoan art The decipherment of the scripts would at once solve the problem We should at least know whether the dominant race in Crete in the Minoan age, or on the mainland of Greece in the Mycenaean age, spoke an Hellenic or a non-Hellenic dialect In the meanwhile, possibly until the tablets are read, at any rate until further evidence is forthcoming, any answer that can be given to the question must necessarily be tentative and provisional. (*See* AEGEAN CIVILIZATION)

It has already been implied that this period of the history of Greece may be subdivided into a Minoan and a Mycenaean age In the Mycenaean age itself, two periods must be distinguished, the earlier, to which belong the objects found in the shaft-graves, and the later, to which belong the beehive-tombs and the remains of the palaces To this latter period belong also the palace at Tiryns, and the beehive-tombs discovered elsewhere on the mainland of Greece, and one of the cities on the site of Troy The pottery of this period is as characteristic of it, both in its forms (*e g*, the "stirrup" or "false-necked" form of vase) and in its peculiar glaze, as is the architecture of the palaces and the beehive-tombs Although the chief remains have been found on the mainland of Greece itself, the art of this latter period is found to have extended as far north as Troy and as far east as Cyprus On the other hand, hardly any traces of it have been discovered on the west coast of Asia Minor, south of the Troad The earlier period of the Mycenaean age may be regarded as extending from 1600 to 1400 B C, and the later period as extending from 1400 to 1200 B C, or even later. The Minoan age is of far wider extent Its latest period corresponds to the earlier period of the Mycenaean age This is the period called by Sir Arthur Evans "Late Minoan" To it belong the Great Palace at Cnossus and the linear system of writing The "Middle Minoan" period, to which the earlier palace belongs, is characterized by the pictographic system of writing and by polychrome pottery of a peculiarly beautiful kind Sir Arthur Evans proposes to carry back this period as far as 2500 B C Even behind it there are traces of a still earlier civilization Thus the Minoan age, even if limited to the middle and later periods, will cover at least a thousand years More recent discoveries have proved that an art, hardly inferior in its way to the art of the classical period, and a civilization which implies the command of great material resources, were flourishing in the Aegean perhaps a thousand years before the siege of Troy

Oriental Influence.—To the question, "What is the origin of this civilization? Is it of foreign derivation or of native growth?" it is not possible to give a direct answer On the one hand, it was developed from a culture which was common to the whole Aegean basin and extended as far to the west as Sicily On the other hand, foreign influences contributed largely to the process of development Egyptian influences, in particular, can be traced throughout the "Minoan" and "Mycenaean" periods The developed art, however, both in Crete and on the mainland, displays characteristics which are the very opposite of those which are commonly associated with the term "oriental" Egyptian work, even of the best period, is stiff and conventional, in the best Cretan work, and, in a less degree, in Mycenaean work, we find an originality and a freedom of treatment which remind one of the spirit of the Greek artists The civilization is, in many respects, of an advanced type The Cretan architects could design on a grand scale, and could carry out their designs with no small degree of mechanical skill. At Cnossus we find a system of drainage in use, which is far in advance of anything known in the modern world before the 19th century The art of the Minoan age is hardly inferior to that of the age of Peisistratus. It is a civilization, too, which has long been familiar with the art of writing But it belongs entirely to the Bronze Age. Iron is not found until the very end of the Mycenaean period, and then only in small quantities Nor is this the only point of contrast between the culture of the earliest age and that of the historical period in Greece The so-called Phoenician alphabet, in use among the later Greeks, is unknown in the earliest age Its systems of writing, both the earlier and the later, are syllabic in character, and analogous to those in vogue in Asia Minor and Cyprus In the art of war, the chariot is of more importance than the foot-soldier, and the latter, unlike the Greek hoplite, is lightly clad, and trusts to a shield large enough to cover the whole body, rather than to the metal helmet, breastplate and greaves of later times (*see* ARMS AND ARMOUR) The political system appears to have been a despotic monarchy, and the realm of the monarch to have extended to far wider limits than those of the "city-states" of historical Greece It is, perhaps, in the religious practices of the age, and in the ideas implied in them, that the contrast is most apparent Neither in Crete nor on the mainland is there any trace of the worship of the "Olympian" deities The cults in vogue remind us rather of Asia than of Greece The worship of pillars and of trees carries us back to Canaan, while the double-headed axe, so prominent in the ritual of Cnossus, survives in later times as the symbol of the national deity of the Carians The beehive-tombs, found on many sites on the mainland besides Mycenae, are evidence both of a method of sepulture and of ideas of the future state, which are alien to the practice and the thought of the Greeks of history

(2) THE HOMERIC AGE

Alike in Crete and on the mainland the civilization disclosed by excavation comes abruptly to an end In Crete we can trace it back from *c* 1200 B C to the Neolithic period From the Stone Age to the end of the Minoan age the development is continuous and uninterrupted But between the culture of the Early Age and the culture of the Dorians, who occupied the island in historical times, no connection whatever can be established Between the two there is a great gulf fixed It would be difficult to imagine a greater contrast than that presented by the rude life of the Dorian communities in Crete when compared with the political power, the material resources and the extensive commerce of the earlier period The same gap between the archaeological age and the historical exists on the mainland also The solution of continuity is here less complete Mycenaean art continues, here and there, in a debased form down to the 9th century, a date to which we can trace back the beginnings of the later Greek art On one or two lines (*e g*, architecture) it is even possible to establish some sort of connection between them But Greek art as a whole cannot have evolved from Mycenaean art We cannot bridge over the interval that separates the latter art, even in its decline, from the former What then is the relation of the Heroic or Homeric Age (*i e*, the age whose life is portrayed for us in the poems of Homer) to the Earliest Age? It, too, presents many contrasts to the later periods On the other hand, it presents contrasts to the Minoan Age, which in their way, are not less striking Is it then to be identified with the Mycenaean Age? Schliemann unhesitatingly identified Mycenaean with Homeric He even identified the shaft-graves of Mycenae with the tombs of Agamemnon and Clytemnestra Subsequent inquirers, while refusing to discover so literal a correspondence between things Homeric and things Mycenaean, did accept a general correspondence between the Homeric Age and the Mycenaean Where it is a case of comparing literary evidence with archaeological, an exact coincidence is not of course to be demanded The case for a general correspondence appears prima facie a strong one Much in Homer seems to find confirmation or explanation in Schliemann's finds Mycenae is Agamemnon's city, the plan of the Homeric house agrees fairly well with the palaces at Tiryns and Mycenae; the forms and the technique of Mycenaean art serve to illustrate passages in the poems, such are only a few of the arguments that have been urged The late Professor Ridgeway demonstrated, once and for all, that Mycenaean is not Homeric

pure and simple He insisted upon differences as great as the resemblances. Iron is in common use in Homer; it is practically unknown to the Mycenaeans. The Homeric dead are cremated; the Mycenaean are buried The gods of Homer are the deities of Olympus, of whose cult no traces are to be found in the Mycenaean Age. It can hardly be doubted that Professor Ridgeway has succeeded in proving that much that is Homeric is post-Mycenaean It is possible that different strata are to be distinguished in the Homeric poems. There are passages which seem to assume the conditions of the Mycenaean Age; others presuppose the conditions of a later age The latter passages may reflect the circumstances of the poet's own times, while the former ones reproduce those of an earlier period If so, the substitution of iron for bronze must have been effected in the interval between the earlier and the later periods

The Homeric State.—The question whether the makers of the Minoan and Mycenaean civilizations were Greeks must still be regarded as open No such question can be raised as to the Homeric Age The Achaeans may or may not have been Greek in blood. What is certain is that the Achaean Age forms an integral part of Greek history Alike on the religious and the political sides, Homer is the starting-point of subsequent developments With regard to religion it is sufficient to refer to the judgment of Herodotus, that it was Homer and Hesiod who were the authors of the Greek theogony (ii 53 οὗτοί εἰσι οἱ ποιήσαντες θεογονίην Ἕλλησι). It is a commonplace that Homer was the Bible of the Greeks. On the political side, Greek constitutional development would be unintelligible without Homer When Greek history, in the proper sense, begins, oligarchy is almost universal. Everywhere, however, an antecedent stage of monarchy has to be presupposed In the Homeric system monarchy is the sole form of government, but monarchy already well on the way to being transformed into oligarchy. In the person of the king are united the functions of priest, of judge, and of leader in war He belongs to a family which claims divine descent and his office is hereditary. He is no despotic monarch He is compelled by custom to consult the council (*boulē*) of the elders, or chiefs He must ask their opinion, and, if he fails to obtain their consent, he has no power to enforce his will Even when he has obtained the consent of the council, the proposal still awaits the approval of the assembly (*agora*) of the people

Homeric Society.—Thus in the Homeric state we find the germs not only of the oligarchy and democracy of later Greece, but also of all the various forms of constitution known to the Western world And a monarchy such as is depicted in the Homeric poems is clearly ripe for transmutation into oligarchy The chiefs are addressed as kings (*basilēes*), and claim, equally with the monarch, descent from the gods In Homer, again, we can trace the later organization into tribe (*phulē*), clan (*genos*), and phratry, which is characteristic of Greek society in the historical period, and meets us in analogous forms in other Aryan societies. The *genos* corresponds to the Roman *gens*, the *phulē* to the Roman tribe, and the phratry to the *curia* The importance of the phratry in Homeric society is illustrated by the well-known passage (*Iliad* ix 63) in which the outcast is described as "one who belongs to no phratry" (*aphrētōn*) The society is, of course, based upon slavery, but it is slavery in its least repulsive aspect The treatment which Eumaeus and Eurycleia receive at the hands of the poet of the *Odyssey* is highly creditable to the humanity of the age A society which regarded the slave as a mere chattel would have been impatient of the interest shown in a swineherd and a nurse It is a society, too, that exhibits many of the distinguishing traits of later Greek life Feasting and quarrels are of more moment to the heroes than to the contemporaries of Pericles or Plato; but "music" and "gymnastic" (understood in a more restricted sense) are as distinctive of the age of Homer as of that of Pindar There is retrogression in the historical period Woman in Homeric society enjoys a greater freedom, and receives greater respect, than in the Athens of Sophocles and Pericles

(3) THE GROWTH OF THE GREEK STATES

The Greek world at the beginning of the 6th century B.C presents a picture in many respects different from that of the Homeric Age The Greek race is no longer confined to the Greek peninsula It occupies the islands of the Aegean, the western seaboard of Asia Minor, the coasts of Macedonia and Thrace, of southern Italy and Sicily. Scattered settlements are found as far apart as the mouth of the Rhone, the north of Africa, the Crimea and the eastern end of the Black Sea The Greeks are called by a national name, *Hellenes*, the symbol of a fully-developed national self-consciousness. They are divided into three great branches, the Dorian, the Ionian, and the Aeolian, names almost, or entirely unknown to Homer. The heroic monarchy has nearly everywhere disappeared. In Greece proper, south of Thermopylae, it survives, but in a peculiar form, in the Spartan state alone What is the significance and the explanation of contrasts so profound?

Dorian Invasion.—It is probable that the explanation is to be found, directly or indirectly, in a single cause, the Dorian invasion In Homer the Dorians are mentioned in one passage only (*Odyssey* xix 177). They there appear as one of the races which inhabit Crete. In the historical period the whole Peloponnese, with the exception of Arcadia, Elis and Achaea, is Dorian. In northern Greece the Dorians occupy the little state of Doris, and in the Aegean they form the population of Crete, Rhodes and some smaller islands Thus the chief centres of Minoan and Mycenaean culture have passed into Dorian hands, and the chief seats of Achaean power are included in Dorian states Greek tradition explained the overthrow of the Achaean system by an invasion of the Peloponnese by the Dorians, a northern tribe, which had found a temporary home in Doris. The story ran that, after an unsuccessful attempt to force an entrance by the Isthmus of Corinth, they had crossed from Naupactus, at the mouth of the Corinthian Gulf, landed on the opposite shore, and made their way into the heart of the Peloponnese, where a single victory gave them possession of the Achaean states Their conquests were divided among the invaders into three shares, for which lots were cast, and thus the three states of Argos, Sparta and Messenia were created. Much in this tradition is impossible or improbable It is improbable that the conquest should have been either as sudden, or as complete, as the legend represents But there are indications that the conquest was gradual, and that the displacement of the older population was incomplete. The improbability of the details affords, however, no ground for questioning the reality of the invasion The tradition can be traced back at Sparta to the 7th century B C (Tyrtaeus, quoted by Strabo, p. 362), and there is abundant evidence, other than that of legend, to corroborate it. There is the Dorian name, to begin with. If it originated on the coast of Asia Minor, where it served to distinguish the settlers in Rhodes and the neighbouring islands from the Ionians and Aeolians to the north of them, how came the great and famous states of the Peloponnese to adopt a name in use among the petty colonies planted by their kinsmen across the sea? Or, if Dorian is simply Old Peloponnesian, how are we to account for the Doric dialect or the Dorian pride of race?

There are great differences between the literary Doric, the dialect of Corinth and Argos, and the dialects of Laconia and Crete; there are affinities between the dialect of Laconia and the non-Dorian dialects of Arcadia and Elis But all the Doric dialects are distinguished from all other Greek dialects by certain common characteristics. Perhaps the strongest sentiment in the Dorian nature is the pride of race Indeed, it looks as if the Dorians claimed to be the sole genuine Hellenes. How can we account for an indigenous population, first imagining itself to be immigrant, and then developing a contempt for the rest of the race, equally indigenous with itself, on account of a fictitious difference in origin? Finally, there is the archaeological evidence The older civilization comes to an abrupt end, on the mainland at least, at the very period to which tradition assigns the Dorian migration Its development is greatest, and its overthrow most complete, precisely in the regions occupied by the Dorians and the other tribes, whose migrations were traditionally connected with theirs. It is hardly too much to say that the archaeologist

would have been compelled to postulate an inroad into central and southern Greece of tribes from the north, at a lower level of culture, in the course of the 12th and 11th centuries B C, if the historian had not been able to direct him to the traditions of the great migrations (*metanastaseis*), of which the Dorian invasion was the chief.

With the Dorian migration Greek tradition connected the expansion of the Greek race eastwards across the Aegean In the historical period the Greek settlements on the western coast of Asia Minor fall into three clearly defined groups To the north is the Aeolic group, consisting of the island of Lesbos and twelve towns, mostly insignificant, on the opposite mainland To the south is the Dorian *hexapolis*, consisting of Cnidus and Halicarnassus on the mainland, and the islands of Rhodes and Cos In the centre comes the Ionian *dodecapolis*, a group consisting of ten towns on the mainland, together with the islands of Samos and Chios Of these Greek settlements the Ionian is incomparably the most important The Ionians also occupy Euboea and the Cyclades Although Cyprus (and possibly Pamphylia) had been occupied by settlers from Greece in the Mycenaean age, Greek tradition puts the colonization of Asia Minor and the islands of the Aegean after the Dorian migration Both the Homeric and the archaeological evidence seem to point to the same conclusion Between Rhodes on the south and the Troad on the north scarcely any Mycenaean remains have been found Homer is ignorant of any Greeks east of Euboea If the poems are earlier than the Dorian invasion his silence is conclusive If the poems are some centuries later than the invasion, they at least prove that, within a few generations of that event, it was the belief of the Greeks of Asia Minor that their ancestors had crossed the seas after the close of the Heroic Age It is probable, too, that the names Ionian and Aeolian, the former of which is found once in Homer, and the latter not at all, originated among the colonists in Asia Minor, and served to designate first the members of the Ionic and Aeolic *dodecapoleis* The only Ionia known to history is in Asia Minor It does not follow that Ionia is the original home of the Ionian race It almost certainly follows, however, that it is the original home of the Ionian name

Hellenes.—It is less easy to account for the name *Hellenes* The Greeks were profoundly conscious of their common nationality, and of the gulf that separated them from the rest of mankind They themselves recognized a common race and language, and a common type of religion and culture, as the chief factors in this sentiment of nationality (*see* Herod viii 144) "Hellenes" was the name of their common race, and "Hellas" of their common country In Homer there is no distinct consciousness of a common nationality, and consequently no antithesis of Greek and Barbarian (*see* Thuc i 3) Nor is there a true collective name There are indeed Hellenes (though the name occurs in one passage only, *Iliad* ii 684) and there is a Hellas; but Homer's Hellas, whatever its precise signification may be, is, at any rate, not equivalent either to Greece proper or to the land of the Greeks; his Hellenes are the inhabitants of a small district to the south of Thessaly It is possible that the diffusion of the Hellenic name was due to the Dorian invaders Its use can be traced back to the first half of the 7th century

Monarchy and Oligarchy.—Not less obscure are the causes of the fall of monarchy It cannot have been the immediate effect of the Dorian conquest, for the states founded by the Dorians were at first monarchically governed It may, however, have been an indirect effect of it The power of the Homeric kings is more limited than that of the rulers of Cnossus Tiryns or Mycenae In other words, monarchy is already in decay at the epoch of the invasion The invasion, in its effects on wealth, commerce and civilization, is almost comparable to the irruption of the barbarians into the Roman empire The monarch of the Minoan and Mycenaean Age has extensive revenues at his command, the monarch of the early Dorian states is little better than a petty chief. Thus the interval, once a wide one, that separates him from the nobles, tends to disappear The decay of monarchy was gradual, much more gradual than is generally recognized There were parts of the Greek world in which it still survived in the 6th century, *e g.*, Sparta, Cyrene, Cyprus, and possibly Argos and Tarentum. Both Herodotus and Thucydides apply the title "king" (*basileus*) to the rulers of Thessaly in the 5th century The date at which monarchy gave place to a republican form of government must have differed, and differed widely, in different cases The traditions relating to the foundation of Cyrene assume the existence of monarchy in Thera and in Crete in the middle of the 7th century (Herod iv 150 and 154), and the reign of Amphicrates at Samos (Herod iii. 59) can hardly be placed more than a generation earlier In view of our general ignorance of the history of the 7th and 8th centuries, it is hazardous to pronounce these instances exceptional On the other hand, the change from monarchy to oligarchy was completed at Athens before the end of the 8th century, and at a still earlier date in some of the other states The process, again, by which the change was effected was, in all probability, less uniform than is generally assumed There are very few cases in which we have any trustworthy evidence, and the instances about which we are informed refuse to be reduced to any common type In Greece proper our information is fullest in the case of Athens and Argos In the former case, the king is gradually stripped of his powers by a process of devolution In place of an hereditary king, ruling for life, we find three annual and elective magistrates, between whom are divided the executive, military, and religious functions of the monarch (*see* ARCHON) At Argos the fall of the monarchy is preceded by an aggrandisement of the royal prerogatives There is nothing in common between these two cases, and there is no reason to suppose that the process elsewhere was analogous to that at Athens Everywhere, however, oligarchy is the form of government which succeeds to monarchy Political power is monopolized by a class of nobles, whose claim to govern is based upon birth and the possession of land, the most valuable form of property in an early society Sometimes power is confined to a single clan (*e g*, the Bacchiadae at Corinth), more commonly, as at Athens, all houses that are noble are equally privileged In every case there is found, as the adviser of the executive, a boulē, or council, representative of the privileged class Without such a council a Greek oligarchy is inconceivable The relations of the executive to the council doubtless varied At Athens the real authority was exercised by the archons[1], in many states the magistrates were probably subordinate to the council (*cf* the relation of the consuls to the senate at Rome) And the way in which the oligarchies used their power varied also The cases in which the power was abused are naturally the ones of which we hear, for an abuse of power gave rise to discontent and was the ultimate cause of revolution We hear little or nothing of the cases in which power was exercised wisely Happy is the constitution which has no annals! Oligarchy held its ground for generations, or even for centuries in a large proportion of the Greek states, and a government which, like the oligarchies of Elis, Thebes or Aegina, could maintain itself for three or four centuries cannot have been merely oppressive

Trade.—The period of the transition from monarchy to oligarchy is the period in which commerce begins to develop and trade routes to be organized Greece had been the centre of an active trade in the Minoan and Mycenaean epochs The products of Crete and of the Peloponnese had found their way to Egypt and Asia Minor The overthrow of the older civilization put an end to commerce The seas became insecure and intercourse with the East was interrupted Our earliest glimpses of the Aegean after the period of the migrations disclose the raids of the pirate and the activity of the Phoenician trader With the 8th century trade begins to revive, and the Phoenician retires before his Greek competitor For some time to come, however, no clear distinction is drawn between the trader and the pirate The pioneers of Greek trade in the West are the pirates of Cumae (Thuc vi 4) The rapid development of Greek commerce in the 7th and 6th centuries must have been assisted by the great discovery of the early part of the former century, the invention of coined money

[1] If the account of early Athenian constitutional history given in the *Athenaiōn Politeia* were accepted, it would follow that the archons were inferior in authority to the Eupatrid Boulē, the Areopagus

To the Lydians, rather than the Greeks, belongs the credit of the discovery, but it was the genius of the latter race that divined the importance of the invention and spread its use The coinage of the Ionian towns goes back to the reign of Gyges (*c* 675 B C) And in Ionia commercial development is earliest and greatest In the most distant regions the Ionian is first in the field Egypt and the Black Sea are both opened up to Greek trade by Miletus, the Adriatic and the Western Mediterranean by Phocaea and Samos Of the twelve states engaged in the Egyptian trade in the 6th century all, with the exception of Aegina, are from the eastern side of the Aegean (Herod II 178) On the western side the chief centres of trade during these centuries were the islands of Euboea and Aegina and the town of Corinth The Aeginetan are the earliest coins of Greece proper (*c* 650 B C), and the two rival scales of weights and measures, in use amongst the Greeks of every age, are the Aeginetan and the Euboic Commerce naturally gave rise to commercial leagues, and commercial relations tended to bring about political alliances Foreign policy even at this early epoch seems to have been largely determined by considerations of commerce Two leagues, the members of which were connected by political as well as commercial ties, can be recognized At the head of each stood one of the two rival powers in the island of Euboea, Chalcis and Eretria Their primary object was doubtless protection from the pirate and the foreigner Competing routes were organized at an early date under their influence, and their trading connections can be traced from the heart of Asia Minor to the north of Italy Miletus, Sybaris and Etruria were members of the Eretrian league, Samos, Corinth, Rhegium, Zancle (commanding the Straits of Messina), and Cumae, on the Bay of Naples, of the Chalcidian The wool of the Phrygian uplands, woven in the looms of Miletus, reached the Etruscan markets by way of Sybaris, through Cumae, Rome and the rest of Latium obtained the elements of Greek culture Greek trade, however, was confined to the Mediterranean area The Phoenician and the Carthaginian navigators penetrated to Britain, they discovered the passage round the Cape two thousand years before Vasco da Gama's time The Greek sailor dared not adventure himself outside the Black Sea, the Adriatic and the Mediterranean Greek trade, too, was essentially maritime Ports visited by Greek vessels were often the starting-points of trade routes into the interior, the traffic along those routes was left in the hands of the natives (*see, e g*, Herod IV 24) Geography is the invention of the Greeks The first maps were made by them (in the 6th century), and it was the discoveries and surveys of their sailors that made map-making possible

Colonization.—The period of colonization, in its narrower sense, extends from the middle of the 8th to the middle of the 6th century Greek colonization is, however, merely a continuation of the process which at an earlier epoch had led to the settlement, first of Cyprus, and then of the islands and coasts of the Aegean From the earlier settlements the colonization of the historical period is distinguished by three characteristics. The later colony acknowledges a definite *metropolis* ("mother-city"), it is planted by a definite *oecist* (*oikistēs*); it has a definite date assigned to its foundation[1] It would be a mistake to regard Greek colonization as commercial in origin, in the sense that the colonies were in all cases established as trading-posts This was the case with the Phoenician and Carthaginian settlements, most of which remained mere factories, and some of the Greek colonies (*e g.*, many of those planted by Miletus on the shores of the Black Sea) bore this character The typical Greek colony, however, was neither in origin nor in development a mere trading-post. It was, or it became, a *polis*, a city-state, in which was reproduced the life of the parent state Nor was Greek colonization, like the emigration from Europe to America and Australia in the 19th century, simply the result of over-population The causes were as various as those which can be traced in the history of modern colonization Those which were established for the purposes of trade may be compared to the factories of the Portuguese and Dutch in Africa and the Far East. Others were the result of political discontent, in some form or shape; these may be compared to the Puritan settlements in New England Others again were due to ambition or the mere love of adventure (*see* Herod. V 42, *et seq*, the career of Dorieus). But however various the causes, two conditions must always be presupposed—an expansion of commerce and a growth of population Within the narrow limits of the city-state there was a constant tendency for population to become redundant until, as in the later centuries of Greek life, its growth was artificially restricted Alike from the Roman colonies, and from those founded by the European nations in the course of the last few centuries, the Greek colonies are distinguished by a fundamental contrast. It is significant that the contrast is a political one The Roman colony was in a position of entire subordination to the Roman state, of which it formed a part The modern colony was, in varying degrees, in political subjection to the home government The Greek colony was completely independent from the first The ties that united a colony to its metropolis were those of sentiment and interest; the political tie did not exist There were exceptions The colonies established by imperial Athens closely resembled the colonies of imperial Rome. The cleruchy (*q v*) formed part of the Athenian state, the cleruchs kept their status as citizens of Athens and acted as a military garrison And if the political tie, in the proper sense, was wanting, political relations sprang out of commercial or sentimental ones Thus Corinth interfered twice to save her colony Syracuse from destruction, and Megara brought about the revolt of Byzantium, her colony, from Athens Sometimes it is not easy to distinguish political relations from a political tie (*e g*, the relations of Corinth, both in the Persian and Peloponnesian Wars, to Ambracia and the neighbouring group of colonies) When we compare the development of the Greek and the modern colonies we shall find that the development of the former was even more rapid than that of the latter The differences of race, of colour and of climate, with which the chief problems of modern colonization are connected, played no part in the history of the Greek settlements The races amongst whom the Greeks planted themselves were in some cases on a similar level of culture Where the natives were still backward or barbarous, they came of a stock either closely related to the Greek, or at least separated from it by no great physical differences Amalgamation with the native races was easy, and it involved neither physical nor intellectual degeneracy as its consequence Of the races with which the Greeks came in contact the Thracian was far from the highest in the scale of culture, yet two of the greatest names in the Great Age of Athens are those of men who had Thracian blood in their veins, Cimon and the historian Thucydides In the absence of any distinction of colour, no insuperable barrier existed between the Greek and the hellenized native The *demos* of the colonial cities was largely recruited from the native population[1], nor was there anything in the Greek world analogous to the "poor whites" or the "black belt" Of hardly less importance were the climatic conditions In this respect the Mediterranean area is unique There is no other region of the world of equal extent in which these conditions are at once so uniform and so favourable Nowhere had the Greek settler to encounter a climate which was either unsuited to his labour or subversive of his vigour That in spite of these advantages so little, comparatively speaking, was effected in the work of hellenization before the epoch of Alexander and the Diadochi, was the effect of a single counteracting cause The Greek colonist, like the Greek trader, clung to the shore He penetrated no farther inland than the sea-breeze Hence it was only in islands, such as Sicily or Cyprus, that the process of hellenization was complete.

The Tyrants.—To the 7th century belongs another movement of high importance in its bearing upon the economic, religious and literary development of Greece, as well as upon its constitutional history This movement is the rise of the "tyrannis." In the political writers of a later age the word possesses a clear-cut connotation. From other forms of monarchy it is distinguished

[1]The dates before the middle of the 7th century are in most cases artificial, *e g*, those given by Thucydides (book VI) for the earlier Sicilian settlements *See* J. P. Mahaffy, *Journal of Hellenic Studies*, II 164 ff.

[1]At Syracuse the *demos* makes common cause with the Sicel serf-population against the nobles (Herod VII 155).

GREECE



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by a twofold differentiation The *turannos* is an unconstitutional ruler, and his authority is exercised over unwilling subjects. In the 7th and 6th centuries the line was not drawn so distinctly between the tyrant and the legitimate monarch Even Herodotus uses the words "tyrant" and "king" interchangeably (*e g*, the princes of Cyprus are called "kings" in v 110 and "tyrants" in v 109), so that it is sometimes difficult to decide whether a legitimate monarch or a tyrant is meant (*e g*, Aristophilides of Tarentum, iii 136, or Telys of Sybaris, v 44) But the distinction between the tyrant and the king of the Heroic Age is a valid one It is not true that his rule was always exercised over unwilling subjects, it is true that his position was always unconstitutional The Homeric king is a legitimate monarch; his authority is invested with the sanctions of religion and immemorial custom The tyrant is an illegitimate ruler, his authority is not recognized, either by customary usage or by express enactment But the word "tyrant" was originally a neutral term, it did not necessarily imply a misuse of power The origin of the tyrannis is obscure The word *turannos* has been thought, with some reason, to be Lydian Probably both the name and the thing originated in the Greek colonies of Asia Minor, though the earliest tyrants of whom we hear in Asia Minor (at Ephesus and Miletus) are a generation later than the earliest in Greece itself, where, both at Sicyon and at Corinth, tyranny appears to date back to the second quarter of the 7th century It is not unusual to regard tyranny as a universal stage in the constitutional development of the Greek states and as a stage that occurs everywhere at one and the same period In reality, tyranny is confined to certain regions, and is not a phenomenon peculiar to any one age or century In Greece proper, before the 4th century B C, it is confined to a small group of states round the Corinthian and Saronic Gulfs The greater part of the Peloponnese was exempt from it, and there is no good evidence for its existence north of the Isthmus, except at Megara and Athens It plays no part in the history of the Greek cities in Chalcidice and Thrace It was rare in the Cyclades The regions in which it finds a congenial soil are two, Asia Minor and Sicily Thus it is incorrect to say that most Greek states passed through this stage, or to assume that they passed through it at the same time There is no "Age of the Tyrants" Tyranny began in the Peloponnese a hundred years before it appears in Sicily, and disappeared in the Peloponnese almost before it began in Sicily In the latter the great age of tyranny comes at the beginning of the 5th century, in the former it is at the end of the 7th and the beginning of the 6th At Athens the history of tyranny begins after it has ended both at Sicyon and Corinth There is, indeed, a period in which tyranny is non-existent in the Greek states, roughly speaking, the last sixty years of the 5th century But with this exception, there is no period in which the tyrant is not to be found The greatest of all the tyrannies, that of Dionysius at Syracuse, belongs to the 4th century Nor must it be assumed that tyranny always comes at the same stage in the history of a constitution, that it is always a stage between oligarchy and democracy At Corinth it is followed by oligarchy, that lasts, with a brief interruption, for two hundred and fifty years At Athens it is not immediately preceded by oligarchy Between the Eupatrid oligarchy and the rule of Peisistratus there comes the timocracy of Solon These exceptions do not stand alone The cause of tyranny is, in one sense, uniform In the earlier centuries, at any rate, tyranny is always the expression of discontent, the tyrant is always the champion of a cause But it would be a mistake to suppose that the discontent is necessarily political, or that the cause which he champions is always a constitutional one At Sicyon it is racial Cleisthenes is the champion of the older population against their Dorian oppressors (*see* Herod v 67, 68) At Athens the discontent is economic rather than political, Peisistratus is the champion of the Diacrii, the inhabitants of the poorest region of Attica The party strifes in the early history of Miletus, which doubtless gave the tyrant his opportunity, are concerned with the claims of rival industrial classes In Sicily the tyrant is the ally of the rich and the foe of the *demos*, and the cause which he champions, both in the 5th century and the 4th, is a national one, that of the Greek against the Carthaginian We may suspect that in Greece itself the tyrannies of the 7th century are the expression of an anti-Dorian reaction. It can hardly be an accident that the states in which the tyrannis is found at this epoch, Corinth, Megara, Sicyon, Epidaurus, are all of them states in which a Dorian upper class ruled over a subject population In Asia Minor the tyrannis assumes a peculiar character after the Persian conquest The tyrant rules as the deputy of the Persian satrap Thus in the East the tyrant is the enemy of the national cause, in the West, in Sicily, he is its champion

Tyranny has analogies in Roman history, in the power of Caesar, or of the Caesars; in the despotisms of mediaeval Italy, or even in the Napoleonic empire Between the tyrant and the Italian despot there is indeed a real analogy; but between the Roman principate and the Greek tyrannis there are two essential differences In the first place, the principate was expressed in constitutional forms, or veiled under constitutional fictions, the tyrant stood altogether outside the constitution And, secondly, at Rome both Julius and Augustus owed their position to the power of the sword The power of the sword, it is true, plays a large part in the history of the later tyrants (*e g*, Dionysius of Syracuse), the earlier ones, however, had no mercenary armies at their command We can hardly compare the bodyguard of Peisistratus to the legions of the first or the second Caesar

The view taken of the tyrannis in Greek literature is almost uniformly unfavourable In this respect there is no difference between Plato and Aristotle, or between Herodotus and the later historians (except Thucydides) His policy is represented as purely selfish, and his rule as oppressive Herodotus is influenced partly by the traditions current among the oligarchs, who had been the chief sufferers, and partly by the odious associations which had gathered round tyranny in Asia Minor The philosophers write under their impressions of the later tyrannis, and their account is largely a priori We seldom find any attempt, either in the philosophers or the historians, to do justice to the real services rendered by the tyrants Their first service was constitutional They helped to break down the power of the old aristocratic houses, and thus to create the social and political conditions indispensable to democracy The tyrannis involved the sacrifice of liberty in the cause of equality When tyranny falls, it is never succeeded by the aristocracies which it has overthrown It is frequently succeeded by an oligarchy, in which the claim to exclusive power is based upon wealth, or the possession of land It would be unfair to treat this service as one that was rendered unconsciously and unwillingly Where the tyrant asserted the claims of an oppressed class, he consciously aimed at the destruction of privilege and the effacement of class distinctions Hence it is unjust to treat his power as resting upon mere force A government which can last eighty or a hundred years, as was the case with the tyrannies at Corinth and Sicyon, must have a moral force behind it It must rest upon the consent of its subjects The second service which the tyrants rendered to Greece was political Their policy tended to break down the barriers which isolated each petty state from its neighbours In their history we can trace a system of widespread alliances, which are often cemented by matrimonial connections The Cypselid tyrants of Corinth appear to have been allied with the royal families of Egypt, Lydia and Phrygia, as well as with the tyrants of Miletus and Epidaurus, and with some of the great Athenian families In Sicily we find a league of the northern tyrants opposed to a league of the southern, and in each case there is a corresponding matrimonial alliance Anaxilaus of Rhegium is the son-in-law and ally of Terillus of Himera, Gelon of Syracuse stands in the same relation to Theron of Agrigentum Royal marriages have played a great part in the politics of Europe In the comparison of Greek and modern history it has been too often forgotten how great a difference it makes, and how great a disadvantage it involves, to a republic that it has neither sons nor daughters to give in marriage In commerce and colonization the tyrants continued the work of the oligarchies to which they succeeded Greek trade owed its expansion to the intelligent efforts of the oligarchs who ruled at Miletus and Corinth, in Samos, Aegina and Euboea,

but in Miletus, Corinth, Sicyon and Athens, there was a further development, and a still more rapid growth, under the tyrants In the same way, the foundation of the colonies was in most cases due to the policy of the oligarchical governments They can claim credit for the colonies of Chalcis and Eretria, of Megara, Phocaea and Samos, as well as for the great Achaean settlements in southern Italy The Cypselids at Corinth, and Thrasybulus at Miletus, are instances of tyrants who colonized on a great scale

Religion under the Tyrants.—In their religious policy the tyrants went far to democratize Greek religion The functions of monarchy had been largely religious, but, while the king was necessarily a priest, he was not the only priest in the community There were special priesthoods, hereditary in particular families, even in the monarchial period; and upon the fall of the monarchy, while the priestly functions of the kings passed to republican magistrates, the priesthoods which were in the exclusive possession of the great families tended to become the important ones Thus, before the rise of tyranny, Greek religion is aristocratic The cults recognized by the state are the *sacra* of noble clans The religious prerogatives of the nobles helped to confirm their political ones, and, as long as religion retained its aristocratic character, it was impossible for democracy to take root The policy of the tyrants aimed at fostering popular cults which had no associations with the old families, and at establishing new festivals. The cult of the wine-god, Dionysus, was thus fostered at Sicyon by Cleisthenes, and at Corinth by the Cypselids, while at Athens a new festival of this deity, which so completely overshadowed the older festival that it became known as the Great Dionysia, probably owed its institution to Peisistratus Another festival, the Panathenaea, which had been instituted only a few years before his rise to power, became under his rule, and thanks to his policy, the chief national festival of the Athenian state Everywhere we find the tyrants the patrons of literature Pindar and Bacchylides, Aeschylus and Simonides found a welcome at the court of Hieron Polycrates was the patron of Anacreon, Periander of Arion To Peisistratus has been attributed the first critical edition of the text of Homer, a work as important in the literary history of Greece as was the issue of the Authorized Version of the Bible in English history. To judge fairly of tyranny and of its contributions to the development of Greece, we must remember the states in whose history the period of greatest power coincides with the rule of a tyrant, such as Corinth and Sicyon, Syracuse in the 5th, and again in the 4th century; and probably Samos and Miletus In the case of Athens the splendour of the Great Age blinds us to the greatness of the results achieved by the policy of the Peisistratids

Literature and the Arts.—With the overthrow of this dynasty tyranny disappears from Greece proper for more than a century During the century and a half which had elapsed since its first appearance the whole aspect of Greek life, and of the Greek world, had changed The development was as yet incomplete, but the lines on which it was to proceed had been clearly marked out Political power was no longer the monopoly of a class. The struggle between the "few" and the "many" had begun, in one state at least (Athens) the victory of the "many" was assured The first chapter in the history of democracy was already written In the art of war the two innovations which were ultimately to establish the military supremacy of Greece, hoplite tactics and the trireme, had already been introduced Greek literature was no longer synonymous with epic poetry Some of its most distinctive forms had not yet been evolved, indeed, it is only quite at the end of the period that prose-writing begins, but both lyric and elegiac poetry had been brought to perfection In art, statuary was still comparatively stiff and crude; but in other branches, in architecture, in vase-painting and in coin-types, the aesthetic genius of the race had asserted its pre-eminence Philosophy, the supreme gift of Greece to the modern world, had become a living power Some of her most original thinkers belong to the 6th century. Criticism had been applied to everything in turn. to the gods, to conduct, and to the conception of the universe Before the Great Age begins, the claims of intellectual as well as of political freedom had been vindicated It was not, however, in Greece proper that progress had been greatest. In the next century the centre of gravity of Greek civilization shifts to the western side of the Aegean; in the 6th century it must be looked for at Miletus, rather than at Athens To estimate how far the development of Greece had advanced, or to appreciate the distinctive features of Greek life at this period, we must study Ionia, rather than Attica or the Peloponnese Almost all that is greatest and most characteristic is to be found on the eastern side of the Aegean. The great names in the history of science and philosophy before the beginning of the 5th century—Thales, Pythagoras, Xenophanes, Heracleitus, Parmenides, Anaximander, Hecataeus, names which are representative of mathematics, astronomy, geography, and metaphysics, are all, without exception, Ionian In poetry, too, the most famous names, if not so exclusively Ionian, are connected either with the Asiatic coast or with the Cyclades Against Archilochus and Anacreon, Sappho and Alcaeus, Greece has nothing better to set, after the age of Hesiod, than Tyrtaeus and Theognis Reference has already been made to the greatness of the Ionians as navigators, as colonizers and as traders In wealth and in population, Miletus, at the epoch of the Persian conquest, must have been far ahead of any city of European Greece Sybaris, in Magna Graecia, can have been its only rival outside Ionia There were two respects, however, in which the comparison was in favour of the mother-country In warfare, the superiority of the Spartan infantry was unquestioned; in politics, the Greek states showed a greater power of combination than the Ionian.

(4) THE PERSIAN WARS

Finally, Ionia was the scene of the first conflicts with the Persian Here were decided the first stages of a struggle which was to determine the place of Greece in the history of the world The rise of Persia under Cyrus was the turning-point of Greek history Hitherto the Greek had proved himself indispensable to the oriental monarchies with which he had been brought into contact In Egypt the power of the Saite kings rested upon the support of their Greek mercenaries Amasis (569–525 B C), who is raised to the throne as the leader of a reaction against the influence of the foreign garrison, ends by showing greater favour to the Greek soldiery and the Greek traders than all that were before him With Lydia the relations were originally hostile, the conquest of the Greek fringe is the constant aim of Lydian policy Greek influences, however, seem to have quickly permeated Lydia, and to have penetrated to the court Alyattes (610–560 B C) marries an Ionian wife, and the succession is disputed between the son of this marriage and Croesus, whose mother was a Carian Croesus (560–546 B C) secures the throne, only to become the lavish patron of Greek sanctuaries and the ally of a Greek state The history of Hellenism (*i e*, of the diffusion of Greek civilization in non-Hellenic states) had begun The rise of Cyrus closed the East to Greek enterprise and Greek influences. In Persia we find the antithesis of all that is characteristic of Greece—autocracy as opposed to liberty, a military society organized on an aristocratic basis, to an industrial society, animated by a democratic spirit; an army, whose strength lay in its cavalry, to an army, in which the foot-soldier alone counted; a morality, which assigned the chief place to veracity, to a morality which subordinated it to other virtues, a religion, which ranks among the great religions of the world, to a religion, which appeared to the most spiritual minds among the Greeks themselves both immoral and absurd Between two such races there could be neither sympathy nor mutual understanding In the Great Age the Greek had learned to despise the Persian, and the Persian to fear the Greek In the 6th century it was the Persian who despised, and the Greek who feared The history of the conflicts between the Ionian Greeks and the Persian empire affords a striking example of the combination of intellectual strength and political weakness in the character of a people The causes of the failure of the Ionians to offer a successful resistance to Persia, both at the time of the conquest by Harpagus (546–545 B C) and in the Ionic revolt (499–494 B C), are not far to seek The centrifugal forces always tended to prove the stronger in the Greek system, and

nowhere were they stronger than in Ionia. The tie of their tribal union proved weaker, every time it was put to the test, than the political and commercial interests of the individual states. A league of jealous commercial rivals is certain not to stand the strain of a protracted struggle against great odds Against the advancing power of Lydia a common resistance had not so much as been attempted Miletus, the greatest of the Ionian towns, had received aid from Chios alone. Against Persia a common resistance was attempted The Panionium, the centre of a religious amphictyony (*see* AMPHICTYONY), became for the moment the centre of a political league. At the time of the Persian conquest Miletus held aloof. She secured favourable terms for herself, and left the rest of Ionia to its fate. In the later conflict, on the contrary, Miletus is the leader in the revolt The issue was determined by the selfish policy of the leading states In the sea-fight at Lade (494 B C) the decisive battle of the war, the Milesians and Chians fought with desperate courage The day was lost thanks to the treachery of the Samian and Lesbian contingents.

The causes of the successful resistance of the Greeks to the invasions of their country, first by Datis and Artaphernes (490 B C), in the reign of Darius, and then by Xerxes in person (480–479 B.C), are more complex Their success was partly due to a moral cause And this was realized by the Greeks themselves. They felt (*see* Herod vii 104) that the subjects of a despot are no match for the citizens of a free state, who yield obedience to a law which is self-imposed But the cause was not solely a moral one Nor was the result due to the numbers and efficiency of the Athenian fleet, in the degree that the Athenians claimed (*see* Herod vii 139) The truth is that the conditions, both political and military, were far more favourable to the Greek defence in Europe than they had been in Asia. (*See* GRAECO-PERSIAN WARS.)

(5) THE GREAT AGE

The effects of the repulse of Persia were momentous in their influence upon Greece The effects upon Elizabethan England of the defeat of the Spanish Armada would afford quite an inadequate parallel It gave the Greeks a heightened sense, both of their own national unity and of their superiority to the barbarian, while at the same time it helped to create the material conditions requisite alike for the artistic and political development of the 5th century Other cities besides Athens were adorned with the proceeds of the spoils won from Persia, and Greek trade benefited both from the reunion of Ionia with Greece, and from the suppression of piracy in the Aegean and the Hellespont Do these developments justify us in giving to the period, which begins with the repulse of Xerxes, and ends with the victory of Philip, the title of "the Great Age"? If the title is justified in the case of the 5th century, should the 4th century be excluded from the period? At first sight, the difference between the 4th century and the 5th may seem greater than that which exists between the 5th and the 6th On the political side, the 5th century is an age of growth, the 4th an age of decay, on the literary side, the former is an age of poetry, the latter an age of prose In spite of these contrasts, there is a real unity in the period which begins with the repulse of Xerxes and ends with the death of Alexander It is an age of maturity in politics, in literature, and in art; and this is true of no earlier age Nor can we say that the 5th century is, in all these aspects of Greek life, immature as compared with the 4th, or, on the other hand, that the 4th is decadent as compared with the 5th On the political side, maturity is, in one sense, reached in the earlier century There is nothing in the later century so great as the Athenian Empire In another sense, maturity is not reached till the 4th century It is only in the later century that the tendency of the Greek constitutions to conform to a common type, democracy, is (at least approximately) realized, and it is only in this century that the principles upon which democracy is based are carried to their logical conclusion In literature, if we confine our attention to poetry, we must pronounce the 5th century the age of completed development, but in prose it is different The style even of Thucydides is immature, as compared with that of Isocrates and Plato In philosophy, however high may be the estimate that is formed of the genius of the earlier thinkers, it cannot be disputed that in Plato and Aristotle we find a more mature stage of thought In art, architecture may perhaps be said to reach its zenith in the 5th, sculpture in the 4th century

Systems of Government.—In its political aspect, the history of the Great Age resolves itself into the history of two movements, the imperial and the democratic. Hitherto Greece had meant, politically, an aggregate of independent states, very numerous, and, as a rule, very small The principle of autonomy was to the Greek the most sacred of all political principles; the passion for autonomy the most potent of political factors In the latter half of the 6th century Sparta had succeeded in combining the majority of the Peloponnesian states into a loose federal union; so loose, however, that it appears to have been dormant in the intervals of peace In the crisis of the Persian invasion the Peloponnesian League was extended so as to include all the states which had espoused the national cause It looked on the morrow of Plataea (*q v*) and Mycale (the two victories, won simultaneously, in 479 B C , by Spartan commanders, by which the danger from Persia was finally averted) as if a permanent basis for union might be found in the hegemony of Sparta The sense of a common peril and a common triumph brought with it the need of a common union; it was Athens, however, instead of Sparta, by whom the first conscious effort was made to transcend the isolation of the Greek political system and to bring the units into combination The league thus founded—the Delian League (*q v*) established in 477 B C —was under the presidency of Athens, but it included hardly any other state amongst those that had conducted the defence of Greece It was formed, almost entirely, of the states which had been liberated from Persian rule by the great victories of the war The Delian League, even in the form in which it was first established, as a confederation of autonomous allies, marks an advance in political conceptions upon the Peloponnesian League Provision is made for an annual revenue, for periodical meetings of the council, and for a permanent executive It is a real, though imperfect, federation There were defects in its constitution which rendered it inevitable that it should be transformed into an empire Athens was from the first "the predominant partner" The fleet was mainly Athenian, the commanders entirely so, the assessment of the tribute was in Athenian hands, there was no federal court appointed to determine questions at issue between Athens and the other members; and, worst omission of all, the right of secession was left undecided By the middle of the century the Delian League has become the Athenian empire Henceforward the imperial idea, in one form or another, dominates Greek politics Athens failed to extend her authority over the whole of Greece Her empire was overthrown, but the triumph of autonomy proved the triumph of imperialism The Spartan empire succeeds to the Athenian, and, when it is finally shattered at Leuctra (371 B C), the hegemony of Thebes, which is established on its ruins, is an empire in all but name The decay of Theban power paves the way for the rise of Macedon

Thus throughout this period we can trace two forces contending for mastery in the Greek political system Two causes divide the allegiance of the Greek world, the cause of empire and the cause of autonomy The formation of the Delian League did not involve the dissolution of the alliance between Athens and Sparta. For seventeen years more Athens retained her place in the league, "which had been established against the Mede" under the presidency of Sparta in 480 B C (Thuc i 102) The ascendancy of Cimon and the Philolaconian party at Athens was favourable to a good understanding between the two states, and at Sparta in normal times the balance inclined in favour of the party whose policy is best described by the motto "quieta non movere"

The Peloponnesian War.—In the end, however, the opposition of the two contending forces proved too strong for Spartan neutrality The fall of Cimon (461 B C) was followed by the so-called "First Peloponnesian War," a conflict between Athens and her maritime rivals, Corinth and Aegina, into which Sparta was ultimately drawn Thucydides regards the

hostilities of these years (460–454 B.C.), which were resumed for a few months in 446 B C, on the expiration of the Five Years' Truce, as preliminary to those of the great Peloponnesian War (*q.v.*), 431–404 B C The real question at issue was in both cases the same The tie that united the opponents of Athens was found in a common hostility to the imperial idea It is a complete misapprehension to regard the Peloponnesian War as a mere duel between two rival claimants for empire The ultimatum presented by Sparta on the eve of the war demanded the restoration of autonomy to the subjects of Athens There is no reason for doubting her sincerity in presenting it in this form It would, however, be an equal misapprehension to regard the war as merely a struggle between the cause of empire and the cause of autonomy Corresponding to this fundamental contrast there are other contrasts, constitutional, racial and military The military interest of the war is largely due to the fact that Athens was a sea power and Sparta a land one As the war went on, the constitutional aspect tended to become more marked. At first there were democracies on the side of Sparta, and oligarchies on the side of Athens In the last stage of the war, when Lysander's influence was supreme, we see the forces of oligarchy everywhere united and organized for the destruction of democracy In its origin the war was certainly not due to the rivalry of Dorian and Ionian. This racial, or tribal, contrast counted for more in the politics of Sicily than of Greece, and, though the two great branches of the Greek race were represented respectively by the leaders of the two sides, the allies on neither side belonged exclusively to the one branch or the other Still, it remains true that the Dorian states were, as a rule, on the Spartan side, and the Ionian states, as a rule, on the Athenian—a division of sentiment which must have helped to widen the breach and to intensify the animosities

The Athenian Empire.—As a political experiment the Athenian empire possesses a unique interest It represents the first attempt to fuse the principles of imperialism and democracy. It is at once the first empire in history possessed and administered by a sovereign people, and the first which sought to establish a common system of democratic institutions amongst its subjects[1]. The experiment failed, partly owing to the inherent strength of the oligarchic cause, partly owing to the exclusive character of ancient citizenship

The Athenians themselves recognized that their empire depended for its existence upon the solidarity of democratic interests (*see* Thuc iii 47; Ps.-Xen, *de Rep Ath* i 14, iii 10) An understanding existed between the democratic leaders in the subject-states and the democratic party at Athens Charges were easily trumped up against obnoxious oligarchs, and conviction as easily obtained in the Athenian courts of law Such a system forced the oligarchs into an attitude of opposition How much this opposition counted for was realized when the Sicilian disaster (413 B C) gave the subjects their chance to revolt The organization of the oligarchical party throughout the empire, which was effected by Lysander in the last stage of the war, contributed to the overthrow of Athenian ascendancy hardly less than the subsidies of Persia Had Athens aimed at establishing a community of interest between herself and her subjects, based upon a common citizenship, her empire might have endured It would have been a policy akin to that which secured the permanence of the Roman empire. And it was a policy which found advocates when the day for it was past (*see* Aristophanes, *Lysistrata*, 574, *et seq*; *cf* the grant of citizenship to the Samians after Aegospotami, *Inscr, Gr* ii 5 1b) But the policy pursued by Athens in the plenitude of her power was the reverse of the policy pursued by Rome in her treatment of the franchise It is hardly an exaggeration to say that the fate of the empire was sealed by the law of Pericles (451 B.C.), by which the franchise was restricted to those who could establish Athenian descent on both sides It was not merely that the process of amalgamation through intermarriage was abruptly checked; what was more serious was that a hard and fast line was drawn, once and for all, between the small body of privileged rulers and the great mass of unprivileged subjects. Maine (*Early Institutions*, lecture 13) has classed the Athenian empire with those of the familiar Oriental type, which attempt nothing beyond the raising of taxes and the levying of troops. The Athenian empire cannot, indeed, be classed with the Roman, or with the British rule in India; it does not, however, deserve to be classed with the empires of Cyrus or of Jenghiz Khan Though the basis of its organization, like that of the Persian empire under Darius, was financial, it attempted, and secured, objects beyond the mere payment of tribute and the supply of ships If Athens did not introduce a common religion, or a common system of education, or a common citizenship, she did introduce a common type of political institutions, and a common jurisdiction[1] She went some way, too, in the direction of establishing a common system of coins and of weights and measures A common language was there already In a word, the Athenian empire marks a definite stage of political evolution

The Mature Democracy.—The other great political movement of the age was the progress of democracy. Before the Persian invasion democracy was a rare phenomenon in Greek politics Where it was found it existed in an undeveloped form, and its tenure of power was precarious By the beginning of the Peloponnesian War it had become the prevalent form of government The great majority of Greek states had adopted democratic constitutions Both in the Athenian sphere of influence and in the colonial world outside that sphere, democracy was all but the only form of constitution known It was only in Greece proper that oligarchy held its own In the Peloponnese it could count a majority of the states; in northern Greece at least a half of them The spread of democratic institutions was arrested by the victory of Sparta in the East, and the rise of Dionysius in the West There was a moment at the end of the 5th century when it looked as if democracy was a lost cause. Even Athens was for a brief period under the rule of the Thirty (404–403 B C) In the regions which had formed the empire of Athens the decarchies set up by Lysander were soon overthrown, and democracies restored in most cases, but oligarchy continued to be the prevalent form in Greece proper until Leuctra (371 B C), and in Sicily tyranny had a still longer tenure of power By the end of the Great Age oligarchy has almost disappeared from the Greek world, except in the sphere of Persian influence. The Spartan monarchy still survives, a few Peloponnesian states still maintain the rule of the few, here and there in Greece itself we meet with a revival of the tyrannis, but, with these exceptions, democracy is everywhere the only type of constitution And democracy has developed as well as spread At the end of the 5th century the constitution of Cleisthenes, which was a democracy in the view of his contemporaries, had come to be regarded as an aristocracy (Aristot *Ath Pol* 29 3) We can trace a similar change of sentiment in Sicily As compared with the extreme form of constitution adopted at Syracuse after the defeat of the Athenian expedition, the democracies established two generations earlier, on the fall of the tyrannis, appeared oligarchical. The changes by which the character of the Greek democracies was revolutionized were four in number. the substitution of the lot for election, the abolition of a property qualification, the payment of officials and the rise of a class of professional politicians. In the democracy of Cleisthenes no payment was given for service, whether as a magistrate, a juror or a member of the boulē. The higher magistracies were filled by election, and they were held almost exclusively by the members of the great Athenian families For the highest office of all, the archonship, none but *Pentakosiomedimnoi* (the first of the four Solonian classes) were eligible. The introduction of pay and the removal of the property qualification formed part of the reforms of

[1] It has been denied by some writers (*e g.*, by A. H J. Greenidge) that Athens interfered with the constitutions of the subject-states For the view put forward in the text, the following passages may be quoted: Aristotle, *Politics* 1307 b 20; Isocrates, *Panegyricus*, 105, 106, *Panathenaicus*, 54 and 68; Xenophon, *Hellenica*, iii. 4.7; Ps.-Xen. *Athen. Constit.* i. 14, iii. 10.

[1] The evidence seems to indicate that all the more important criminal cases throughout the empire were tried in the Athenian courts In civil cases Athens secured to the citizens of the subject-states the right of suing Athenian citizens, as well as citizens of other subject-states.

Pericles. The lot had been substituted for election a generation earlier (487 B C)[1]. What is perhaps the most important of all these changes, the rise of the demagogues, belongs to the era of the Peloponnesian War. From the time of Cleisthenes to the outbreak of the war every statesman of note at Athens, with the exception of Themistocles (and, perhaps, of Ephialtes), is of aristocratic birth Down to the fall of Cimon the course of Athenian politics is to a great extent determined by the alliances and antipathies of the great clans. With the Peloponnesian War a new epoch begins. The chief office, the *strategia,* is still as a rule held by men of rank. But leadership in the ecclesia has passed to men of a different class The demagogues were not necessarily poor men Cleon was a wealthy man, Eucrates, Lysicles and Hyperbolus were, at any rate, tradesmen rather than artisans The first "labour member" proper is Cleophon (411–404 B C), a lyre-maker They belonged, however, not to the land-owning, but to the industrial classes, they were distinguished from the older race of party-leaders by a vulgar accent, and by a violence of gesture in public speaking, and they found their supporters among the population of the city and its port, the Peiraeus, rather than among the farmers of the country districts In the 4th century the demagogues, though under another name, that of orators, have acquired entire control of the ecclesia. It is an age of professionalism, and the professional soldier has his counterpart in the professional politician Down to the death of Pericles the party-leader had always held office as *strategos* His rival, Thucydides, son of Melesias, forms a solitary exception to this statement In the 4th century the divorce between the general and the statesman is complete The generals are professional soldiers, who aspire to no political influence in the state, and the statesmen devote themselves exclusively to politics, a career for which they have prepared themselves by a professional training in oratory or administrative work The ruin of agriculture during the war had reduced the old families to insignificance Birth counts for less than nothing as a political asset in the age of Demosthenes

The City State.—But great as are the contrasts which have been pointed out between the earlier and the later democracy, those that distinguish the ancient conception of democracy from the modern are of a still more essential nature The differences that distinguish the democracies of ancient Greece from those of the modern world have their origin, to a great extent, in the difference between a city-state and a nation-state Many of the most famous Greek states had an area of a few square miles, the largest of them was no larger than an English county Political theory put the limit of the citizen-body at 10,000 Though this number was exceeded in a few cases, it is doubtful if any state, except Athens, ever counted more than 20,000 citizens In the nation-states of modern times, democratic government is possible only under the form of a representative system, in the city-state representative government was unnecessary, and therefore unknown In the ancient type of democracy a popular chamber has no existence The ecclesia is not a chamber in any sense of the term, it is an assembly of the whole people, which every citizen is entitled to attend, and in which every one is equally entitled to vote and speak The question raised in modern political science, as to whether sovereignty resides in the electors or their representatives, has thus neither place nor meaning in ancient theory In the same way, one of the most familiar results of modern analysis, the distinction between the executive and the legislative, finds no recognition in the Greek writers In a direct system of government there can be no executive in the proper sense Executive functions are discharged by the ecclesia, to whose decision the details of administration may be referred The position of the *strategoi,* the chief officials in the Athenian democracy of the 5th century, was in no sense comparable to that of a modern cabinet Hence the individual citizen in an ancient democracy was concerned in, and responsible for, the actual work of government to a degree that is inconceivable in a modern state Thus participation in the administrative and judicial business of the state is made by Aristotle the criterion of the citizen (πολίτης ἐστὶν ὁ μετέχων κρίσεως καὶ ἀρχῆς, Aristot. *Politics,* p 1275 a 20) A large proportion of the citizens of Athens, in addition to frequent service in the courts of law, must in the course of their lives have held a magistracy, great or small, or have acted for a year or two as members of the boulē[1] There was nothing corresponding to a permanent civil service in the ancient state Much of the work of a government office would have been transacted by the Athenian boulē Political and administrative questions of great importance came before the popular courts of law Hence the ordinary citizen of an ancient democracy, in the course of his service in the boulē or the law-courts, acquired an interest in political questions, and a grasp of administrative work, which none but a select few can hope to acquire under the conditions of the modern system Where there existed neither a popular chamber nor a distinct executive, there was no opportunity for the growth of a party-system There were, of course, political parties at Athens and elsewhere—oligarchs and democrats, conservatives and radicals, a peace-party and a war-party, according to the burning question of the day. There was, however, nothing equivalent to a general election, to a cabinet (or to that collective responsibility which is of the essence of a cabinet), or to the government and the opposition Party organization, therefore, and a party system, in the proper sense, were never developed The evils incident to the ancient form of democracy do not include the "boss," the caucus and the spoils-system

Ancient Democracy and Privilege.—Besides these differences, which, directly or indirectly, result from the difference of scale, there are others, hardly less profound, which are not connected with the size of the city-state Perhaps the most striking contrast between the democracies of ancient and of modern times is to be found in their attitude towards privilege Ancient democracy implies privilege, modern democracy implies its destruction In the more fully developed democracies of the modern world (*e g*, in the United States, or in Australia), the privilege of class is unknown, in many of them even the privilege of sex has been abolished Ancient democracy was bound up with privilege as much as oligarchy was The transition from the latter to the former was effected by enlarging the area of privilege and by altering its basis In an oligarchical state citizenship might be confined to 10% of the free population, under a democracy 50% might enjoy it In the former case the qualification might be wealth or land, in the latter case it might be, as it was at Athens, birth, *i e*, descent, on both sides, from a citizen family But, in both cases alike, the distinction between a privileged and an unprivileged body of free-born residents is fundamental To the unprivileged class belonged, not only foreigners temporarily resident (*xenoi*) and aliens permanently domiciled (*metoikoi*), but also those native-born inhabitants of the state who were of foreign extraction, on one side or the other[2] The privileges attaching to citizenship included, in addition to eligibility for office and a vote in the assembly, such private rights as that of owning land or a house, or of contracting a marriage with one of citizen status The citizen, too, was alone the recipient of all the various forms of pay (*e g*, for attendance in the assembly, for service in the boulē or the law-courts, or for the celebration of the great festivals) which are so conspicuous a feature in the developed democracy of the 4th century The *metoikoi* could not even plead in a court of law in person, but only through a patron (προστάτης). It is intelligible that privileges so great should be jealously guarded In the democracies of the modern world naturalization is comparatively easy, in those of ancient Greece admission to the franchise was rarely accorded In modern times, again, we are accustomed to connect democracy with the emancipation of women It is true that not all democratic constitutions grant them the suffrage, but although they may be denied public

[1]After this date, and partly in consequence of the change, the archonship, to which the lot was applied, loses its importance. The *strategoi* (generals) become the chief executive officials As the lot was never substituted for election in their case, the change had less practical meaning than might appear at first sight. (*See* ARCHON; STRATEGUS)

[1]For an estimate of the numbers annually engaged in the service of Athens, *see* Aristot *Ath Pol* 24 3

[2]Foreign is not used here as equivalent to non-Hellenic. It means "belonging to another state, whether Greek or barbarian"

rights, the growth of popular government has been almost everywhere accompanied by an extension of their private rights, and by the removal of the restrictions imposed by law, custom or public opinion upon their freedom of action. In ancient Greece the democracies were as illiberal in their policy as the oligarchies. Women of the respectable class were condemned to comparative seclusion They enjoyed far less freedom in 4th-century Athens than in the Homeric Age It is not in any of the democracies, but in conservative Sparta that they possess privilege and exercise influence.

Slavery.—The most fundamental of all the contrasts between democracy in its ancient and in its modern form remains to be stated. The ancient state was inseparable from slavery In this respect there was no difference between democracy and the other forms of government. No inconsistency was felt, therefore, between this institution and the democratic principle Modern political theory has been profoundly affected by the conception of the dignity of labour; ancient political theory tended to regard labour as a disqualification for the exercise of political rights Where slavery exists, the taint of it will inevitably cling to all labour that can be performed by the slave In ancient Athens (which may be taken as typical of the Greek democracies) unskilled labour was almost entirely slave-labour, and skilled labour was largely so The arts and crafts were, to some extent, exercised by citizens, but to a less extent in the 4th than in the 6th century. They were, however, chiefly left to aliens or slaves The citizen-body of Athens in the age of Demosthenes has been stigmatized as consisting in great measure of salaried paupers There is, doubtless, an exaggeration in this It is, however, true, both that the system of state-pay went a long way towards supplying the simple wants of a southern population, and that a large proportion of the citizens had time to spare for the service of the state. Had the life of the lower class of citizens been absorbed in a round of mechanical labours, as fully as is the life of our industrial classes, the working of an ancient democracy would have been impossible In justice to the ancient democracies it must be conceded that, while popular government carried with it neither the enfranchisement of the alien nor the emancipation of the slave, the rights secured to both classes were more considerable in the democratic states than elsewhere The lot of the slave, as well as that of the alien, was a peculiarly favourable one at Athens. The pseudo-Xenophon in the 5th century (*De rep Ath* i. 10–12) and Plato in the 4th (*Republic*, p 563 B), prove that the spirit of liberty with which Athenian life was permeated, was not without its influence upon the position of these classes When we read that critics complained of the opulence of slaves, and of the liberties they took, and when we are told that the slave could not be distinguished from the poorer class of citizens either by his dress or his look, we begin to realize the difference between the slavery of ancient Athens and the system as it was worked on the Roman *latifundia* or the plantations of the New World

The Spartan Empire.—It had been anticipated that the fall of Athens would mean the triumph of the principle of autonomy If Athens had surrendered within a year or so of the Sicilian catastrophe, this anticipation would probably have been fulfilled It was the last phase of the struggle (412–404 B.C.) that rendered a Spartan empire inevitable The oligarchical governments established by Lysander recognized that their tenure of power was dependent upon Spartan support, while Lysander himself, to whose genius, as a political organizer not less than as a commander, the triumph of Sparta was due, was unwilling to see his work undone. The Athenian empire had never included the greater part of Greece proper; since the Thirty Years' Peace its possessions on the mainland, outside the boundaries of Attica, were limited to Naupactus and Plataea Sparta, on the other hand, attempted the control of the entire Greek world east of the Adriatic Athens had been compelled to acknowledge a dual system; Sparta sought to establish uniformity The attempt failed from the first. Within a year of the surrender of Athens, Thebes and Corinth had drifted into an attitude of opposition, while Argos remained hostile It was not long before the policy of Lysander succeeded in uniting against Sparta the very forces upon which she had relied when she entered on the Peloponnesian War The Corinthian War (394–387 B.C.) was brought about by the alliance of all the second-class powers—Thebes, Athens, Corinth, Argos—against the one first-class power, Sparta Though Sparta emerged successful from the war, it was with the loss of her maritime empire, and at the cost of recognizing the principle of autonomy as the basis of the Greek political system. It was already evident, thus early in the century, that the centrifugal forces were to prove stronger than the centripetal Two further causes may be indicated which help to explain the failure of the Spartan Empire. In the first place Spartan sea-power was an artificial creation History seems to show that it is idle for a state to aspire to naval supremacy unless it possesses a great commercial marine Athens had possessed such a marine; her naval supremacy was due not to the mere size of her fleet, but to the numbers and skill of her seafaring population. Sparta had no commerce. She could build fleets more easily than she could man them A single defeat (at Cnidus, 394 B.C.) sufficed for the ruin of her sea-power The second cause is to be found in the financial weakness of the Spartan state The Spartan treasury had been temporarily enriched by the spoils of the Peloponnesian War, but neither during that war, nor afterwards, did Sparta succeed in developing any scientific financial system Athens was the only state which either possessed a large annual revenue or accumulated a considerable reserve Under the conditions of Greek warfare, fleets were more expensive than armies. Not only was money needed for the building and maintenance of the ships, but the sailor must be paid, while the soldiers served for nothing. Hence the power with the longest purse could both build the largest fleet and attract the most skilful seamen

The Theban Hegemony.—The battle of Leuctra transferred the hegemony from Sparta to Thebes, but the attempt to unite Greece under the leadership of Thebes was from the first doomed to failure. The conditions were less favourable to Thebes than they had been to Athens or Sparta Thebes was even more exclusively a land-power than Sparta She had no revenue comparable to that of Athens in the preceding century. Unlike Athens and Sparta, she had not the advantage of being identified with a political cause As the enemy of Athens in the 5th century, she was on the side of oligarchy, as the rival of Sparta in the 4th, she was on the side of democracy, but in her bid for primacy she could not appeal, as Athens and Sparta could, to a great political tradition, nor had she behind her, as they had, the moral force of a great political principle Her position, too, in Boeotia itself was insecure. The rise of Athens was in great measure the result of the *synoecism* (συνοικισμός) of Attica. All inhabitants of Attica were Athenians But "Boeotian" and "Theban" were not synonymous terms The Boeotian league was an imperfect form of union, as compared with the Athenian state, and the claim of Thebes to the presidency of the league was, at best, sullenly acquiesced in by the other towns The destruction of some of the most famous of the Boeotian cities, however necessary it may have been in order to unite the country, was a measure which at once impaired the resources of Thebes and outraged Greek sentiment It has been often held that the failure of Theban policy was due to the death of Epameinondas (at the battle of Mantineia, 362 B.C.) For this view there is no justification His policy had proved a failure before his death Where it harmonized with the spirit of the age, the spirit of dissidence, it succeeded; where it attempted to run counter to it, it failed It succeeded in destroying the supremacy of Sparta in the Peloponnese; it failed to unite the Peloponnese on a new basis It failed still more signally to unite Greece north of the Isthmus It left Greece weaker and more divided than it found it (*see* the concluding words of Xenophon's *Hellenica*). It would be difficult to overestimate the importance of his policy as a destructive force, as a constructive force it effected nothing[1] The Peloponnesian system which Epameinondas overthrew had lasted two hundred years. Under Spartan leadership the Peloponnese had enjoyed almost complete immunity from invasion and compar-

[1] It failed even to create a united Arcadia or a strong Messenia.

ative immunity from *stasis* (faction) The claim that Isocrates makes for Sparta is probably well-founded (*Archidamus*, 64–69; during the period of Spartan ascendancy the Peloponnesians were "the happiest of the Greeks") Peloponnesian sentiment had been one of the chief factors in Greek politics; to it, indeed, in no small degree was due the victory over Persia. The Theban victory at Leuctra destroyed the unity, and with it the peace and the prosperity, of the Peloponnese It inaugurated a period of misery, the natural result of civil strife and invasion, to which no parallel can be found in the earlier history (*see* Isocrates, *Archidamus*, 65, 66). It destroyed, too, the Peloponnesian sentiment of hostility to the invader. The bulk of the army that defeated Mardonius at Plataea came from the Peloponnese, at Chaeronea no Peloponnesian state was represented

(6) THE RISE OF MACEDON AND ALEXANDER THE GREAT

The question remains, Why did the city-state fail to save Greece from conquest by Macedon? Was this result due to the inherent weakness either of the city-state itself, or of one particular form of it, democracy? It is clear, in any case, that the triumph of Macedon was the effect of causes which had long been at work If neither Philip nor Alexander had appeared on the scene, Greece might have maintained her independence for another generation or two; but, when invasion came, it would have found her weaker and more distracted, and the conquerors might easily have been less imbued with the Greek spirit, and less sympathetic to Greek ideals, than the great Macedonian and his son These causes are to be found in the tendencies of the age, political, economic and moral Of the two movements which characterized the Great Age in its political aspect, the imperial and the democratic, the one failed and the other succeeded The failure and the success were equally fatal to the chances of Greece in the conflict with Macedon By the middle of the 4th century Greek politics had come to be dominated by the theory of the balance of power This theory, enunciated in its coarsest form by Demosthenes, had shaped the foreign policy of Athens since the end of the Peloponnesian War As long as Sparta was the stronger, Athens inclined to a Theban alliance, after Leuctra she tended in the direction of a Spartan one At the epoch of Philip's accession the forces were everywhere nicely balanced The Peloponnese was fairly equally divided between the Theban and the Spartan interests, and central Greece was similarly divided between the Theban and the Athenian Farther north we get an Athenian party opposed to an Olynthian in Chalcidice, and a republican party, dependent upon the support of Thebes, opposed to that of the tyrants in Thessaly Thus the political conditions of Greece, both in the north and in the south, invited interference from without And the triumph of democracy in its extreme form was ruinous to the military efficiency of Greece. On the one side there was a monarchical state, in which all powers, civil as well as military, were concentrated in the hands of a single ruler; on the other, a constitutional system, in which a complete separation had been effected between the responsibility of the statesman and that of the commander

The Causes of Decline.—It could not be doubtful with which side the victory would rest The cause which Aristotle assigns for the decay of the Spartan state—a declining population (see *Politics*, p. 1270 a)—might be extended to the Greek world generally The loss of population was partly the result of war and civil strife—Isocrates speaks of the number of political exiles from the various states as enormous—but it was also due to a declining birth-rate, and to the exposure of infants Aristotle, while condemning exposure, sanctions the procuring of abortion (*Politics*, 1335 b). It is probable that both ante-natal and post-natal infanticide were rife everywhere, except among the more backward communities. The materials for forming a trustworthy estimate of the population of Greece at any given epoch are not available; there is evidence to prove that the military population of the leading Greek states at the era of the battle of Chaeronea (338 B C) fell far short of what it had been at the beginning of the Peloponnesian War The decline in population had been accompanied by a decline in wealth, both public and private; and while revenues had shrunk, expenditure had grown It was a century of warfare; and warfare had become enormously more expensive, partly through the increased employment of mercenaries, partly through the enhanced cost of material The power of the purse had made itself felt even in the 5th century; Persian gold had helped to decide the issue of the great war. In the politics of the 4th century the power of the purse becomes the determining factor The public finance of the ancient world was singularly simple in character, and the expedients for raising a revenue were comparatively few The distinction between direct and indirect taxation was recognized in practice, but states as a rule were reluctant to submit to the former system The revenue of Athens in the 5th century was mainly derived from the tribute paid by her subjects; it was only in time of war that a direct tax was levied upon the citizen-body In the age of Demosthenes the revenue derived from the Athenian Confederacy was insignificant The whole burden of the expenses of a war fell upon the 1,200 richest citizens, who were subject to direct taxation in the dual form of the *Trierarchy* and the *Eisphora* (property-tax) The revenue thus raised was wholly insufficient for an effort on a great scale; yet the revenues of Athens at this period must have exceeded those of any other state

Venality and Corruption.—The economic history of Greece is discussed in a subsequent article But it is to moral rather than to political or economic causes that the failure of Greece in the conflict with Macedon is attributed by the most famous Greek statesmen of that age Demosthenes is never weary of insisting upon the decay of patriotism among the citizens and upon the decay of probity among their leaders Venality had always been the besetting sin of Greek statesmen Pericles' boast as to his own incorruptibility (Thuc II. 60) is significant as to the reputation of his contemporaries In the age of Demosthenes the level of public life in this respect had sunk at least as low as that which prevails in many states of the modern world Corruption was certainly not confined to the Macedonian party. The best that can be said in defence of the patriots, as well as of their opponents, is that they honestly believed that the policy which they were bribed to advocate was the best for their country's interests The evidence for the general decay of patriotism among the mass of the citizens is less conclusive The battle of Megalopolis (331 B C), in which the Spartan soldiery "went down in a blaze of glory," proves that the spirit of the Lacedaemonian state remained unchanged But at Athens it seemed to contemporary observers—to Isocrates equally with Demosthenes—that the spirit of the great days was extinct (*see* Isocr *On the Peace*, 47 48) It cannot, of course, be denied that public opinion was obstinately opposed to the diversion of the Theoric Fund to the purposes of the war with Philip It was not till the year before Chaeroneia that Demosthenes succeeded in persuading the assembly to devote the entire surplus to the expenses of the war Nor can it be denied that mercenaries were far more largely employed in the 4th century than in the 5th In justice, however, to the Athenians of the Demosthenic era, it should be remembered that the burden of direct taxation was rarely imposed, and was reluctantly endured, in the previous century It must also be remembered that, even in the 4th century, the Athenian citizen was ready to take the field, provided that it was not a question of a distant expedition or of prolonged service In the two expeditions sent to Euboea, the cavalry force that took part in the battle of Mantineia, and the army that fought at Chaeronea, the troops were citizens For distant expeditions, or for prolonged service, a citizen-militia is unsuited The substitution of a professional for an unprofessional force is explained, partly by the change in the character of Greek warfare, and partly by the operation of the laws of supply and demand There was a time when warfare meant a brief campaign in the summer months against a neighbouring state It came to mean prolonged operations against a distant enemy Athens was at war, *e g*, with Philip, for eleven years continuously (357–346 B C) If winter campaigns in Thrace were unpopular at this epoch, they were hardly less unpopular in the epoch of the Peloponnesian War In the days of her greatness, too, Athens

freely employed mercenaries, but in the navy rather than the army In the age of Pericles the supply of mercenary rowers was abundant, the supply of mercenary troops inconsiderable. In the age of Demosthenes incessant warfare and ceaseless revolution had filled Greece with crowds of homeless adventurers The supply helped to create the demand The mercenary was as cheap as the citizen-soldier, and much more effective On the whole, then, it is a mistake to regard the prevalence of the mercenary system as the expression of a declining patriotism It would be nearer the mark to treat the transition from the voluntary to the professional system as cause rather than effect as one among the causes which contributed to the decay of public spirit in the Greek world

(7) ALEXANDER TO THE ROMAN CONQUEST (336–146 B.C.)

Federal Government.—In the history of Greece proper during this period the interest is mainly constitutional It may be called the age of federation Federation, indeed, was no novelty in Greece. Federal unions had existed in Thessaly, in Boeotia and elsewhere, and the Boeotian league can be traced back at least to the 6th century Two newly-founded federations, the Chalcidian and the Arcadian, play no inconsiderable part in the politics of the 4th century But it is not till the 3rd century that federation attains to its full development in Greece, and becomes the normal type of polity The two great leagues of this period are the Aetolian and the Achaean Both existed in the 4th century, but the latter, which was dissolved shortly before the beginning of the 3rd century, becomes important only after its restoration in 280 B C, about which date the former, too, first begins to attract notice The interest of federalism lies in the fact that it marks an advance beyond the conception of the city-state It is an attempt to solve the problem which the Athenian empire failed to solve, the reconciliation of the claims of local autonomy with those of national union The federal leagues of the 3rd century possess a further interest for the modern world, in that there can be traced in their constitutions a nearer approach to a representative system than is found elsewhere in Greek experience A genuine representative system, it is true, was never developed in any Greek polity What we find in the leagues is a sort of compromise between the principle of a primary assembly and the principle of a representative chamber In both leagues the nominal sovereign was a primary assembly, in which every individual citizen had the right to vote In both of them, however, the real power lay with a council (*boulē*) composed of members representative of each of the component states[1]

Alexander's Empire.—The real interest of this period, however, is to be looked for elsewhere than in Greece itself Alexander's career is one of the turning-points in history He is one of the few to whom it has been given to modify the whole future of the human race He originated two forces which have profoundly affected the development of civilization He created Hellenism (*q v*), and he created for the western world the monarchical ideal Greece had produced personal rulers of ability, or even of genius, but to the greatest of these, to Peisistratus, to Dionysius, even to Jason of Pherae, there clung the fatal taint of illegitimacy As yet no ruler had succeeded in making the person of the monarch respectable Alexander made it sacred From him is derived, for the West, that "divinity that doth hedge a king" And in creating Hellenism he created, for the first time, a common type of civilization, with a common language, literature and art, as well as a common form of political organization In Asia Minor he was content to reinforce the existing Hellenic elements (*cf* the case of Side, Arrian, *Anabasis*, 1 26 4) In the rest of the East his instrument of hellenization was the *polis* He is said to have founded no less than seventy cities, destined to become centres of Greek influence, the great majority in lands in which city-life was almost unknown In this respect his example was emulated by his successors The eastern provinces were soon lost, though Greek influences lingered on even in Bactria and across the Indus It was only the regions lying to the west of the Euphrates that were effectively hellenized, and the permanence of this result was largely due to the policy of Rome. But, after all deductions have been made, the great fact remains that for many centuries after Alexander's death Greek was the language of literature and religion, of commerce and of administration throughout the Nearer East. Alexander created a universal empire as well as a universal culture His empire perished at his death, but its central idea survived—that of the municipal freedom of the Greek *polis* within the framework of an imperial system. Hellenistic civilization may appear degenerate when compared with Hellenic; when compared with the civilizations which it superseded in non-Hellenic lands, it marks an unquestionable advance Greece left her mark upon the civilization of the West as well as upon that of the East, but the process by which her influence was diffused was essentially different In the East Hellenism came in the train of the conqueror, and Rome was content to build upon the foundations laid by Alexander In the West Greek influences were diffused by the Roman conquest of Greece It was through the ascendancy which Greek literature, philosophy and art acquired over the Roman mind that Greek culture penetrated to the nations of western Europe The civilization of the East remained Greek The civilization of the West became and remained Latin, but it was a Latin civilization that was saturated with Greek influences The ultimate division, both of the empire and the church, into two halves, finds its explanation in this original difference of culture (*See* HELLENISM and MACEDONIAN EMPIRE)

[1] It is known that the councillors were appointed by the states in the Aetolian League, it is only surmised in the case of the Achaean.

(8) ANCIENT AUTHORITIES

I. Earliest Period.—For the earliest periods of Greek history, the so-called Minoan and Mycenaean, the evidence is purely archaeological It is sufficient here to refer to the article AEGEAN CIVILIZATION For the next period, the Heroic or Homeric Age, the evidence is derived from the poems of Homer In any estimate of the value of these poems as historical evidence, much will depend upon the view taken of the authorship, age and unity of the poems For a full discussion of these questions *see* HOMER

II. To End of Fifth Century B.C.—For the period that extends from the end of the Heroic Age to the end of the Peloponnesian War[1] the two principal authorities are Herodotus and Thucydides Not only have the other historical works which treated of this period perished (those at least whose date is earlier than the Christian era), but their authority was secondary and their material chiefly derived from these two writers In one respect then this period of Greek history stands alone Indeed, it might be said, with hardly an exaggeration, that there is nothing like it elsewhere in history Almost our sole authorities are two writers of unique genius, and they are writers whose works have come down to us intact For the period which ends with the repulse of the Persian invasion our authority is Herodotus For the period which extends from 478 to 411 we are dependent upon Thucydides In each case, however, a distinction must be drawn The Persian Wars form the proper subject of Herodotus, the Peloponnesian War is the subject of Thucydides The interval between the two wars is merely sketched by Thucydides, while of the period anterior to the conflicts of the Greek with the Persian, Herodotus does not attempt either a complete or a continuous narrative His references to it are episodical and accidental Hence our knowledge of the Persian Wars and of the Peloponnesian War is widely different in character from our knowledge of the rest of this period In the history of these wars the *lacunae* are few, in the rest of the history they are alike frequent and serious In the history, therefore, of the Persian and Peloponnesian Wars little is to be learnt from the secondary sources Elsewhere, especially in the interval between the two wars, they become relatively important

Herodotus.—In estimating the authority of Herodotus (*q v*) we must distinguish between the invasion of Xerxes and all that is earlier Herodotus' work was published soon after 430 B C, *i e*, about half a century after the invasion Much of his infor-

[1] Strictly speaking, to 411 B.C. For the last seven years of the war our principal authority is **Xenophon**, *Hellenica*, 1, ii

mation was gathered in the course of the preceding twenty years. Although his evidence is not that of an eye-witness, he had had opportunities of meeting those who had themselves played a part in the war, on one side or the other (*e g*, Thersander of Orchomenos, ix 16) In any case, we are dealing with a tradition which is little more than a generation old, and the events to which the tradition relates, the incidents of the struggle against Xerxes, were of a nature to impress themselves indelibly upon the minds of contemporaries Where, on the other hand, he is treating of the period anterior to the invasion of Xerxes, he is dependent upon a tradition which is never less than two generations old, and is sometimes centuries old His informants were, at best, the sons or grandsons of the actors in the wars (*e g*, Archias the Spartan, iii 55) Moreover, the invasion of Xerxes, entailing, as it did, the destruction of cities and sanctuaries, especially of Athens and its temples, marks a dividing line in Greek history It was not merely that evidence perished and records were destroyed What, in reference to tradition, is even more important, a new consciousness of power was awakened, new interests were aroused, and new questions and problems came to the front The former things had passed away, all things were become new A generation that is occupied with making history on a great scale is not likely to busy itself with the history of the past Consequently, the earlier traditions became faint and obscured, and the history difficult to reconstruct As we trace back the conflict between Greece and Persia to its beginnings and antecedents, we are conscious that the tradition becomes less trustworthy as we pass back from one stage to another The tradition of the expedition of Datis and Artaphernes is less credible in its details than that of the expedition of Xerxes, but it is at once fuller and more credible than the tradition of the Ionian revolt When we get back to the Scythian expedition, we can discover but few grains of historical truth

The criticism of Herodotus as an historian begins with Thucydides Perhaps the two clearest examples of this criticism are to be found in Thucydides' correction of Herodotus' account of the Cylonian conspiracy (Thuc i 126, *cf* Herod. v 71) and in his appreciation of the character of Themistocles—a veiled protest against the slanderous tales accepted by Herodotus (i 138) In Plutarch's tract "On the Ill-nature of Herodotus" there is much that is suggestive, although his general standpoint, viz, that Herodotus was in duty bound to suppress all that was discreditable to the valour or patriotism of the Greeks, is not that of the modern critic It must be conceded to Plutarch that he makes good his charge of bias in Herodotus' attitude towards certain of the Greek states The question, however, may fairly be asked, how far this bias is personal to the author, or how far it is due to the character of the sources from which his information was derived He cannot, indeed, altogether be acquitted of personal bias His work is, to some extent, intended as an *apologia* for the Athenian empire In answer to the charge that Athens was guilty of robbing other Greek states of their freedom, Herodotus seeks to show, firstly, that it was to Athens that the Greek world, as a whole, owed its freedom from Persia, and secondly, that the subjects of Athens, the Ionian Greeks, were unworthy to be free This leads him to be unjust both to the services of Sparta and to the qualities of the Ionian race As a rule, however, the bias apparent in his narrative is due to the sources from which it is derived Writing at Athens, in the first years of the Peloponnesian War, he can hardly help seeing the past through an Athenian medium It was inevitable that much of what he heard should come to him from Athenian informants, and should be coloured by Athenian prejudices We may thus explain the leniency which he shows towards Argos and Thessaly, the old allies of Athens, in marked contrast to his treatment of Thebes, Corinth and Aegina, her deadliest foes In his intimacy with members of the great Alcmaeonid house we probably have the explanation of his depreciation of the services of Themistocles, as well as of his defence of the family from the charges brought against it in connection with Cylon and with the incident of the shield shown on Pentelicus at the time of Marathon (v 71, vi 121–124) His failure to do justice to the Cypselid tyrants of Corinth (v 92), and to the Spartan king, Cleomenes, is to be accounted for by the nature of his sources—in the former case, the tradition of the Corinthian oligarchy; in the latter, accounts, partly derived from the family of the exiled king Demaratus and partly representative of the view of the ephorate Much of the earlier history is cast in a religious mould, *e g*, the story of the Mermnad kings of Lydia in book i, or of the fortunes of the colony of Cyrene (iv. 145–167) In such cases we cannot fail to recognize the influence of the Delphic priesthood The moralizing tendency observable in Herodotus is partly to be explained by the fact that much of his information was gathered from priests and at temples, and was given in explanation of votive offerings, or of the fulfilment of oracles Hence the determination of the sources of his narrative has become one of the principal tasks of Herodotean criticism In addition to the current tradition of Athens, the family tradition of the Alcmaeonidae, and the stories to be heard at Delphi and other sanctuaries, there may be indicated the Spartan tradition, in the form in which it existed in the middle of the 5th century, that of his native Halicarnassus, to which is due the prominence of its queen Artemisia, the traditions of the Ionian cities, especially of Samos and Miletus (important both for the history of the Mermnadae and for the Ionian Revolt), and those current in Sicily and Magna Graecia, which were learned during his residence at Thurii (Sybaris and Croton, v 44, 45, Syracuse and Gela, vii 153–167) Among his more special sources we can point to the descendants of Demaratus, who still held, at the beginning of the 4th century, the principality in the Troad which had been granted to their ancestor by Darius (Xen *Hell* iii 1 6), and to the family of the Persian general Artabazus, in which the satrapy of Dascylium (Phrygia) was hereditary in the 5th century Possibly some of his information about Persian affairs may have been derived, at first or second hand, from Zopyrus, son of Megabyzus, whose flight to Athens is mentioned in iii 160

His use of written material is more difficult to determine It is generally agreed that the list of Persian satrapies, with their respective assessments of tribute (iii 89–97), the description of the royal road from Sardis to Susa (v 52–54), and of the march of Xerxes, together with the list of the contingents that took part in the expedition (vii 26–131), are all derived from documentary and authoritative sources From previous writers (*e g*, Dionysius of Miletus, Hecataeus, Charon of Lampsacus and Xanthus the Lydian) it is probable that he has borrowed little, though the fragments are too scanty to permit of adequate comparison His references to monuments, dedicatory offerings, inscriptions and oracles are frequent

The chief defects of Herodotus are his failure to grasp the principles of historical criticism, to understand the nature of military operations, and to appreciate the importance of chronology In place of historical criticism we find a crude rationalism (*e g*, ii 45, vii 129, viii 8) Having no conception of the distinction between occasion and cause, he is content to find the explanation of great historical movements in trivial incidents or personal motives Thus, in his account of the Ionian revolt, he fails to discover the real causes either of the movement or of its result Indeed, it is clear that he regarded criticism as no part of his task as an historian Again and again he gives two or more versions of a story We are thus frequently enabled to arrive at the truth by a comparison of the discrepant traditions It would have been fortunate if all ancient writers who lacked the critical genius of Thucydides had been content to adopt the practice of Herodotus His accounts of battles are always unsatisfactory The great battles, Marathon, Thermopylae, Salamis and Plataea, present a series of problems This result is partly due to the character of the traditions which he follows—traditions which were to some extent inconsistent or contradictory, and were derived from different sources, it is, however, in great measure due to his inability to think out a strategical combination or a tactical movement The battle of Plataea, as described by Herodotus, is wholly unintelligible Most serious of all his deficiencies is his careless chronology Even for the 5th century, the data which he affords are inadequate or ambiguous The interval between the Scythian expedition and the Ionian revolt is described by a vague expres-

sion. In the history of the revolt itself, though he gives us the interval between its outbreak and the fall of Miletus, he does not give us the interval between this and the battle of Ladē, nor does he indicate with sufficient precision the years to which the successive phases of the movement belong Throughout the work professed synchronisms too often prove to be mere literary devices for facilitating a transition from one subject to another In the 6th century a whole generation, or more, disappears in his historical perspective The attempts to reconstruct the chronology of this century upon the basis of the data afforded by Herodotus have completely failed

In spite of all such defects Herodotus is an author, not only of unrivalled literary charm, but of the utmost value to the historian. If much remains uncertain or obscure, even in the history of the Persian Wars, it is chiefly to motives or policy, to topography or strategy, to dates or numbers, that uncertainty attaches It is to these that a sober criticism will confine itself

Thucydides.—Thucydides (*q v*) is at once the father of contemporary history and the father of historical criticism From a comparison of i 1, i 22 and v 26, we may gather both the principles to which he adhered in the composition of his work and the conditions under which it was composed It is seldom that the circumstances of an historical writer have been so favourable for the accomplishment of his task Thucydides was a contemporary, in the fullest sense of the term, of the Twenty-Seven Years' War He had reached manhood at its outbreak, and he survived its close by at least half-a-dozen years And he was more than a mere contemporary As a man of high birth, a member of the Periclean circle, and the holder of the chief political office in the Athenian state, the *strategia*, he was not only familiar with the business of administration and the conduct of military operations, but he possessed in addition a personal knowledge of those who played the principal part in the political life of the age His exile in the year 424 afforded him opportunities of visiting the scenes of distant operations (*e g*, Sicily), and of coming in contact with the actors on the other side He spared no pains to obtain the best information available in each case He began collecting materials for his work from the very beginning of the war Indeed, it is probable that much of books i–v 24 was written soon after the Peace of Nicias (421), just as it is possible that the history of the Sicilian expedition (books vi and vii) was originally intended to form a separate work The work, as a whole, appears to have been composed in the first years of the 4th century, after his return from exile in 404, when the material already in existence must have been revised and largely recast There are exceedingly few passages which seem to have been overlooked in the process of revision The impression left upon the reader's mind is that the point of view of the author, in all the books alike, is that of one writing after the fall of Athens

The task of historical criticism in the case of the Peloponnesian War is widely different from its task in the case of the Persian Wars It has to deal, not with facts as they appear in the traditions of an imaginative race, but with facts as they appeared to a scientific observer Facts, indeed, are seldom in dispute The question is rather whether facts of importance are omitted, whether the explanation of causes is correct, or whether the judgment of men and measures is just Such inaccuracies as have been brought home to Thucydides on the strength, *e g*, of epigraphic evidence, are, as a rule, trivial His most serious errors relate to topographical details in regard to which he was dependent on the information of others Sphacteria (*see* PYLOS) is a case in point Nor have the difficulties connected with the siege of Plataea been cleared up Where, on the contrary, he is writing at first hand his descriptions of sites are surprisingly correct The most serious charge as yet brought against his authority as to matters of fact relates to his account of the Revolution of the Four Hundred, which seems, at first sight, to be inconsistent with the documentary evidence supplied by Aristotle's *Constitution of Athens* (*q v*) It may be questioned, however, whether the documents have been correctly interpreted by Aristotle On the whole, it is probable that the general course of events was such as Thucydides describes, though he failed to appreciate the position of Theramenes and the Moderate party, and was clearly misinformed on some important points of detail. Much is omitted that would not be omitted by a modern writer. Such omissions are generally due to the author's conception of his task Thus the internal history of Athens is passed over as forming no part of the history of the war. It is only where the course of the war is directly affected by the course of political events (*e.g*, by the Revolution of the Four Hundred) that the internal history is referred to However much it may be regretted that the relations of political parties are not more fully described, especially in book v, it cannot be denied that from his standpoint there is logical justification even for the omission of the ostracism of Hyperbolus There are omissions, however, which are not so easily explained, as that of the raising of the tribute in 425 B C. (*see* DELIAN LEAGUE)

Nowhere is the contrast between the historical methods of Herodotus and Thucydides more apparent than in the treatment of the causes of events. The distinction between the occasion and the cause is constantly present to the mind of Thucydides, and it is his tendency to make too little rather than too much of the personal factor Sometimes, however, it may be doubted whether his explanation of the causes of an event is adequate or correct. In tracing the causes of the Peloponnesian War itself, modern writers are disposed to allow more weight to the commercial rivalry of Corinth; while in the case of the Sicilian expedition, they would actually reverse his judgment To us it seems that the very idea of the expedition implied a gigantic miscalculation of the resources of Athens and of the difficulty of the task His judgments of men and of measures have been criticized by writers of different schools and from different points of view Grote criticized his verdict upon Cleon, while he accepted his estimate of the policy of Pericles More recent writers, on the other hand, have accepted his view of Cleon, while they have selected for attack his appreciation alike of the policy and the strategy of Pericles He has been charged, too, with failure to do justice to the statesmanship of Alcibiades[1]

There are cases, undoubtedly, in which the balance of recent opinon will be adverse to the view of Thucydides. There are many more in which the result of criticism has been to establish his view That he should occasionally have been mistaken in his judgment and his views is certainly no detraction from his claim to greatness

On the whole, while the criticism of Herodotus has tended seriously to modify our view of the Persian Wars, as well as of the earlier history, the criticism of Thucydides has affected but slightly our view of the course of the Peloponnesian War The labours of recent workers in this field have borne most fruit where they have been directed to subjects neglected by Thucydides, such as the history of political parties, or the organization of the empire.

Diodorus and Plutarch.—Of the secondary authorities for this period the two principal ones are Diodorus (xi 38 to xii. 37) and Plutarch. Diodorus is of value chiefly in relation to Sicilian affairs, to which he devotes about a third of this section of his work and for which he is almost our sole authority His source for Sicilian history is Timaeus (*q v*), himself a Sicilian, who wrote in the 3rd century B C For the history of Greece proper during the *Pentēkontaëteris* (the period between the Persian and the Peloponnesian Wars), Diodorus contributes comparatively little of importance. Isolated notices of particular events (*e g*, the *synoecism* of Elis, 471 B C, or the foundation of Amphipolis, 437 B C), which appear to be derived from a chronological writer, may generally be trusted The greater part of his narrative is, however, derived from Ephorus, who seems to have had before him little authentic information for this period of Greek history other than that afforded by Thucydides' work Four of Plutarch's *Lives* are concerned with this period, viz., *Themistocles, Aristeides, Cimon,* and *Pericles* From the *Aristeides* little can be gained. The *Cimon,* on the other hand, contains much that is valuable; such as the account of the battle of the Eurymedon (chs. 12 and 13). To the *Pericles* we owe several quotations from the Old Comedy

[1]For a defence of Thucydides' judgment on all three statesmen, *see* E. Meyer, *Forschungen,* ii. 296–379.

Two other of the *Lives*, *Lycurgus* and *Solon*, are amongst our most important sources for the early history of Sparta and Athens respectively. Of the two (besides *Pericles*) which relate to the Peloponnesian War, *Alcibiades* adds little to what can be gained from Thucydides and Xenophon; the *Nicias*, on the other hand, supplements Thucydides' narrative of the Sicilian expedition with many valuable details, which, it may safely be assumed, are derived from the contemporary historian, Philistus of Syracuse. Amongst the most valuable material afforded by Plutarch are the quotations, which occur in almost all the *Lives*, from the collection of Athenian decrees formed by the Macedonian writer Craterus, in the 3rd century B C.

The Constitutions.—Two other works may be mentioned in connection with the history of Athens. For the history of the Athenian Constitution down to the end of the 5th century B C, Aristotle's *Constitution of Athens* (*q v*) is our chief authority The other *Constitution of Athens*, erroneously attributed to Xenophon, a tract of singular interest both on literary and historical grounds, throws a good deal of light on the internal condition of Athens, and on the system of government, both of the state and of the empire, in the age of the Peloponnesian War, during the earlier years of which it was composed

Epigraphical Sources.—To the literary sources for the history of Greece, especially of Athens, in the 5th century B C must be added the epigraphic. Few historical inscriptions have been discovered which date back beyond the Persian Wars. For the latter half of the 5th century they are both numerous and important Of especial value are the series of Quota-lists, from which can be calculated the amount of tribute paid by the subject-allies of Athens from the year 454 B.C. onwards. The great majority of the inscriptions of this period are of Athenian origin They relate, as a rule, to questions of organization, finance and administration, as to which little information is to be gained from the literary sources

III. The 4th Century to the Death of Alexander.—Of the historians who flourished in the 4th century the sole writer whose works have come down to us is Xenophon. It is a singular accident of fortune that neither of the two authors, who at once were most representative of their age and did most to determine the views of Greek history current in subsequent generations, Ephorus (*q v*) and Theopompus (*q.v*), should be extant It was from them, rather than from Herodotus, Thucydides or Xenophon, that the Roman world obtained its knowledge of the history of Greece in the past, and its conception of its significance Both were pupils of Isocrates, and both, therefore, bred up in an atmosphere of rhetoric. Hence their popularity and their influence. The scientific spirit of Thucydides was alien to the temper of the 4th century, and hardly more congenial to the age of Cicero or Tacitus To the rhetorical spirit, which is common to both, each added defects peculiar to himself. Theopompus is a strong partisan, a sworn foe to Athens and to democracy. Ephorus, though a military historian, is ignorant of the art of war. He is also almost incredibly careless and uncritical. Only a few fragments remain of either writer, but Theopompus was largely used by Plutarch in several of the *Lives*, while Ephorus continues to be the main source of Diodorus' history, as far as the outbreak of the Sacred War (Fragments of Ephorus in Muller's *Fragmenta historicorum Graecorum*, vol i; of Theopompus in *Hellenica Oxyrhynchia, cum Theopompi et Cratippi fragmentis*, ed B P. Grenfell and A. S Hunt, 1909).

Xenophon.—It may be at least claimed for Xenophon (*q v.*) that he is free from all taint of the rhetorical spirit. As a witness, he is both honest and well-informed. But, if there is no justification for the charge of deliberate falsification, he had strong political prejudices, and his narrative has suffered from them His historical writings are the *Anabasis*, an account of the expedition of the Ten Thousand, the *Hellenica* and the *Agesilaus*, a eulogy of the Spartan king. Of these the *Hellenica* is far the most important for the student of history. It consists of two distinct parts (though there is no ground for the theory that the two parts were separately written and published), books i. and ii, and books iii. to vii The first two books are intended as a continuation of Thucydides' work. They begin, quite abruptly, in the middle of the Attic year 411/10, and they carry the history down to the fall of the Thirty, in 403. Books iii to vii, the *Hellenica* proper, cover the period from 401 to 362, and give the histories of the Spartan and Theban hegemonies down to the death of Epameinondas. There is thus a gap of two years between the point at which the first part ends and that at which the second part begins The two parts differ widely, both in their aim and in the arrangement of the material In the first part Xenophon attempts, though not with complete success, to follow the chronological method of Thucydides, and to make each successive spring, when military and naval operations were resumed after the winter's interruption, the starting-point of a fresh section The resemblance between the two writers ends, however, with the outward form of the narrative. All that is characteristic of Thucydides is absent in Xenophon The latter writer shows neither skill in portraiture, nor insight into motives He is deficient in the sense of proportion, and he knows nothing of the distinction between occasion and cause Perhaps his worst fault is a lack of imagination It was not given to Xenophon, as it was to Thucydides, to discriminate between the circumstances that are essential and those that are not essential to the comprehension of the story In spite, therefore, of its wealth of detail, his narrative is frequently obscure In the first two books, though there are omissions (*e g*, the loss of Nisaea, 409 B C.), they are not so serious as in the last five, nor is the bias so evident If the account of the rule of the Thirty given in Aristotle's *Constitution of Athens* be accepted, Xenophon must have deliberately misrepresented the course of events to the prejudice of Theramenes But it is at least doubtful whether Aristotle's version can be sustained against Xenophon's, though there are mistakes as to details in the latter writer's narrative, and less than justice is done to the policy and motives of the "Buskin" The *Hellenica* was written, it should be remembered, at Corinth, after 362 B C More than forty years had thus elapsed since the events recorded in the first two books, and after so long an interval, accuracy of detail, even where the detail is of importance, is not always to be expected. In the second part the chronological method is abandoned A subject once begun is followed out to its natural ending, so that sections of the narrative which are consecutive in order are frequently parallel in point of date A good example of this will be found in book iv In chapters 2 to 7, the history of the Corinthian war is carried down to the end of 390, so far as the operations on land are concerned, while chapter 8 contains an account of the naval operations from 394 to 388 B C. In this second part of the *Hellenica* the author's disqualifications for his task are more apparent than in the first two books The more he is acquitted of bias in his selection of events and in his omissions, the more clearly does he stand convicted of lacking all sense of the proportion of things Down to Leuctra (371 B C) Sparta is the centre of interest, and it is of the Spartan state alone that a complete or continuous history is given. After Leuctra, if the point of view is no longer exclusively Spartan, the narrative of events is hardly less incomplete Throughout the second part of the *Hellenica* omissions abound which it is difficult either to explain or justify. The formation of the Second Athenian Confederacy of 377 B C, the foundation of Megalopolis and the restoration of the Messenian state are unrecorded Yet the writer who passes them over without mention thinks it worth while to devote more than one-sixth of an entire book to a chronicle of the unimportant feats of the citizens of the petty state of Phlius No attempt is made to appraise the policy of the great Theban leaders, Pelopidas and Epameinondas The former, indeed, is mentioned only in a single passage, relating to the embassy to Susa in 368 B C; the latter does not appear on the scene till a year later, and receives mention but twice before the battle of Mantineia An author who omits from his narrative some of the most important events of his period, and elaborates the portraiture of an Agesilaus, while not attempting the bare outline of an Epameinondas, may be honest; he may even write without a consciousness of bias, he certainly cannot rank among the great writers of history

Diodorus.—For the history of the 4th century Diodorus assumes a higher degree of importance than belongs to him in the

earlier periods. This is partly to be explained by the deficiencies of Xenophon's *Hellenica*, partly by the fact that for the interval between the death of Epameinondas and the accession of Alexander we have in Diodorus alone a continuous narrative of events. Books xiv. and xv. of his history include the period covered by the *Hellenica* More than half of book xiv is devoted to the history of Sicily and the reign of Dionysius, the tyrant of Syracuse For this period of Sicilian history he is, practically, our sole authority. In the rest of the book, as well as in book xv, there is much of value, especially in the notices of Macedonian history. Thanks to Diodorus we are enabled to supply many of the omissions of the *Hellenica* Diodorus is, *e.g.*, our sole literary authority for the Athenian naval confederation of 377 Book xvi must rank, with the *Hellenica* and Arrian's *Anabasis*, as one of the three principal authorities for this century, so far, at least, as works of an historical character are concerned. It is our authority for the Social and the Sacred Wars, as well as for the reign of Philip. It is a curious irony of fate that, for what is perhaps the most momentous epoch in the history of Greece, we should have to turn to a writer of such inferior capacity. For this period his material is better and his importance greater: his intelligence is as limited as ever. Who but Diodorus would be capable of narrating the siege and capture of Methone twice over, once under the year 354, and again, under the year 352, of giving three different numbers of years (eleven, ten and nine) in three different passages (chs. 14, 23 and 59) for the length of the Sacred War, or of inserting a conclusion of peace between Athens and Philip in 340 B C, after the failure of his attack on Perinthus and Byzantium? Among the subjects which are omitted is the peace of Philocrates. For the earlier chapters, which bring the narrative down to the outbreak of the Sacred War, Ephorus, as in the previous book, is Diodorus' main source His source for the rest of the book, *i.e*, for the greater part of Philip's reign, cannot be determined It is generally agreed that it is not the *Philippica* of Theopompus.

Historians of Alexander's Reign.—For the reign of Alexander our earliest extant authority is Diodorus, who belongs to the age of Augustus Of the others, Q Curtius Rufus, who wrote in Latin, lived in the reign of the emperor Claudius, Arrian and Plutarch in the 2nd century A D. Yet Alexander's reign is one of the best known periods of ancient history The Peloponnesian War and the twenty years of Roman history which begin with 63 B C are the only two periods which we can be said to know more fully or for which we have more trustworthy evidence For there is no period of ancient history which was recorded by a larger number of contemporary writers, or for which better or more abundant materials were available. Of the writers actually contemporary with Alexander there were five of importance—Ptolemy, Aristobulus, Callisthenes, Onesicritus and Nearchus; and all of them occupied positions which afforded exceptional opportunities of ascertaining the facts Four of them were officers in Alexander's service Ptolemy, the future king of Egypt, was one of the *somatophulakes* (we may, perhaps, regard them as corresponding to Napoleon's marshals); Aristobulus was also an officer of high rank (*see* Arrian, *Anab* vi 29 10); Nearchus was admiral of the fleet which surveyed the Indus and the Persian Gulf, and Onesicritus was one of his subordinates The fifth, Callisthenes, a pupil of Aristotle, accompanied Alexander on his march, and was admitted to the circle of his intimate friends A sixth historian, Cleitarchus, was possibly also a contemporary; at any rate he is not more than a generation later. These writers had at their command a mass of official documents, edited and published after Alexander's death by his secretary, Eumenes of Cardia; the records of the marches of the armies, which were carefully measured at the time; and the official reports on the conquered provinces That these documents were made use of by the historians is proved by the references to them which are to be found in Arrian, Plutarch and Strabo We have, in addition, in Plutarch numerous quotations from Alexander's correspondence with his mother, Olympias, and with his officers The contemporary historians may be roughly divided into two groups On the one hand there are Ptolemy and Aristobulus, who, except in a single instance, are free from all suspicion of deliberate invention. On the other hand, there are Callisthenes, Onesicritus and Cleitarchus, whose tendency is rhetorical. Nearchus appears to have allowed full scope to his imagination in dealing with the wonders of India, but to have been otherwise veracious Of the extant writers Arrian (*q v*) is incomparably the most valuable His merits are twofold As the commander of Roman legions and the author of a work on tactics, he combined a practical with a theoretical knowledge of the military art, while the writers whom he follows in the *Anabasis* are the two most worthy of credit, Ptolemy and Aristobulus We may well hesitate to call in question the authority of writers who exhibit an agreement which it would be difficult to parallel elsewhere in the case of two independent historians. It may be inferred from Arrian's references to them that there were only eleven instances in all in which he found discrepancies between them The most serious drawback which can be alleged against them is an inevitable bias in Alexander's favour. It would be only natural that they should pass over in silence the worst blots on their great commander's fame Next in value to the *Anabasis* comes Plutarch's *Life of Alexander*, the merits of which, however, are not to be gauged by the influence which it has exercised upon literature The *Life* is a valuable supplement to the *Anabasis*, partly because Plutarch, as he is writing biography rather than history (for his conception of the difference between the two see the famous preface, *Life of Alexander*, ch i), is concerned to record all that will throw light upon Alexander's character (*e g*, his epigrammatic sayings and quotations from his letters); partly because he tells us much about his early life, before he became king, while Arrian tells us nothing Plutarch writes in an uncritical spirit; he formed no clear conception and drew no consistent picture of Alexander's character Book xvii of Diodorus and the *Historiae Alexandri* of Curtius Rufus are thoroughly rhetorical in spirit It is probable that in both cases the ultimate source is the work of Cleitarchus

The Orators.—Towards the end of the 5th century a fresh source of information becomes available in the speeches of the orators, the earliest of whom is Antiphon (d 411 B C) Lysias is of great importance for the history of the Thirty (*see* the speeches against Eratosthenes and Agoratus), and a good deal may be gathered from Andocides with regard to the last years of the 5th and the opening years of the next century At the other end of this period Lycurgus, Hypereides and Deinarchus throw light upon the time of Philip and Alexander The three, however, who are of most importance to the historian are Isocrates, Aeschines and Demosthenes

Isocrates.—Isocrates (*q v*), whose long life (436–338 B C) more than spans the interval between the outbreak of the Peloponnesian War and the triumph of Macedon at Chaeroneia, is one of the most characteristic figures in the Greek world of his day To comprehend that world the study of Isocrates is indispensable, for in an age dominated by rhetoric he is the prince of rhetoricians It is difficult for a modern reader to do him justice, so alien is his spirit and the spirit of his age to ours He is frequently monotonous and prolix, at the same time, as the most famous representative of rhetoric, he was read from one end of the Greek world to the other He was the friend of Evagoras and Archidamus, of Dionysius and Philip; he was the master of Aeschines and Lycurgus amongst orators and of Ephorus and Theopompus amongst historians No other contemporary writer has left so indelible a stamp upon the style and the sentiment of his generation It is a commonplace that Isocrates is the apostle of Panhellenism It is not so generally recognized that he is the prophet of Hellenism Doubtless he had no conception of the extent to which the East was to be hellenized He was, however, the first to recognize that it would be hellenized by the diffusion of Greek culture rather than of Greek blood. His Panhellenism was the outcome of his recognition of the new forces and tendencies which were at work in the midst of a new generation When Greek culture was becoming more and more international, the exaggeration of the principle of autonomy in the Greek political system was becoming more and more absurd. He had sufficient insight to be aware that the price paid for this

autonomy was the domination of Persia; a domination which meant the servitude of the Greek states across the Aegean and the demoralization of Greek political life at home His Panhellenism led him to a more liberal view of the distinction between what was Greek and what was not than was possible to the intenser patriotism of a Demosthenes. In his later orations he has the courage not only to pronounce that the day of Athens as a first-rate power is past, but to see in Philip the needful leader in the crusade against Persia. The earliest and greatest of his political orations is the *Panegyricus*, published in 380 B C, midway between the peace of Antalcidas and Leuctra It is his *apologia* for Panhellenism To the period of the Social War belong the *De pace* (355 B C) and the *Areopagiticus* (354 B C.), both of great value as evidence for the internal conditions of Athens at the beginning of the struggle with Macedon The *Plataicus* (373 B C) and the *Archidamus* (366 B C.) throw light upon the politics of Boeotia and the Peloponnese respectively The *Panathenaicus* (339 B C), the child of his old age, contains little that may not be found in the earlier orations The *Philippus* (346 B C) is of peculiar interest, as giving the views of the Macedonian party

Demosthenes.—With the estimate of character and statesmanship of the orator Demosthenes (*q v*) we are not here concerned With regard to his value as an authority for the history of the period, it is to his speeches, and to those of his contemporaries, Aeschines, Hypereides, Deinarchus and Lycurgus, that we owe our intimate knowledge, both of the working of the constitutional and legal systems, and of the life of the people, at this period of Athenian history From this point of view his value can hardly be overestimated As a witness, however, to matters of fact, his authority can no longer be rated as highly as it once was The orator's attitude towards events, both in the past and in the present, is inevitably different from that of the historian The object of a Thucydides is to ascertain a fact, or to exhibit it in its true relations The object of a Demosthenes is to make a point, or to win his case In their dealings with the past the orators exhibit a levity which is almost inconceivable to a modern reader Andocides, in a passage of his speech *On the Mysteries* (§ 107), speaks of Marathon as the crowning victory of the campaign against Xerxes, in his speech *On the Peace* (§ 3) he confuses Miltiades with Cimon, and the Five Years' Truce with the Thirty Years' Peace Though the latter passage is a mass of absurdities and confusion, it was so generally admired that it was incorporated by Aeschines in his speech *On the Embassy* (§§ 172–6). If such was their attitude towards the past, if, in order to make a point, they do not hesitate to pervert history, is it likely that they would conform to a higher standard of veracity in their statements as to the present—as to their contemporaries, their rivals or their own actions? It has come to be recognized that no statement as to a matter of fact is to be accepted, unless it receives independent corroboration, or unless it is admitted by both sides

The speeches of Demosthenes may be conveniently divided into four classes according to their dates To the pre-Philippic period belong the speeches *On the Symmories* (354 B C), *On Megalopolis* (352 B C), *Against Aristocrates* (351 B C), and, perhaps, the speech *On Rhodes* (? 351 B C) These speeches betray no consciousness of the danger threatened by Philip's ambition The policy recommended is one based upon the principle of the balance of power To the succeeding period, which ends with the peace of Philocrates (346 B C), belong the *First Philippic* and the three *Olynthiacs* To the period between the peace of Philocrates and Chaeronea belong the speech *On the Peace* (346 B C), the *Second Philippic* (344 B C), the speeches *On the Embassy* (344 B C) and *On the Chersonese* (341 B C), and the *Third Philippic* The masterpiece of his genius, the speech *On the Crown*, was delivered in 330 B C., in the reign of Alexander Of the three extant speeches of Aeschines (*q v*) that *On the Embassy* is of great value, as enabling us to correct the misstatements of Demosthenes

IV. Later Authorities.—For the period from the death of Alexander to the fall of Corinth (323–146 B C) our literary authorities are singularly defective For the Diadochi (*q v*) Diodorus (books xviii–xx) is our chief source These books form the most valuable part of Diodorus' work They are mainly based upon the work of Hieronymus of Cardia, a writer who combined exceptional opportunities for ascertaining the truth (he was in the service first of Eumenes, and then of Antigonus) with an exceptional sense of its importance Hieronymus ended his history at the death of Pyrrhus (272 B C), but, unfortunately, book xx. of Diodorus' work carries us no farther than 303 B C, and of the later books we have but scanty fragments The narrative of Diodorus may be supplemented by the fragments of Arrian's *History of the events after Alexander's death* (which reach, however, only to 321 B C), and by Plutarch's *Lives* of *Eumenes* and of *Demetrius* For the rest of the 3rd century and the first half of the 2nd we have his *Lives* of *Pyrrhus*, of *Aratus*, of *Philopoemen*, and of *Agis and Cleomenes*. For the period from 220 B C. onwards Polybius (*q v*) is our chief authority (*see* ROME: *Ancient History*) In a period in which the literary sources are so scanty great weight attaches to the epigraphic and numismatic evidence

BIBLIOGRAPHY.—The literature which deals with the history of Greece in its various periods, departments and aspects, is of so vast a bulk that all that can be attempted here is to indicate the most important and the most accessible of the works of a general character It may be pointed out that a full bibliography will be found at the end of each of the volumes of the *Cambridge Ancient History*

General Histories of Greece.—There are only three general histories of Greece written by English scholars that call for mention here. George Grote's *History of Greece* was published originally in 12 volumes, 1846–56 (new ed 1888) Grote had his faults and his limitations His prejudices are strong and his scholarship is weak, he had never visited Greece, and he knew little or nothing of Greek art, and, at the time at which he wrote, the importance of coins and inscriptions was imperfectly apprehended In spite of every defect, however, his work is the greatest history of Greece that has yet been written It is not too much to say that nobody knows Greek history till he has mastered Grote *The History of Greece*, by the late J B Bury, Regius Professor of Modern History in the University of Cambridge (2nd ed, 1922), in one volume, is a work on a far less elaborate scale than Grote's Of a different character from the *Histories* of Grote and Bury, is *The Cambridge Ancient History*, edited by J B Bury, S A Cook and F E Adcock, and published by the Cambridge University Press This work, which is in course of publication, is intended, when complete, to deal with the history of the ancient world down to the fall of the Roman empire, vols IV–VII. being mainly concerned with the history of Greece The plan of the *Ancient History* is similar to that of the *Cambridge Modern History* and the *Cambridge Mediaeval History*, different chapters being assigned to different scholars, chiefly English and American

Of general histories by foreign scholars, the following may be mentioned K J Beloch, *Griechische Geschichte*, ed 2 (Strasbourg, 1912–27), E Cavaignac, *Histoire de l'Antiquité*, vols 1–3 (1913–14), G Busolt, *Griechische Geschichte*, ed 2 (Gotha, 1893–1904) (differs in character from other histories of Greece, the writer's object being to refer in the notes, which constitute five-sixths of the book, to the views of every writer, in any language, upon every controverted question, it is indispensable as a work of reference for any serious study of Greek history), Eduard Meyer, *Geschichte des Altertums* (Stuttgart, 1893–1902) (the ablest work on Greek history since Grote's, of the five volumes which have appeared, vols II–V are principally concerned with the history of Greece, and carry the narrative down to a few years later than the death of Epameinondas), M Rostovtzeff, *A History of the Ancient World*, trans J D Duff (Oxford, 1926)

Works bearing on the History of Greece Iwan Muller, *Handbuch der Klassischen Altertumswissenschaft* (Munich, various dates), K F Hermann, *Lehrbuch der griechischen Antiquitaten*, new ed (Tubingen, various dates), A. Gercke and E Norden, *Einleitung in die Altertumswissenschaft*, ed 2 (Leipzig and Berlin, 1914), Pauly-Wissowa, *Realencyklopadie der Klassischen Altertumswissenschaft* (Stuttgart, 1893) (in progress), H F Clinton, *Fasti Hellenici*, 3rd ed (Oxford, 1841), (a work of which English scholarship may well be proud; it is still invaluable for the study of Greek chronology)

Among works on Epigraphy may be mentioned *Inscriptiones Graecae* (1924), E. L Hicks and G F Hill, *Manual of Greek Historical Inscriptions*, new ed, 1 vol (Oxford, 1901), W Dittenberger, *Sylloge Inscriptionum Graecarum*, 3rd ed (Berlin, 1915–17).

Among works on Numismatics, the English reader may refer to B V Head, *Historia numorum*, 2nd ed (Oxford, 1911), G F Hill, *Handbook of Greek and Roman Coins* (1899), P Gardner, *History of Ancient Coinage*, 700–300 B C (Oxford, 1918) (E M. WA)

HISTORY: (2) ECONOMIC AND SOCIAL DEVELOPMENT OF ANCIENT GREECE

Life in Ancient Greece.—The conditions under which the men of the ancient world lived were so different from those

of the life of the present day that it is difficult to realise, and perhaps impossible to realise fully, even the main circumstances of an existence in which factors which are in some respects the chief determinants of modern life played no part; and this although life even in western Europe up to the end of the 18th century in many ways approximates in respect to its economics more closely to the life of the men of the fifth century before Christ than it does to that of the present day The effect of rapid means of communication on the problems of material existence has been so great that the problems themselves have for the last hundred years ceased to be of that gravity which the men of previous centuries had every reason to recognise. Before that time individuals and states were largely concerned with devising means of securing a margin of safety in respect to material life, a margin which varied from age to age in accordance with the variations of race, time and geographical situation If the Roman government at the height of its power, and at a time when means of communication had been greatly improved, showed anxiety for the food supply of that Italy which was dominant in the Mediterranean world, it may be imagined that in the period preceding the great economic organisation introduced by the Roman Principate the peoples of the Mediterranean region, peoples no one of which at the height of its power had controlled the visible food supply of the world so widely or so absolutely, had far graver cause for anxiety on the same subject, an anxiety such as would be, under ordinary circumstances, the main factor, or, even under the most favourable circumstances possible in those ages, *a* main factor, in moulding the life of the individual and the policy of the state.

The modifications introduced into the problem of the world's food supply by the introduction of steam power into communications by land and sea, and by the invention of the telegraph, can be best realised by a consideration of the facts of past, or even of contemporary, history. Within the memory of thousands now living a famine due to widespread failure of crops carried off hundreds of thousands of people in India, because the absence of adequate means of communication rendered it impossible even for a sympathetic government to supply the deficiency in time to save the lives of a large percentage of those suffering from the famine The Chinese government, owing to lack of communications, has never been able to cope with the chronic famines in regions of that country; and the obvious impossibility of so doing seems to have led it to regard such disasters with apathetic indifference

What must have been in antiquity the case of a people whose crops had failed—in ages in which, supposing that the scarcity affected only part of a political unit, government sympathy would be determined by political expediency, and the help of other members of the unit would be almost certainly restricted by the smallness of the surplus, if any, of their own harvest, and immeasurably impeded by the badness and slowness of communication? And what would be the case when such a disaster fell on the whole of a political unit? Enough is known of the spirit and circumstances of antiquity to say that help from outside would not be forthcoming from other political units, which had probably but little food produce to spare from the annual yield, to a political unit which had probably no means of paying for that which could be spared, even supposing that supplies could be moved into the affected region in time to save any part of the situation.

But it is possible to illustrate the economic conditions of ancient life to an English-speaking reader by examples drawn from nearer home A single case of starvation in the British isles evokes universal horror at the present day Nearly all Englishmen and Americans know something of English history; but their interest is apt to be directed by preference to the stories of wars and battles, and by compulsion to the growth of English law and the British constitution How many of them ever realise that in the period between the Saxon settlement and the end of the first half of the 14th century not merely thousands, but hundreds of thousands, of English people perished of famine or of the terrible diseases which semi-starvation brought in its train—and this in a land in which the percentage of productive area was far greater than in the lands of the Mediterranean region, and when the acreage under cereal cultivation was in the later centuries of the period considerably greater than at the present day?

It is necessary to recognise brutal facts of this nature in order to realise the conditions under which the ancient world lived. It is also necessary to realise that variations in social and political conditions vary in direct ratio to the extent to which the hardness of the conditions of physical life can or cannot be alleviated. Poverty in the widest sense is an impediment to the advance of civilisation

The Reasons for Migration.—The peoples of the ancient world did not always solve the problem of existence on the same lines It was, for instance, natural that a race which lived in a region where the natural conditions were hard, and means of living peculiarly precarious, should seek to conquer lands where the conditions were more favourable This impulse must have been at the root of the great movements of peoples at various periods in ancient history from the comparatively inhospitable lands of central and northern Asia to the more fertile and more favoured regions of Europe and parts of western Asia. This gave rise to secondary impulses The invaders drove in front of them the original inhabitants of the regions which they seized; and these in their turn forced their way into regions in which they had not dwelt aforetime These movements are recurrent, not merely in the dim tradition of legend, but in the pages of recorded history They are peculiarly prominent in the legendary history of the Greek people

In various recorded instances such invaders did not expel or massacre the population of the region they occupied, but constituted themselves as a superior class which kept the original population in a position of quasi-serfdom as tillers of the soil This was notoriously the case with the Dorian invaders of Greece It was also the case with the Celtic invaders of Galatia, of Gaul, and of Britain, a fact which ancient historians recorded in the case of Galatia, and archaeology and ethnology have established in the case of Gaul and Britain A successful invasion of this type placed the invaders outside the fear of starvation They were free from the general anxiety with regard to daily bread, free to turn their thoughts to other things outside the problem of material daily existence In other cases the invaders merged with the invaded In many they expelled or exterminated them

There can be little doubt that these movements, invasions and settlements were not inspired by mere lust of conquest for conquest's sake, but by the desire to solve or ease by conquest the problem of material existence to banish that spectre of possible starvation which ever haunted the ancient world The danger of failure of crops was ever present Populations which were not militarily dominant in the land in which they lived could only supply the deficiency by either raiding the lands of neighbours whose crops had not failed, or by piratical expeditions to lands over sea "For in early times the Hellenes and the barbarians of the coast and islands, as communication by sea became more common, were tempted to turn pirates, under the conduct of their most powerful men, the motives being to serve their own cupidity *and to support the needy*" (Thuc 1 5) A danger still greater, because on a larger scale, arose when the population of a region became greater than the home products of the land could support

A people which is obsessed by the struggle of daily existence must remain backward in the development of the arts and ideas of civilisation The great civilisations of the early world developed in the rich regions of the Nile and the Euphrates where, save under very exceptional circumstances, a living was easily won from the soil, and the land produced even more than the population could consume But it is also significant that in these wealthy lands the population evolved methods, such as irrigation and so forth, which increased the productiveness of the cultivated regions, and brought into cultivation areas originally arid

The First Civilisation.—These general circumstances must be taken into account in consideration of the beginnings and development of any great civilisation, ancient or modern; and, as Greece was a land of peculiarly marked characteristics, their

effect on the development of the civilisation of the Greek race is very marked and, consequently, easily traceable.

Starting with the major premiss that ease of existence is necessary for the development of civilisation, and that that ease could in the ancient world be attained in only three ways: by a conquest which resulted in the conquering race being able to set itself up as a ruling and privileged class exploiting an inferior race as tillers of the soil. by raiding on land or by sea: by improving methods of cultivation and developing trade: it is plain that the last of these could only be developed in regions and at times undisturbed by racial movements. The former were the expedients of an unsettled world.

Greece and the Greeks passed through all these three phases. It is little more than fifty years ago that the discoveries of Schliemann revealed to an astonished world a civilisation which existed in Greece long before anything which can be called a historic period, a civilisation which by some strange caprice legend had forgotten, though it had preserved the name of that family which ruled at Mycenae while still the authors of this civilisation held sway in Peloponnese. Curiously enough tradition had preserved in the Minos legend a reminiscence of that Cretan civilisation which was the parent of that at Mycenae But the Minos legend was regarded in modern times as a myth until when, a little more than thirty years ago, Evans disclosed to a still more astonished world the remains of the great palace at Cnossos (*see* CRETE), a few miles south of the modern Candia. This appears to have been the main centre of this civilisation; but other minor centres of it have been since discovered in various parts of Crete. Those best qualified to judge of it have come to the conclusion that the people who evolved it were not Indo-Europeans; and Africa has been suggested as their original home. It was, relative to the time, an advanced civilisation evolved apparently in Crete itself, and not imported from abroad It had won a footing at some unknown date on the Asiatic coast of the Aegean, and, seemingly in the first half of the second millennium before Christ, had established offshoots on the Greek mainland, first at Tiryns in the Argolid, and later at Mycenae, Sparta, in Boeotia, and in south-east Thessaly on the Pagasaetic Gulf The most essential feature of the later Minos legend is that this Cretan monarch exercised a *thalassocracy* (sea-power) in the Aegean; and the sites where remnants of this civilisation have been discovered confirm the legend that it was that of a people in command of the sea. It was thus a civilisation due to the fact that the control of sea communications rendered those who evolved it more or less free from the anxieties of food supply They found themselves in a position to develop those arts which are a part of material civilisation It is significant for the Greece of later times that this Cretan people developed to a high degree the art of draughtsmanship and painting In building and architecture too they must have been, judging from the remains of their palaces, far in advance of any other Mediterranean race of the time except the Egyptians This again is significant for later times

Racial parricide brought their civilisation to a close in Crete The final downfall of Cnossos, which took place about 1500 B C, seems to have been the work of those Cretan colonists who had been settled at Tiryns, Mycenae and elsewhere on the mainland of Greece (*See* AEGAEAN CIVILISATION)

The period of Mycenaean predominance and civilisation in Greece was brought to an end by a series of invasions from the north

The Invasions.—The first of these invasions was that of the Achaeans A branch of this people seems to have been settled in Thessaly from the very earliest times But the invaders came in all probability from the lands to the north of Greece They destroyed the power of the Mycenaean dynasts and Achaean chiefs took their place at such centres as Mycenae and Sparta (Another theory founded on the very uncertain evidence at present available is that the Achaeans descended on the Peloponnese as early as 2000 B C and formed a ruling minority among a population akin to that which had evolved the civilisation of Crete; and that some centuries after their settlement the civilisation of Crete made its way into Peloponnese, and was adopted by the Achaean dynasts) The Homeric epics depict their life in the period during which they dominated Greece, the life of a dominant military minority which has taken over the material elements of a civilisation superior to their own, but has not adopted its usages or ideas From this time forward for several centuries the daily life of the inhabitants of Greece was too hard and too anxious for them to have time to give thought to the attainment of the higher arts of civilisation Several centuries of turmoil, settlement and unsettlement followed, in which the strong had to give their whole minds to battling for what they had got, and the weak to getting what they could get If, as has been suggested, the tradition of the Trojan War enshrines the historical fact that the Achaeans were seeking to free the passage of the Hellespont, then it is fairly certain that the question of food supply was pressing on the land, and relief was even thus early being sought from the rich corn region of the north Euxine

The Achaean dominion in Greece may not have lasted more than a century Thesprotian and Boeotian movements southwards disturb middle Greece Achaeans driven from Thessaly evict the Ionian population of the northern fringe of Peloponnese; and finally the great Dorian invasion overruns the whole of that peninsula, and so, somewhere about 1150 B.C. (or, according to others, 1200 B C.) brings to an end the Achaean dominion The new race of still ruder civilisation than the Achaean, establishes itself as a dominant military caste in various of the southern regions of Greece

Food Shortage and Tyrants.—The social and economic development of the next five centuries was slow The aftermath of the storms of invasion took long to pass away Of the details of what passed in the centuries which immediately followed the coming of the Dorians nothing is known

Greece was too small and too poor to support both its old population and the successive waves of new comers, and first Ionians, and later Aeolians and others sought a refuge on the Asiatic coast of the Aegean[1]. But even so the pressure of population in Greece itself, a land of which only a little more than one-fifth is cultivable, seems to have been great Even on the richer Asiatic coast the food situation does not seem to have been secure, for the Ionians of that region are resorting to the Euxine at a very early date On the European side the new invaders, not originally sea-faring peoples, gradually develop some skill in navigation under the compulsion of circumstances, and one result of their activities and those of the Asiatic Greeks is that they gradually oust from the Aegean those Phoenicians who had stepped into the gap caused by the fall of the Cretan sea power That the Phoenicians had various settlements on the islands and coasts of the Aegean is undoubtedly the case, but the Greeks of a later age were apt to attribute to their remembered presence various things which went back to the almost forgotten Mycenean age

But living was precarious, and in Greece itself men's minds were so cumbered with the problem of the material that they had no time nor inclination to give thought to the intellectual life.

Experience in navigation led to the growth of trade, and with its profits some of the Greek states began to solve the food question by getting the means to purchase supplies from abroad instead of using the older method of piratical raiding This must have relieved, but obviously did not cure, the economic evils of the age The growth of a class which did not draw its living from the land in a country in which the land had been almost the sole source of livelihood was certain to eventuate in social and political changes The landless man and the poor landholder now found an ally in the commercial class whose social and political jealousy of the dominant landed aristocracy made it quite ready to make common cause with other enemies of the aristocrat The dynasts and nobility had owed their position to the necessity which the disorders of the past had imposed on the people generally of having leaders who could rally the population to resistance to the aggressor But that time had passed away, and probably with its passing the aristocracy had declined in fighting power.

[1]Some put the Aeolian migration before the Ionian

Moreover the tradition of later times ascribed unanimously to this period a growing demand on the part of the poorer classes for better conditions of life The old aristocracies sought to save the situation by sending off the discontented to new settlements overseas, and thus in the earlier half of the 8th century began that system of colonisation which was to have so marked an influence on the cultural development of the Greek race But even this could not save the old aristocratic system; and kingdoms and aristocracies fell one after the other before the attacks of the discontented classes

The newly acquired power of the many had to be consolidated if it were not to succumb once more to aristocracy; and so the leaders of popular movements found in many cases but little difficulty in concentrating in their own hands the control of the movement, and so establishing those tyrannies which the Greek democrat of later days regarded with even more dislike than the aristocracies which had preceded them Yet many of these tyrants were enlightened men who, in a hard, practical and sometimes brutal way, did much towards the development of Greek life on those lines which made the great period of the fifth century a realisable possibility. Many of them directed colonisation on lines which brought relief and profit to the states concerned

Colonisation and Trade.—These Greek *piéds-à-terre* abroad made trade easier, and, consequently, larger and more productive Planted in the richer lands of the Mediterranean and its branches their existence facilitated the getting of foreign foodstuffs, and their promotion of trade increased the means of purchase · The food problem became less pressing in some, at any rate, of the states of Greece Men came to regard the morrow with less apprehension, and so began to turn their thoughts to other things; and an easier mode of existence gave them the leisure for so doing Some writers of modern times have descanted on the development of Greek ideas by contact with the races with which the colonies brought them into contact That men's minds are enlarged by increased knowledge of the world is of course the case, but such advances as the Greek made in civilisation during the two centuries of colonisation cannot be ascribed to any impulse from outside the race, but to development within the Greek race itself The Asiatic Greeks were doubtless influenced by the material civilisation of Lydia; but, so far as it is known, it was a civilisation from which no intellectual impulse could be derived The colonies of the European Greeks were planted on the shores ' peoples inferior in civilisation to the Greeks themselves The wer of Greek *νόμος* (custom) was not to be shaken until the 'eks came into contact with a civilisation which had some inectual elements unrepresented in their own It was increased ' and resultant wealth and leisure which began to modify the 'k world, because it gave the Greek the time to think rade developed the Greek began to see more clearly where its lay. Manufactured articles, especially pottery and texrics, brought much gain in a world where manufacture was nfancy The products of the vine and the olive were of ir value at a time when the cultivation of them was much restricted than in later times Of this side of Greek agri-.e the history is only known in the case of Attica in the 6th ury, but it may be regarded as fairly certain that the trading ies of the 8th and 7th centuries, Corinth, Chalcis, Eretria, .icyon, Megara and Corcyra, not to mention the Asiatic cities, began to find that the hillslopes were better adapted to vine and olive cultivation than to the growth of cereals.

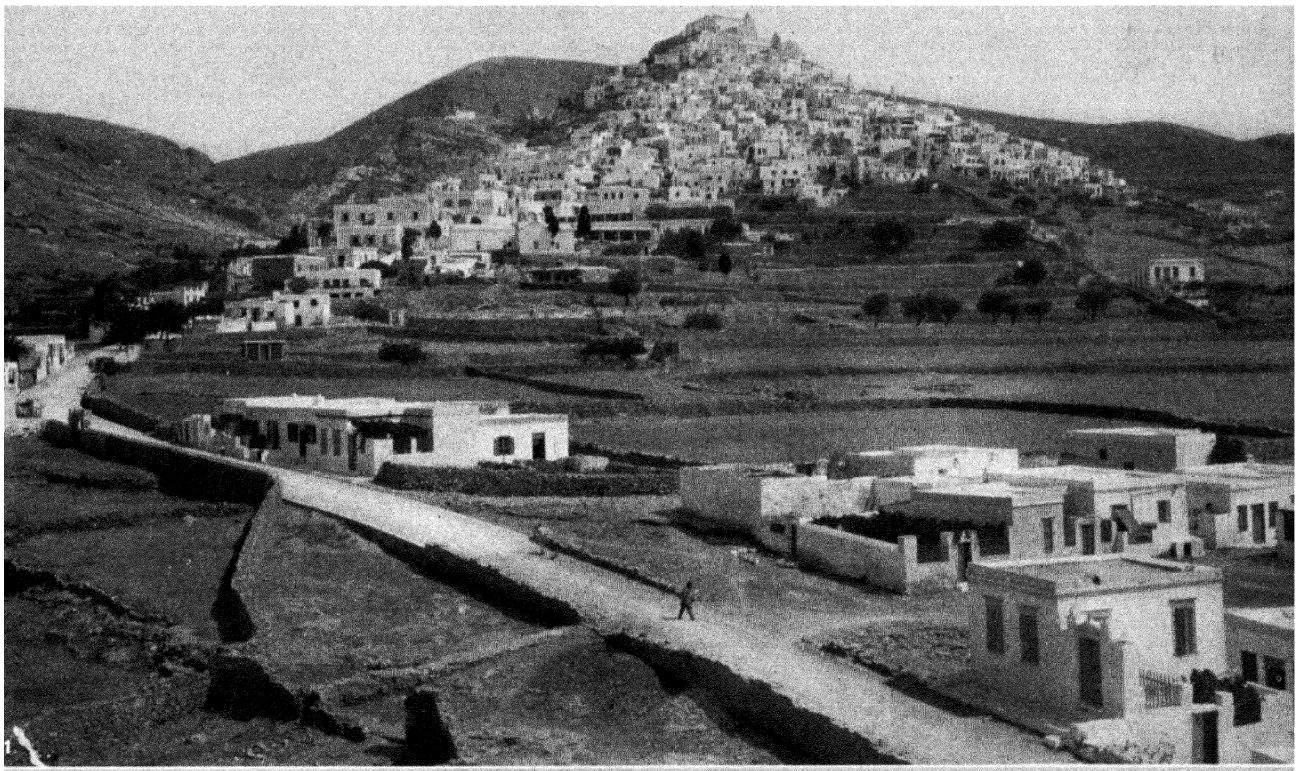
No longer haunted by the spectre of want, afforded a certain leisure by the increase of wealth, men's minds turned to other than material interests, and a revival of art began New essays in literature were attempted The epics and sagas of the heroic age had gradually declined into a dreary balladry which concerned itself largely with the lineage of those noble families which supported a balladmonger The old families were now passing into the background. Men wanted something more than the praise of families to which they did not belong; and so lyric poetry came from the country to the town, and was there elaborated by poetic genius. Composers of chronology anticipated the historians, and writers of route books the geographers of a later age.

Rise of Athens.—While between 800 and 600 B.C. the trading states especially had advanced in cultural development, a development in which the comparatively rich community of Sparta had shared, other Greek states, especially Attica, had remained in a more backward condition. Attica was still the typical self-centred Greek agricultural community. Lying away from the main land routes of the country, a region whose tracks were only culs-de-sac, it had been less affected than other states by the turmoil of the period of the invasions Apart from its remoteness, the poverty of its soil had never attracted the invading settler; and so it had not till the opening of the sixth century felt the pressure of overpopulation But it began to feel it then; and the dangerous discontent which resulted led to the appointment of Solon as arbiter between conflicting interests The food question was pressing The situation of a certain class of small cultivators was desperate. Taught, it may be, by the experience of other states, he determined to develop Attica as a trading state, so that by the export of manufactured articles the land might have the means of purchasing the corn it so sorely needed A drastic law made instruction in crafts practically compulsory This reform had eventually an enormous effect The evidence from Sicily shows that Attic trade with that island, which at the beginning of the century was practically nil, had developed so much by the end of it that it had become a formidable rival to that of Corinth. His agricultural reforms were not so successful It is indeed the case that the distressed class of the *Hektemoroi* disappears, probably converted by his reforms into small owners instead of tenants, but a large, and probably distinct, class, the Diacrii, who cultivated the hillslopes, were so badly situated that thirty years after Solon's time they established a leader, Peisistratus, as tyrant in their interest His tyranny, though intermittent, did wonders for agricultural development His main policy was to convert the Diacrii from the error of their ways of agriculture, and to provide them with the capital necessary for the establishment of vine and olive cultivation on those slopes where an attempted cultivation of cereals could only result, at best, in chronic failure An acre of hillslope under the vine and olive produced that which could purchase far more corn than ever that acre could grow From his time forward Attic agriculture enjoyed a prosperity which only the ravages of war could impair Solon and Peisistratus revolutionised the economic position of Attica

It is evident that the last part of the sixth century introduced a new and troublesome factor into Athenian life, unemployment. The old historians refer to it in the fifth century, but it had its roots in the sixth in all probability They never say, however, to what cause it was due, but analogies from other periods in ancient history make it probable that it was due to the competition of slave labour, especially in manufactures

In the great fifth century the economic, social and intellectual development is largely centred in Attica, though in this century, as in the last, the greatest intellectual movement of the time originated in the Greek world outside Greece itself Previous centuries had solved two of the main factors in the question of food supply, sources and purchasing power There remained another, the safeguarding of the avenues from the sources That was solved by the great Athenian fleet which the revenues from that empire formed in the period succeeding the Persian War of 480–479 rendered possible The insecure passage to the Euxine was rendered safe from Persian or other interference. Of the literary development in this century enough is said elsewhere But this fact with regard to it must be emphasised, that it was largely due to that security of economic conditions which had been attained gradually in previous centuries, and was greatly enhanced in the present one by the victory over Persia.

Life in the Fifth Century B.C.—It is perhaps impossible to realise the life of the average Greek of the fifth century All that appears in, or can be deduced from, extant literature is the life of a select few at Athens. To the majority of Greeks life year in and year out was passed in days of work on the land, ploughing, sowing and reaping the corn crops, tending the vineyards and olive grounds. They loved the work. They loved too





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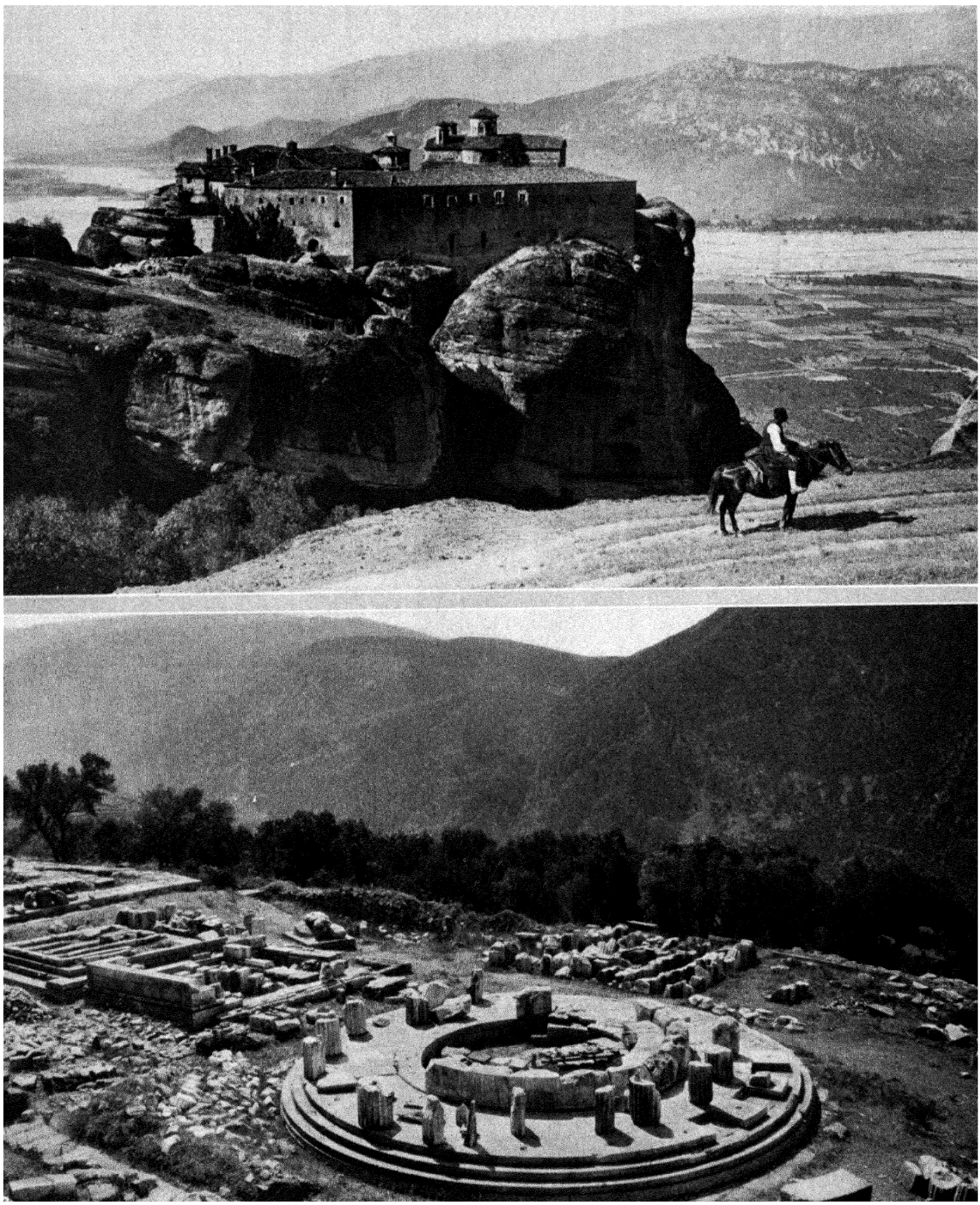
GREEK ISLAND SCENERY

1. View of the Island of Melos, one of the Cyclades. The conical hill bearing the modern town of Kastro is shown. Near the summit which commands a wide view stands the sailors' church, Panagia Thalassine or Our Lady of the Sea. The ancient town of Melos, within which the famous statue of the Venus of Milo was found lay at a lower level

2. Mount Oxoburgo in Tinos, another of the Cyclades Islands. The rocky summit is crowned by the ruins of the Venetian citadel. The lower slopes on which the village is placed are elaborately terraced for the production of vines, the local wine having some repute

GREECE



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MEDIAEVAL AND ANCIENT GREECE

1. Monastery of St. Stephen, founded by the Byzantine emperor Andronicus III. in the 14th century; one of the 14 meteora or "hanging" monasteries built on isolated rocks in Thessaly, northern Greece. This monastery is separated from the ground behind by a deep narrow chasm, which is spanned by a drawbridge (seen at the left centre of the picture). 2. Ruins at Delphi, recently uncovered on the spot known as the Marmaria. They comprise: two limestone Doric temples of the 4th and 5th centuries, one dedicated to *Athena Pronaia*, the other to *Athena Ergane;* and the Tholos, a circular marble building with Corinthian columns of the 5th century B.C.

the interludes of little country festivals, and enjoyed such visits to the city as they made for business purposes or to see the sights and hear the latest drama. In the trading and manufacturing cities there were the craftsmen and sailors, though the large manufacturers employed slaves largely Still there must have been considerable numbers of small craftsmen working on their own account

For the rest the people as a whole were very unsophisticated, very impressionable and very superstitious Progressive in political ideas, they were singularly conservative of the superstitions of religion, and quite ready to kill anyone who slighted, or seemed to slight, their age-old religious beliefs They were more quick-witted than other races of the time; but, like other races of their type, had more capacity for conceiving the end than for devising the means.

Imaginative writers of modern times have written Greek history in such a way as to convey the impression that Athens in this century was full of potential Aeschyluses and Pericleses. No century can produce many men of outstanding genius The glory of the fifth century is that it produced more than any other century in the long history of the old world The idealised society of Thucydides' version of the funeral speech of Pericles has been taken as a true picture of social life in Athens in the latter half of the century, regardless of the very different picture implied in the contemporary plays of Aristophanes Thucydides drew the picture of an ideal, not of an actuality.

The intellectual life of the time was lived by the learned few, the sophists or teachers, and those who had money enough and leisure enough to attend their lectures The mass of the Greek people went meanwhile its own way doing its daily work getting as much enjoyment as possible out of life but not worrying itself about abstract questions of a philosophical nature, the discussion of which it could not afford to hear Only such intellectual matter as promised to bring some material gain appealed to the average man

In the sixth century the Ionian cities of Asia had taken the lead in intellectual development It was from Sicily that the next great movement came Between 470 and 460 the states of the island passed from tyranny to democracy Hitherto the Greek had left the art of persuasion to those who had the gift of eloquence Certain clever heads in Sicily, however, conceived the idea that the art ran on certain lines which could easily be reduced to rules such as any man could learn under proper instruction This was the beginning of rhetoric It was naturally taken up keenly by those who had ambitions in the new democratic politics But it was further recognised that underneath this practical science lay a more abstract science, that of Politics. so teachers of this arose The sophists who taught it sailed with the wind, justifying Athenian imperialism by the dictum that the state existed by convention, the concession of the strong to the weak, and not by any divine ordering of nature, and flattering those who could afford to attend their lectures by laying down that only the wise should rule, that is to say, those who had studied politics under them

The general result of the intellectual movement was that both the wise and the unwise sought political distinction by two different roads, the wise by two abortive attempts at revolution, the unwise by a disastrous essay at world dominion Socrates was the last great intellectual figure of the fifth century, teacher of doctrines which would have made the world and its people better had they only been able to interpret them aright Some, like Critias, misinterpreted them to their own undoing, others, the mass of the Athenian people, to the undoing of the teacher

The Change in the Fourth Century.—Then comes the fourth century, the history of which is the story of what is in some of its aspects that of the greatest failure in history A century which produced Plato and Aristotle ought to have been great. Their works are in their different ways absolutely unique in literature. They summarize and expand the teachings of the past age, carrying far beyond their previous limits all the ideas which had emanated ultimately from the natural philosophy of Ionia and the political philosophy of Sicily. For the present consideration it is the practical side of their teaching which is important Each in his different way tries (by suggesting forms of constitution other than those under which the race had fallen into political decadence) to rescue that Greek world which was so much to him from the political and social disaster to which it is rushing But the Greek world was past saving.

The material life of the fourth century presents problems the solution of which is, in the absence of evidence, impossible at the present day Despite the almost incessant warfare and political turmoil of the time the Greek states are in a better financial position than they were in the fifth century They can face expenditure which would have ruined them in the previous age. Greek commerce must have expanded Its decline begins with the gradual introduction of a gold standard into Mediterranean trade, rendered possible by the enormous mass of Persian gold which was let loose on the world by the conquests of Alexander the Great.

The Currency Crisis of the Third Century.—By the time that the third century begins the trader of European Greece is seeking to save the commercial situation by acquiring gold for currency purposes The Thasian gold mines were either worked out, or at any rate did not supply anything like the requisite quantity of the precious metal In the lands of barbarism there were two regions from which it might be acquired, that in western Dacia, the modern Transylvania, and a smaller one in the extreme north of Illyria Within the old area of Dacia there have been found in modern times considerable hoards of Thasian coins of the third century the presence of which can only be accounted for by the purchase of gold in the region on the part of the mine-owners in Thasos and on the neighbouring mainland Corcyra in the same period developed colonising activity up the east coast of the Adriatic, at Black Corcyra and elsewhere, probably with intent to get into touch with the Illyrian gold region

Scientific financial statistics can rarely be drawn from the records of ancient history; but there is good reason to believe that the ratios of value between gold and silver which in the fifth century had been 10 1, had in the third century risen to 13½ 1, so something had to be done if Greek trade with its silver standard was to be saved. The success of the efforts at salvation was partial The trading cities of the south Italian coast fell rapidly into commercial decline Even the wealthy Sicily ceases to hold in the world the prominent position she had held in the fifth century In Greece Corinth alone maintained that impregnable trade position which her situation afforded her For the rest the tendency was for the centre of gravity of Greek trade to revert once more after several centuries to the east coast of the Aegean, especially to Rhodes The position of that island on the route from Greece to the Syrian ports, and on what was probably the most popular route to Egypt, had always promoted its trade development The Athenian tribute lists of the latter half of the fifth century suggest that Rhodes was developing rapidly as a trade centre at that time, though it is not possible to say why. During the third century and the earlier part of the second she was by far the greatest trading centre in the Greek-speaking world, a position due to the fact that she maintained her independence of the kingdoms of the Diadochi, and was at the meeting point of the trade of the three great realms of the Macedonian kings, of the Seleucids of Asia and of the Ptolemies of Egypt The importance of the Aegean as a centre of trade in the world of that period is shown by the eagerness of the otherwise self-centred and, economically speaking, self-satisfied rulers of Egypt to get a footing in it

Rhodes almost dominated the commercial world of the Levant until Roman political morality, debased by the growth of commercialism, established a rival centre at Delos, and thus with gross ingratitude impaired enormously the prosperity of a state which had been one of her most faithful allies. But Rhodes had already illustrated the connection between national prosperity and intellectual advancement by becoming one of the great schools of the world of the time

A special and peculiarly puzzling problem of fourth century economics is the financial crisis in Sparta early in the century,

brought about by the impoverishment of many of the Spartiate landholders. To such a state were they reduced that they were unable to pay their contributions to the communal life, and thus lost their privileged political status This is one of the inexplicable enigmas among the many connected with the history of that enigmatic state (*See* SPARTA.)

Perhaps the most difficult problem of ancient economic life is the part which currency played in it Dearness of money is a disturbing element even in the modern world where currency is relatively far more abundant than it ever was, even under the most favourable circumstances, in the world of Greece or even of Rome The control of currency when coined money is scarce brings enormous profits to those who control it The ancient world recognized this and disliked it It regarded gain made by barren metal as contrary to nature Currency did certainly at its first introduction into Mediterranean commerce create considerable economic difficulties Some modern critics have ascribed to it the economic difficulties of Solon's time But these were probably due to cruder causes Currency had come to stay whether the thinkers of the ancient world disliked it or not

The dominating position of Athens in the world of the fifth century may have been largely due to the fact that she controlled the two main sources of silver bullion accessible to the Greeks The finances of the Athenian empire could not have been supported by the tribute alone; and customs duties at Piraeeus brought in what was relatively but a small sum

From the profits of Laureion alone she was, ere ever any tribute came to her, able to pay the expenses of the creation and upkeep of a fleet such as the Greek world had never known When the mines of Thasos and the opposite mainland fell largely, if not wholly, under her control, the profits of selling silver to a Greek trading world with a silver standard, and, in the main, a silver currency, must have been very great In the fourth century and even later Attic coinage is circulating far beyond the bounds of the Greek world, and the barbarians of central Asia will only accept coinage with the Attic stamp The gradual introduction of a gold standard must have greatly weakened her position, and the introduction of Roman coinage into the East must have destroyed it But, in a world where means of communication are few, slow and expensive, the man, corporation or state which has large control of currency can buy at a cheap rate from those who have goods to dispose of, and want, not exchange, but a medium of exchange The dominant position of the great companies of Roman *negotiatores* in the last century of the Republic must have been largely due to a wide control of the floating currency capital of the world of their day

Slave and Free Labour.—That slavery as an institution lay largely at the basis of ancient life is unquestionably the case; but that it played the overwhelming part which some modern authorities have attributed to it is not true The mass of the population of the ancient world was too poor to afford the purchase of a single slave, and as an institution it is chiefly connected with some capitalist class In Greece the small farmer worked his own land, partly because it was almost a hereditary instinct with him to do so, partly because he did not want assistance outside his own family, and, if he had wanted it, could not have afforded to purchase slave labour In Greek domestic life slavery played comparatively little part It was in manufactures and crafts, in factories on some scale owned by men with capital, that the slave played most part in Greece Arguments have been put forward in modern times with intent to show that slave labour was cheaper or more expensive than free labour It may be taken as at least probable that those who employed slave labour did so either because there was a shortage in the free labour market, or because it was cheaper The investment of capital in slave labour is a marked feature in ancient economics As to the relative cost of free and slave labour, that would depend on the circumstances of the time the wealth of a community at any given age, and the supply of slaves in the market, a supply largely dependent on the wars of the time After the Persian wars of the fifth century slaves were cheap, and trade and capital greatly increased, so that it is probable that slave labour, especially in Athens, caused unemployment among the lower classes of the citizens At other times data of wages seem to show that free labour was cheaper than that of slaves The economic circumstances, which varied greatly in different periods, produced the variation in values

The moral attitude of the Greek world towards slavery until the middle of the fourth century was quite simple—that slavery, having existed from time immemorial, was a natural institution, and therefore morally justifiable in the case of inferior races. In Aristotle's day certain philosophers raised the question of its justifiability, taking up a position which Aristotle himself refused to accept Later still the Stoics raised the question in a more emphatic form, and, though theorising could not kill so old an institution, yet it did undoubtedly lead men in general to deal more humanely with the slave In any case the Greek had always shown to the servile class a consideration which was not general in the ancient world

The period of the Diadochi which intervenes between Alexander and the subjection of the Greek world to Roman sway is one of such contrasts that it is difficult to estimate whether in respect to civilisation it marks an advance or decline as compared with former things The Hellenistic world was harassed by war and disorder due to the clash of ambitions among the successors of Alexander Egypt was least disturbed by this turmoil, and so Alexandria became a centre of intellectual culture where the learning of the past was studied and preserved by the greatest scholars of the age The wealth and the comparative peacefulness of the life of Rhodes attracted the teachers and litterateurs of the time, while Athens, treated by reason of its past reputation with more respect and political tolerance than it perhaps deserved, maintained a disputatious intellectual life which busied itself with matters of little moment to any save those who discussed them.

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POST-CLASSICAL AND MEDIAEVAL HISTORY

1. The Period of Roman Rule.—(i) *Greece under the Republic* (146–127 B C) After the collapse of the Achaean League (*q v*) the Senate appointed a commission to reorganize Greece as a Roman dependency Corinth, the chief centre of resistance, was destroyed, the national and cantonal federations were dissolved, commercial intercourse between cities was restricted, and the government transferred from the democracies to the propertied classes, whose interests were bound up with Roman supremacy Some favoured states like Athens and Sparta retained their rights as *civitates liberae*, the other cities continued to enjoy local self-government, but probably were subjected to payment of tribute General powers of supervision were entrusted to the governor of Macedonia, who could reserve cases of high treason for his decision, and in case of need send troops into the country The internal disorder which remained over from the previous political revolutions was checked by the historian Polybius, whom the Senate deputed to mediate between the litigants Greece was seriously disturbed during the first Mithridatic War (88–84 B C), when many of its cities sided with Mithridates (*q v*) The success which the invader experienced in detaching the Greeks from Rome is partly to be explained by the way in which his agents incited the imperialistic ambitions of cities like Athens, partly by his promises of support to the democratic parties The result of the war was disastrous to Greece Apart from the confiscations and exactions by which the Roman general L Cornelius Sulla punished the disloyal communities, the extensive and protracted campaigns left Central Greece in a ruinous condition During the last decades of the Roman republic oppression by officials who traversed Greece from time to time and demanded lavish entertainments and presentations in the guise of *viaticum* or *aurum coronarium* was not unknown. Still greater was the suffering

produced by the rapacity of Roman traders and capitalists. It is recorded that Sicyon was reduced to sell its most cherished art treasures in order to satisfy its creditors. A further hindrance to Greek prosperity was the diversion of trade which followed upon the establishment of direct communication between Italy and the Levant. The coast districts and islands suffered considerably from swarms of pirates who freely plundered the chief trading places and sanctuaries; the most notable of such visitations was experienced in 69 B C by the island of Delos. This evil came to an end with the general suppression of piracy in the Mediterranean by Pompey (67 B C), who settled some of his captives on the desolated coast of Achaea

In the conflict between Julius Caesar and Pompey the Greeks provided the latter with a part of his excellent fleet. In 48 B C the decisive campaign was fought on Greek soil, and the resources of the land were severely taxed by the requisitions of both armies As a result of Caesar's victory at Pharsalus the whole country fell into his power, but the treatment which it received was on the whole lenient After the murder of Caesar the Greeks supported the cause of Brutus (42 B C.), but were too weak to render much service They subsequently passed into the hands of M Antonius, who imposed further exactions to defray the cost of his wars The extensive levies and requisitions which he made in 31 B C for his campaign against Octavian exhausted the country so completely that after the battle of Actium Octavian had to take prompt measures to avert a general famine The depopulation which resulted from the civil wars was partly remedied by the settlement of colonists at Corinth and Patrae by Julius Caesar and Octavian, on the other hand, the foundation of Nicopolis (*q v*) by the latter merely had the effect of transferring the people from the country to the city

(ii) *The Early Roman Empire* (27 B C–A D 323)—Under the emperor Augustus Thessaly was incorporated with Macedonia, the rest of Greece was converted into the province of Achaea, under the control of a senatorial proconsul resident at Corinth Several states, including Athens and Sparta, retained their rights as free cities The provincials were encouraged to send delegates to a synod which met at Argos to consider the general interests of the country and to uphold national Hellenic sentiment, the Delphic amphictyony was revived and extended so as to represent in a similar fashion northern and central Greece

Economic conditions did not greatly improve under the empire Although new industries sprang up to meet the needs of Roman luxury, and Greek marble, textiles and table delicacies were in demand, the only cities which regained a flourishing trade were the partly Italian communities of Corinth and Patrae Commerce languished in general, and the soil was mainly abandoned to pasturage Such wealth as remained was amassed in the hands of a few great landowners and capitalists, the middle class continued to dwindle, and many people became dependent on doles and largesses

After a long period of stress, the European Hellenes relapsed into a resigned frame of mind Seeing no future before them, the inhabitants were content to dwell in contemplation amid the glories of the past National pride was fostered by the undisguised respect with which the leading Romans treated Hellenic culture A healthy social tone repressed the ostentatious display of wealth, and good taste long checked the spread of gladiatorial contests beyond the Italian community of Corinth In order to perpetuate their old culture, the Greeks continued to set great store by classical education, and in Athens they possessed one of the chief universities in the Roman empire The highest representatives of this type of old-world refinement are to be found in Dio Chrysostom and especially in Plutarch of Chaeroneia (*q v*) The Greeks had so far lost their warlike qualities that they supplied scarcely any recruits to the army They retained too much local patriotism to crowd into the official careers of senators or imperial servants Although in the 1st century A D the astute Greek man of affairs and the *Graeculus esuriens* of Juvenal abounded in Rome, both these classes were mainly derived from the less pure-blooded population beyond the Aegean The influx of Greek rhetoricians and professors into Italy during the 2nd and 3rd centuries was balanced by the large number of travellers who came to Greece to frequent its sanatoria, and admire its works of art, the abundance in which these latter were preserved is strikingly attested in the extant record of Pausanias (about A D. 170)

In A D. 15 the Greeks petitioned Tiberius to transfer the administration to an imperial legate This new arrangement was sanctioned, but only lasted till A D 44, when Claudius restored the province to the senate The years 66 and 67 were marked by a visit of the emperor Nero, who made a prolonged tour in order to display his artistic accomplishments at the various national festivals In return for the flattering reception accorded to him he bestowed freedom and exemption from tribute upon the country. But this favour was speedily revoked by the emperor Vespasian, and it was neutralized at the outset by the wholesale depredations of Nero among the Greek collections of art Important material benefits were conferred by Hadrian, who made a lengthy visit to Greece Besides erecting public works in many cities, he relieved Achaea of arrears of tribute and exempted it from various imposts He fostered national sentiment by establishing a new pan-Hellenic congress at Athens In the 3rd century Greece again experienced danger from foreign invasions Already in 175 a tribe named Costoboci had penetrated into central Greece, but was there broken up by the local militia In 253 a threatened attack was averted by the stubborn resistance of Thessalonica In 267–268 the province was overrun by Gothic bands, which captured Athens and some other towns, but were finally repulsed by the Attic levies under Dexippus, the historian, and exterminated with the help of a Roman fleet

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(iii) *The Late Roman Empire*—After the reorganization of the empire by Diocletian, Achaea occupied a prominent position in the "diocese" of Moesia Under Constantine I Macedonia was a "diocese" of the "prefecture" of Illyricum, and was subdivided into the "eparchies" of Thessaly, Achaea (including some of the Ionian and Aegean Islands), "Old" Epeiros (including Corfu and Ithake), and Crete while the other Greek islands formed an "eparchy" of the "diocese" of Asia A complex hierarchy of imperial officials was introduced and the system of taxation elaborated so as to yield a steady revenue to the central power The levying of the land-tax was imposed upon the δεκάπρωτοι or "ten leading men," who, like the Latin *decuriones*, were entrusted henceforth with the administration in most cities The tendency to reduce all constitutions to the Roman municipal pattern became prevalent under the rulers of this period, and many were stereotyped by the general regulations of the Codex Theodosianus (438) Although the elevation of Constantinople to the rank of capital was prejudicial to Greece, which felt the competition of the new centre of culture and learning and had to part with numerous works of art to embellish its privileged neighbour, the general level of prosperity in the 4th century was rising Commercial stagnation was checked by a renewed expansion of trade consequent upon the diversion of the trade routes to the east from Egypt to the Euxine and Aegean Seas Agriculture remained depressed, and many small proprietors were reduced to serfdom; but the fiscal interests of the government called for the good treatment of this class, whose growth at the expense of the slaves was an important step in the gradual equalization of the entire population under the central despotism which restored solidarity to the Greek nation

This prosperity received a sharp set-back by a series of unusually severe earthquakes in 375 and by the irruption of a host of Visigoths under Alaric (395–396), whom the imperial officers allowed to overrun the whole land unmolested and the local levies were unable to check Though ultimately hunted down in Arcadia and induced to leave the province, Alaric had time to execute systematic devastations which crippled Greece for decades The arrears of taxation which accumulated in consequence were

remitted by Theodosius II, the husband of an Athenian, in 428

The emperors of the 4th century attempted to stamp out by edict the old pagan religion, but except for the decree of Theodosius I by which the Olympic games were interdicted (394), these measures had no great effect, and indeed were not rigorously enforced Paganism survived in Greece till about 600—in the Laconian mountains still later The sure footing gained by the Christian Church upon the Greeks was strengthened by the judicious manner in which the clergy, unsupported by official patronage and often out of sympathy with the Arian emperors, identified itself with the interests of the people Though in the days when the orthodox Church found favour at court corruption spread among its higher branches, the clergy as a whole rendered conspicuous service in opposing the arbitrary interferences of the central government and in upholding the Hellenic tongue and culture

The separation of the eastern and western provinces of the empire ultimately had an important effect in restoring the language and customs of Greece to their predominant position in the Levant This result, however, was long retarded by the romanizing policy of Constantine and his successors The emperors of the 5th and 6th centuries had no regard for Greek culture, and Justinian I actively counteracted Hellenism by propagating Roman law in Greece, by impairing the powers of the self-governing cities, and by closing the philosophical schools at Athens (529) In course of time the inhabitants had so far forgotten their ancient culture that they abandoned the name of Hellenes for that of Romans (*Rhomaioi*) For a long time Greece continued to be an obscure and neglected province, with no interests beyond its church and its commercial operations, and its culture declined rapidly Its history for some centuries dwindles into a record of barbarian invasions, plagues and earthquakes In the 5th century Greece was only subjected to brief raids by Vandal pirates (466–474) and Ostrogoths (482) In Justinian's reign irruptions by Huns and Avars took place, but led to no far-reaching results The emperor had endeavoured to strengthen the country's defences by repairing the fortifications of cities and frontier posts (530), but his policy of supplanting the local guards by imperial troops and so rendering the natives incapable of self-defence was ill-advised

Towards the end of the century mention is made for the first time of a big incursion by Slavonic tribes (581) These invaders are to be regarded as the forerunners of a steady movement of immigration by which a considerable part of Greece passed for a time into foreign hands The newcomers, consisting mainly of Slovenes and Wends, occupied the mountainous inland, where they mostly led a pastoral life, the natives retained some strips of plain and dwelt secure in their walled towns, among which the newly-built fortresses of Monemvasia, Corone and Calamata soon rose to prosperity The Slavonic element, to judge by the geographical names in that tongue which survive, is specially marked in N W Greece and Peloponnesus, central Greece appears to have been protected against them by the fortress-square of Chalcis, Thebes, Corinth and Athens. The central government took no steps to dislodge the invaders, until in 783 the empress Irene sent an expedition which reduced most of the tribes to pay tribute. In 807 a desperate attempt by the Slavs to capture Patras was foiled, henceforth their power steadily decreased and their submission to the emperor was made complete by 850 A powerful factor in their subjugation was the Greek clergy, who by the 10th century had christianized and largely hellenized all the foreigners save a remnant in the peninsula of Maina

II. The Byzantine Period.—In the 7th century the Greek language made its way into the imperial army and civil service, but European Greece continued to have little voice in the administration The land was divided into four "themes" under a yearly appointed civil and military governor Imperial troops were stationed at the chief strategic points, while the natives contributed ships for naval defence During the dispute about images the Greeks were the backbone of the image-worshipping party, and the iconoclastic edicts of Leo III led to a revolt in 727 which, however, was easily crushed by the imperial fleet, a similar movement in 823, when the Greeks sent 350 ships to aid a pretender, met with the same fate. The firm government of the Isaurian dynasty seems to have benefited Greece, whose commerce and industry again flourished. In spite of occasional set-backs due to the depredations of pirates, notably the Arab corsairs the Greeks remained the chief carriers in the Levant until the rise of the Italian republics, supplying all Europe with its silk fabrics

In the 10th century Greece experienced a renewal of raids from the Balkan tribes The Bulgarians made incursions after 929 and sometimes penetrated to the Isthmus, but in 995 their strength was broken by a crushing defeat on the Spercheios at the hands of the Byzantine army, and after a still greater victory, Basil II "the Bulgar-slayer," in 1018 prayed in the church which had arisen out of the Parthenon. Yet their devastations greatly thinned the population of northern Greece, and after 1084 Thessaly was occupied without resistance by nomad tribes of Vlachs In 1084 also Greece was subjected to the first attack from the new nations of the west, when the Sicilian Normans gained a footing in the Ionian islands The same people made a notable raid upon the seaboard of Greece in 1146, and sacked the cities of Thebes and Corinth The Venetians also appear as rivals of the Greeks, and after 1122 their encroachments in the Aegean Sea began In spite of these attacks, the country on the whole maintained its prosperity

III. The Latin Occupation and Turkish Conquest.—The capture of Constantinople and dissolution of the Byzantine empire by the Latins (1204) brought in its train an invasion of Greece by Frankish barons The natives, who had long forgotten the use of arms and dreaded no worse oppression from their new masters, submitted almost without resistance, and practically only the N W corner of Greece, where Michael Angelus a Byzantine prince, founded the "despotat" of Epirus, was saved from foreign occupation The rest of the country was divided up between a number of Frankish barons, chief among whom were the princes of Achaea (or Peloponnese) and "grand lords" of Thebes and Athens, the Venetians, who held commercial stations at different maritime points, and the islands of Crete, and ultimately Euboea, and various Italian adventurers who mainly settled in the Cyclades which became "the duchy of the Archipelago" with Naxos as its capital The conquerors transplanted their own language, customs and religion to their new possessions, and endeavoured to institute the feudal system of land-tenure, but they allowed the natives to retain their law and internal administration and confirmed proprietors in possession of their land on payment of a rent, the Greek church was subordinated to the Roman archbishops, and its dignitaries exiled It later regained its former control over the people

Greek history during the Latin occupation loses its unity and has to be followed in several threads In the north the "despots" of Epirus extended their rule to Thessaly and Macedonia, but eventually were repulsed by the Asiatic Greeks of Nicaea, and after a decisive defeat at Pelagonia (1259) reduced to a small dominion in Epirus, while Thessaly from 1271 to 1318 was governed by a branch line of the Epirote dynasty, when it was united with the Catalan duchy of Athens In 1349 it was conquered along with Epirus by Stephen Dushan, tsar of Serbia In 1393 it was annexed by the Ottoman Turks, who in 1479 wrested the last fortress in Epirus from its latest possessors, the Beneventine family of Tocco, which from 1357 had held the Palatine County of Cephalonia, likewise annexed by the Turks in 1479 but soon occupied by the Venetians

The leading power in central Greece was the Burgundian house de la Roche, which established a mild and judicious government in Boeotia and Attica, and which in 1261 was raised to ducal rank by the French king Louis IX A conflict with the Grand Catalan Company resulted in a disastrous defeat of the Franks on the Boeotian Cephissus (1311) and the occupation of central Greece by the Spanish mercenaries, who seized for themselves the barons' fiefs and installed princes from the Sicilian house of Aragon as dukes of Athens and soon of Neopatras (Hypate) These absentees after 77 years of oppressive rule and constant wars with their neighbours the Catalans were expelled by the Floren-

tine Lord of Corinth, Nerio Acciaiuoli. The new dynasty, whose peaceful government revived its subjects' industry, survived a brief Venetian occupation, but was deposed by Sultan Mohammed II, who annexed Athens in 1456, and Thebes with the rest of Boeotia in 1460.

The conquest of the Peloponnese was effected by two French knights, William Champlitte and Geoffrey Villehardouin, the latter of whom founded a dynasty of "princes of all Achaea" The rulers of this line were men of ability, who controlled their barons and spiritual vassals with a firm hand and established good order throughout their province The Franks of the Morea maintained as high a standard of culture as their compatriots at home, while the natives grew rich enough from their industry to pay considerable taxes without discontent The climax of the Villehardouins' power was attained under Prince William, who subdued the Byzantine Gibraltar of Monemoasia and the mountaineers of Maina (1246–1249) In 1259, however, the same ruler was involved in the war between the rulers of Epirus and Nicaea, and being captured at the battle of Pelagonia, could only ransom himself by the cession of the Frankish quadrilateral of Monemoasia, Maina, Mistrā and perhaps Geraki in 1262 to the restored Byzantine empire This Byzantine province with its capital at Mistrā after 1348 was treated with great care by the Byzantine monarchs, who sought to repress the violence of the local aristocracies by sending their kinsmen to govern under the title of "despots" On the other hand, with the extinction of the Villehardouin dynasty the Frankish province fell into anarchy, at the same time the numbers of the foreigners were constantly dwindling through war, and as they disdained to recruit them by intermarriage, the preponderance of the native element in the Morea eventually became complete Thus by 1400 the Byzantines recovered control over almost the whole peninsula and apportioned it among several "despots," and in 1432 the last Frankish prince of Achaea died and the whole of the Peloponnese was Greek But the mutual quarrels of these princes soon proved fatal to their rule Already in the 14th century they had employed Albanians and the Turkish pirates who harried their coasts as auxiliaries in their wars The Albanians largely remained as settlers, and the connection with the Turks could no longer be shaken off In spite of attempts to fortify the Isthmus (1415) an Ottoman army penetrated into the Morea and imposed a tribute on the inhabitants in 1423 An invasion of central Greece by the despot Constantine, afterwards the last Greek emperor, was punished by a renewed raid in 1446 In 1457, his brother, the despot Thomas withheld the tribute which he had recently stipulated to pay, but was reduced to obedience by an expedition under Mahommed II (1458) His quarrels with his brother Demetrius and inability to pay the tribute was punished by an invasion attended with executions and deportations on a large scale, and by the annexation of the Morea to Turkey (1460)

MODERN HISTORY

The Turkish Dominion till 1800.—Under the Ottoman government Greece proper was split up into six *sanjaks* or military divisions (1) Morea, (2) Epirus, (3) Thessaly, (4) Euboea, Boeotia and Attica, (5) Aetolia and Acarnania, (6) the rest of central Greece, with capitals at Nauplia, Yannina, Trikkala, Negropont (Chalkis), Karlili and Lepanto, further divisions were subsequently composed of Crete and the islands In each *sanjak* a number of fiefs were apportioned to Turkish settlers, who were bound in return to furnish some mounted men for the sultan's army, the total force thus held in readiness being over 7,000 The local government was left in the hands of the *demogérontes* or primates in each community, who also undertook the farming of the taxes and the policing of their districts. Law was usually administered by the Greek clergy The natives were not burdened with large imposts, but suffered under the method of raising the land-tithes, the capitation-tax, the requisition of forced labour and the tribute of children for the janissaries (*q v*), as well as under oppression from Turkish or native local potentates, which the weak central government was powerless to suppress The new rulers met with singularly little opposition The dangerous elements of the population had been cleared away by Mohammed's executions, the rest were content to absorb their energies in agriculture and commerce, which in spite of preferential duties and capitulations to foreign powers largely fell again into the hands of Greeks Another important instrument by which the people were kept down was their own clergy, whom the Turkish rulers treated with marked favour and so induced to acquiesce in their dominion

In the following centuries Greece was often the theatre of war in which the Greeks played but a passive part Two wars with Venice (1463–79, 1499–1503) put the Turks in possession of the last Venetian strongholds on the mainland, except Nauplia and Monemvasia, lost in 1540 But the issue was mainly fought out at sea Greek ships and sailors were frequently requisitioned for the Turkish fleets, and the damage done to the Greek seaboard by the belligerents and by fleets of adventurers and corsairs brought about the depopulation of many islands and coast-strips The conquest of the Aegean, except Tenos, by the Ottomans was completed by 1566; but Venice retained Crete till 1669 and never lost Corfu until its cession to France in 1797

In 1684 the Venetians took advantage of the preoccupation of Turkey on the Danube to attack the Morea By 1687 they had conquered almost the whole peninsula, and also captured Athens and Lepanto, but the former town had soon to be abandoned, and with their failure to capture Negropont (1688) the Venetians were brought to a standstill By the peace of Karlowitz (1699) the Morea became a possession of Venice The new rulers, in spite of the commercial restrictions which they imposed in favour of their own traders, checked the impoverishment and decrease of population (from 300,000 to 86,000) which the war had caused But their rule, though mild, was not popular, and the population failed to support them when the Ottomans again attacked the Morea (1715), which by the peace of Passarowitz (1718) again became a Turkish dependency The gaps left about this time in the Greek population were largely made up by an immigration from Albania

The condition of the Greeks improved in the 18th century Already in the 17th century the personal services of the subjects had been commuted into money contributions, and since 1676 the tribute of children had fallen into abeyance Greek officials were increasingly used in the Turkish civil service and privileges were accorded to the Greek clergy throughout the Balkan countries The education of the Greeks, which had always remained on a comparatively high level, was rapidly improved by the foundation of new schools and academies, especially at Yannina

At the beginning of the 19th century Greece was still under Turkish domination, but the decadence of the Ottoman empire already showed in the weakening of the central power, the spread of anarchy in the provinces, the ravages of the janissaries, and the establishment of practically independent sovereignties or fiefs, such as those of Mehemet of Bushat at Skodra and of Ali Pasha of Tepelen at Yannina In some of the remoter districts, indeed, the authority of the Turks had never been completely established, among the Greeks, the Mainotes in the extreme south of the Morea and the Sphakiote mountaineers in Crete had never been completely subdued Resistance to Ottoman rule was maintained sporadically in the mountainous districts by the Greek *klephts* or brigands and by the pirates of the Aegean, the armatoles (*q v*) or bodies of Christian warriors, recognized by the Turks as a local police, often differed little in their proceedings from the brigands whom they were appointed to pursue

The Greek Revolution.—The Greek Revolution of 1821, like the Serbian of 1804, owed much to Russia, who coveted Constantinople for herself The policy of inciting the Greek Christians to revolt against their oppressors, first adopted in the reign of Anna, was put into practical operation by Catharine II, whose favourite, Orlov, appeared in the Aegean with a fleet in 1769 and landed in the Morea, where he organized a revolt The attempt proved a failure, Orlov re-embarked, leaving the Greeks at the mercy of the Turks, and terrible massacres took place at Tripolitza, Lemnos and elsewhere, and the ravages of the Albanians completed what their Turkish comrades began.

By the treaty of Kutchuk-Kainarji (1774) Russia obtained a vaguely defined protectorate over the Orthodox Greek subjects in Turkey, and the Greek traders the valuable right to sail under the Russian flag

Under the influence of the French Revolution the sentiment of nationality and an ardent desire for political freedom awoke in the Greeks The national awakening was preceded by a literary revival Literary societies, like that of the *Philomousoi* at Athens came into existence; schools were founded; the philological labours of Coraës (*q v*) which created the modern written language, furnished the nation with a mode of literary expression, the songs of Rhigas of Velestino fired the enthusiasm of the people In 1815 was founded the celebrated *Philiké Hetairea*, or friendly society, a revolutionary organization with centres at Moscow, Bucharest, Trieste, and in all the cities of the Levant, it collected subscriptions, issued manifestos, distributed arms and made preparations for the coming insurrection The revolt of Ali Pasha of Yannina against the authority of the sultan in 1820 formed the prelude to the Greek uprising; this despot, who had massacred the Greeks by hundreds, now declared himself their friend, and became a member of the *Hetairea*. In March 1821 Alexander Ypsilanti, a former aide-de-camp of the Tsar Alexander I., and president of the *Hetairea*, entered Moldavia from Russian territory at the head of a small force, in the same month Archbishop Germanos of Patras unfurled the standard of revolt at Hagia Lavra near Kalavryta in the Morea

Independence of Greece.—For the history of the prolonged struggle which followed, *see* GREEK INDEPENDENCE, WAR OF The warfare was practically brought to a close by the annihilation of the Egyptian fleet at Navarino by the fleets of Great Britain, France and Russia on Oct. 20, 1827 Nine months previously, Count John Capo d'Istria (*q v*), formerly minister of foreign affairs of the tsar Alexander, had been elected president of the Greek republic for seven years beginning on Jan 18, 1828 By the protocol of London (March 22, 1829) the Greek mainland south of a line drawn from the Gulf of Arta to the Gulf of Volo, the Morea and the Cyclades were declared a principality tributary to the sultan under a Christian prince The limits drawn by the protocol of London were confirmed by the treaty of Adrianople (Sept. 14, 1829), by which Greece was constituted an independent monarchy; but a new protocol (Feb 3, 1830), moved the boundary line down to the Aspropotamo, the Spercheios and the Gulf of Lamia. Prince Leopold of Saxe-Coburg-Gotha, to whom the throne of this reduced kingdom was offered, declined it Capo d'Istria, whose Russian proclivities and arbitrary government gave great offence to the Greeks, was assassinated at Nauplia Oct 9, 1831), and a state of anarchy followed.

By the convention of London (May 7, 1832) Greece was declared an independent kingdom under the protection of Great Britain, France and Russia, with Prince Otho, son of King Louis I of Bavaria, as king. The frontier line, now traced from the Gulf of Arta to the Gulf of Lamia, was fixed by the arrangement of Constantinople (July 21, 1832) King Otho's despotic rule, and his employment of Bavarian advisers and troops, to the exclusion of the Greeks, was unpopular On Sept 15, 1843 a military revolt compelled the king to dismiss the Bavarians and accept a constitution A responsible ministry, a senate nominated by the king, and a chamber elected by universal suffrage were now instituted Mavrocordatos, the leader of the English party, became the first prime minister, but was replaced after the ensuing elections by a coalition of the French and Russian parties under Kolettes and Metaxas. On the outbreak of hostilities between Russia and Turkey in 1853 the Greeks displayed sympathy with Russia, armed bands were sent into Thessaly, and an insurrection was fomented in Epirus in the hope of securing an accession of territory In order to prevent further hostile action on the part of Greece, British and French fleets made a demonstration against the Peiraeeus, which was occupied by an Anglo-French force during the Crimean War Meanwhile, a new generation had arisen, with which the childless and irresolute Otho was unpopular In 1862 a military revolt broke out, and a national assembly pronounced his deposition. In the following year Prince William George of Schleswig-Holstein-Sonderburg-Glücksburg, designated by the British government, was elected by the National Assembly with the title "George I, king of the Hellenes." Under the treaty of London (July 13, 1863) the change of dynasty was sanctioned by the three protecting powers, Great Britain undertaking to cede to Greece the seven Ionian Islands (*q v.*), which since 1815 had formed a commonwealth under British protection.

Accession of George I.—After an interregnum, marked by heavy street-fighting in Athens between the rival factions of "The Plain" and "The Mountain," the new sovereign arrived in Athens on Oct 29, 1863, and in the following June the British authorities handed over the Ionian Islands to a Greek commissioner King George thus began his reign under favourable auspices, the patriotic sentiments of the Greeks being flattered by the acquisition of new territory He was, however, soon confronted with constitutional difficulties; party spirit ran riot at Athens, and the ministries which he appointed proved shortlived At last the new constitution, which established a highly democratic, unicameral system, was passed in 1864 This, the second constitution voted since the establishment of the kingdom, remained in force till 1911. In 1865 Count Sponneck, the king's tactless Danish adviser, left Greece, and the attention of the nation was concentrated on the affairs of Crete (*q v*) The revolution which broke out in that island received moral and material support from the Greek government, with the tacit approval of Russia, military preparations were pressed forward at Athens, and cruisers were purchased, and although the king discouraged this provocative attitude, and eventually dismissed the bellicose cabinet of Koumoundouros, relations with the Porte grew ever worse, and Hobart Pasha, with a Turkish fleet, made a demonstration off Syra The Cretan insurrection was crushed in the spring of 1869, and a conference of the powers, which assembled that year at Paris, imposed a settlement of the Turkish dispute on Greece, but took no steps on behalf of the Cretans In 1875, after an acute constitutional crisis, Charilaos Trikoupes, who but ten months previously had been imprisoned for denouncing the crown in a newspaper article, was summoned to form a cabinet This remarkable man, the greatest statesman whom modern Greece had hitherto produced, exercised an extraordinary influence over his countrymen His principal opponent, Theodore Delyannes, succeeded in rallying a strong body of adherents, and political parties, hitherto divided into numerous factions, centred around these two figures

The Frontier of 1881.—In 1877 the outbreak of the Russo-Turkish War produced a fever of excitement in Greece A coalition cabinet, the "great" or "oecumenical" ministry, now came into existence under the presidency of the veteran Kanares; in reality, however, it was controlled by Trikoupes, who, recognizing the unpreparedness of the country, resolved on a pacific policy The capture of Plevna by the Russians brought about the fall of the "oecumenical" ministry, and Koumoundouros and Delyannes, who succeeded to power, ordered the invasion of Thessaly The treaty of San Stefano (1878) checked these activities, and left Greece without the extension she desired, but the Congress of Berlin, where her delegates obtained a hearing, suggested a rectification of her frontier between herself and Turkey It was suggested that the new line should extend from the valley of the Peneus on the east to the mouth of the Kalamas, opposite the southern extremity of Corfu, on the west A Graeco-Turkish commission having failed to reach agreement, Greece invoked the arbitration of the powers, and in 1880 a conference of ambassadors at Berlin approved a line which was practically that suggested by the congress Turkey, however, refused to accept it, and the Greek army was once more mobilized; but by a convention signed at Constantinople in July 1881, the demarcation was entrusted to an international commission The line drawn ran westwards from a point between the mouth of the Peneus and Platamona to the summits of Mounts Kritiri and Zygos, thence following the course of the river Arta to its mouth An area of 13,395 sq kilo, with a population of 300,000, was thus added to the kingdom, while Turkey was left in possession of Yannina, Metzovo and the rest of Epirus except the district of Arta The ceded territory was occupied by Greek troops before the close of the year

Trikoupes and Delyannes.—In 1882 Trikoupes came into power at the head of a strong party. With the exception of three brief intervals, he continued in office for the next 12 years The reforms which he introduced during this period were generally unpopular, and most of them were cancelled during the intervals when his opponent Delyannes occupied the premiership The same want of continuity proved fatal to the somewhat ambitious financial programme which he now inaugurated. While pursuing a cautious foreign policy, he shared the national desire for expansion, but thought it necessary first to develop the material resources of the country With this view he made railways and endeavoured to attract foreign capital to the country, and the confidence which he inspired in financial circles abroad enabled him to contract a number of loans and to better the financial situation by a series of conversions In April 1885 Trikoupes fell from power, and a few months later the indignation excited in Greece by the revolution of Philippopolis placed Delyannes once more at the head of a warlike movement The army and fleet were again mobilized with a view to exacting territorial compensation for the aggrandizement of Bulgaria, and several conflicts with the Turkish troops took place on the frontier The powers, after repeatedly inviting the Delyannes cabinet to disarm, established a blockade of Peiraeus and other Greek ports (May 8, 1886), France alone declining to co-operate Delyannes resigned (May 11) and Trikoupes, who succeeded to power, issued a decree of disarmament Hostilities, however, continued on the frontier, and the blockade was not raised till June 7 Trikoupes had now to face the serious financial situation brought about by the military activity of his predecessor He imposed heavy taxation, which the people, for the time at least, bore without murmuring, and inspired such confidence abroad that Greek securities maintained their price in the foreign market. Meanwhile the Cretan difficulty had become once more a source of trouble to Greece In 1889 Trikoupes was grossly deceived by the Turkish government, which, after inducing him to dissuade the Cretans from opposing the occupation of certain fortified posts, issued a firman annulling many important provisions in the constitution of the island The indignation in Greece was intense, and popular discontent was increased when the Bulgarians succeeded in obtaining the *exequatur* of the sultan for a number of bishops in Macedonia In 1890 Trikoupes was beaten at the elections, but reappointed by the king in view of the financial situation, to which Delyannes proved unequal. He resigned again in May 1893 The Sotiropoulos-Rhalles ministry which followed effected a temporary settlement with the national creditors, but Trikoupes, returning to power in the autumn, at once annulled the arrangement, and introduced a series of arbitrary measures which provoked the severest criticism throughout Europe and exposed Greece to the determined hostility of Germany A law was hastily passed which deprived the creditors of 70% of their interest, and the proceeds of the revenues conceded to the monopoly bondholders were seized (Dec 1893). Long negotiations followed, resulting in an arrangement which was subsequently reversed by the German bondholders In Jan 1895 Trikoupes resigned office, and died at Cannes on April 11, 1896

The Cretan Question.—National sentiment had been depressed for a time by the economic misfortunes of Greece; but a secret patriotic society, known as the *Ethniké Hetairea,* now began to develop prodigious activity, enrolling members from every rank of life and establishing branches in all parts of the Hellenic world The society had been founded in 1894, by a handful of young officers who considered that the military organization of the country was neglected by the government, its principal aim was the preparation of an insurrectionary movement in Macedonia, which, owing to the activity of the Bulgarians and the reconciliation of Prince Ferdinand with Russia, seemed likely to be withdrawn for ever from the domain of Greek irredentism The outbreak of another insurrection in Crete supplied the means of creating a diversion for Turkey while the movement in Macedonia was being matured; arms and volunteers were shipped to the island, but Delyannes, who had succeeded Trikoupes in 1895, loyally aided the powers in the restoration of order by advising the Cretans to accept the constitution of 1896. The unrest and agitation in Crete, however, continued and culminated in an outbreak at Canea on Feb 4, 1897

Delyannes now announced that the government had abandoned the policy of abstention. Two warships were despatched to Canea, and a torpedo flotilla, commanded by Prince George, left Peiraeus, ostensibly to protect Greek subjects in Crete Delyannes was still anxious to avoid a definite rupture with Turkey, but the *Ethniké Hetairea* had found means to influence several members of the ministry and to alarm the king Prince George soon withdrew from Cretan waters owing to the decisive attitude adopted by the commanders of the international squadron A note was addressed to the powers, declaring that Greece could no longer remain a passive spectator of events in Crete, and on Feb 13, 1,500 men, under Colonel Vassos, embarked at Peiraeeus On the same day a Greek warship fired on a Turkish steam yacht which was conveying troops from Candia to Sitia Landing near Canea Colonel Vassos announced the occupation of Crete in the name of King George, but his advance on Canea was arrested by the international occupation of that town, and after a few engagements with the Turkish troops and irregulars he withdrew into the interior of the island Proposals for the coercion of Greece were now put forward by Germany, but Great Britain declined to take action until an understanding had been reached on the future government of Crete Eventually collective notes were addressed to the Greek and Turkish governments announcing the decision of the powers that (1) Crete could in no case in present circumstances be annexed to Greece, (2) in view of the delays caused by Turkey in the application of the reforms, Crete should be endowed with an effective autonomous administration under the suzerainty of the sultan Greece was summoned to remove its army and fleet within six days, and Turkey was warned that its troops must for the present be concentrated in the fortified towns and ultimately withdrawn The action of the powers exasperated the populace of Athens, who demanded war with Turkey and the annexation of Crete, and the government drew up a reply to the powers in which, while expressing the conviction that autonomy would prove a failure, it indicated its readiness to withdraw some of the ships, but declined to recall the army Meanwhile troops, volunteers and munitions of war were hurriedly despatched to the Turkish frontier in anticipation of an international blockade of the Greek ports, but the powers contented themselves with a pacific blockade of Crete

On March 29 the crown prince assumed command of the Greek troops in Thessaly, and a few days later hostilities were precipitated by the irregular forces of the *Ethniké Hetairea,* which attacked several Turkish outposts near Grevena On April 17 Turkey declared war A brief and disastrous campaign followed (*see* Graeco-Turkish War) After the evacuation of Larissa on the 24th, great discontent prevailed at Athens, Delyannes was dismissed (April 29); his successor, Rhalles, after recalling the army from Crete (May 9) invoked the mediation of the powers, and an armistice was concluded on the 19th The conditions of peace put forward by Turkey included a war indemnity of £10,000,000 and the retention of Thessaly, the latter demand, however, was resolutely opposed by Great Britain, and the indemnity was subsequently reduced to £4,000,000. The terms agreed to by the powers were rejected by Rhalles, the chamber, however, refused him a vote of confidence and King George summoned Zaimes to power (Oct 3) The definitive treaty of peace, which was signed at Constantinople on Dec 6, gave Turkey a slight modification of the frontier Her troops finally evacuated Thessaly in June 1898 An immediate result of the war was the institution of an international financial commission at Athens, charged with the control of certain revenues assigned to the service of the national debt The state of the country after the conclusion of hostilities was deplorable, the towns of northern Greece and the islands were crowded with destitute refugees from Thessaly; violent recriminations prevailed at Athens, and the position of the dynasty seemed endangered, but a reaction set in, in consequence of an attempt to assassinate King George (Feb 28, 1898) In the autumn the powers, on the initiative of Russia, decided

to entrust Prince George of Greece with the government of Crete; on Nov 26 he was formally appointed high commissioner, and landed in Crete on Dec 21 (*see* CRETE)

Macedonian Agitation.—In April 1899 Zaimes gave way to Theotokes, the chief of the Trikoupist party. In May 1901 a meeting took place at Abbazia, under the auspices of the Austro-Hungarian government, between King George and King Charles of Rumania with a view to the conclusion of a Graeco-Rumanian understanding directed against the growth of Slavonic, and especially Bulgarian, influence in Macedonia Owing to Rumanian propaganda, however, the compact was short-lived The internal situation was unstable, owing partly to the Macedonian situation and partly to disturbances in the currant-growing districts Ten ministries were formed within six years under Theotokes, Delyannes, Rhalles and Zaimes Delyannes was assassinated on June 13, 1905, and at last, in April 1906, Theotokes secured a large majority In the meanwhile the friendship of Turkey had been cultivated, bands were sent into Macedonia to counteract the Bulgarian influence and relations had become very strained with Bulgaria and (since 1905) with Rumania On Sept 26, 1906, Prince George, who had resigned the high commissionership of Crete, returned to Athens, the designation of his successors was accorded by the protecting powers to King George as a satisfaction to Greek national sentiment (*see* CRETE) The great increase in the activity of the Greek bands in Macedonia during the following spring and summer led to the delivery of a Turkish note at Athens (July 1907), which was supported by representations of the powers.

In Oct 1908 the proclamation by the Cretan assembly of union with Greece threatened fresh complications, the cautious attitude of the Greek government leading to an agitation in the army, which came to a head in 1909 On July 18 a popular demonstration against his Cretan policy led to the resignation of Theotokes His successor, Rhalles, announced a programme of military and economical reform The army, however, took matters into its own hands, and on Aug 23 Rhalles was replaced by Mavromichales, the nominee of the "Military League" For the next six months constitutional government was practically superseded by that of the league, which in Jan 1910 summoned Venizelos from Crete as its political adviser On Feb 7, 1910, Mavromichales resigned, and his successor, Dragoumis, accepting Venizelos' suggestion of a national assembly, persuaded the league to dissolve on receiving the king's assurance that such an assembly would be convened—a promise fulfilled on March 31

But the obstruction of the party leaders soon obliged Venizelos to take the premiership himself and to appeal once more to the electorate When the second revisionary National Assembly met on Jan 22, 1911, he took office at the head of an overwhelming majority During the following 18 months the constitution was revised, internal administration was thoroughly overhauled, army and navy were remodelled under French and British missions

The Balkan Wars.—A treaty was signed with Bulgaria (May 1912) who had already signed a treaty with Serbia for the partition of Macedonia, and in October, the first Balkan War (*q v*) broke out Turkey offered Greece the island of Crete and other concessions to remain neutral Venizelos, however, realized the importance of including Greece in the new grouping The long-excluded Cretan deputies were admitted to the Greek Chamber and Greece declared war on Turkey on Oct 18, 1912

The Balkan allies gained rapid success The Greek army cleared Macedonia and occupied Salonika, the fleet blockaded the Dardanelles Greece refused to sign the armistice obtained from the other allies (Dec 3) but joined the conference which met a fortnight later in London Hostilities were re-opened on Feb 3, 1913 But after Adrianople had surrendered to Bulgarians and Serbs, Scutari to the Montenegrins, and Yannina to the Greeks under Prince Constantine—who 12 days later (March 18) became king on the assassination of his father George I at Salonika —Turkey by the Treaty of London (May 30) signed away to the Balkan allies all her territory in Europe west of a line drawn from Midia on the Black sea to Enos on the Aegean sea, leaving the Powers to settle the problems of Albania and the Aegean Islands

Disputes between the late allies led to the conclusion of a defensive alliance between Greece and Serbia in June, followed by war with Bulgaria (June 30). The treaty of Bucharest (Aug 10, 1913) excluded Bulgaria from the Aegean port of Kavalla (*q v*) and carried the frontier of Greek Macedonia eastwards to the river Mesta and northwards to Doiran and Florina

The Aegean Islands.—The Powers assigned to Greece (Conference of London, Feb 1914) all the islands of the Aegean occupied by the Greek fleet during the war, with the exception of Tenedos and Imbros and of the islands of the Dodecanese (*q v*) which Italy had occupied in 1912 as security for the Turkish fulfilment of the first Treaty of Lausanne pledging her good faith that her occupation should be temporary After the World War, Venizelos negotiated an agreement with Signor Tittoni (July 29, 1919) by which all these islands except Rhodes were to revert to Greece unconditionally This was renewed by the Graeco-Italian treaty of Aug 10, 1920, with the addition that, if Great Britain gave Cyprus to Greece, Italy would allow a plebiscite in Rhodes on union with Greece, but not till 1935 These Tittoni agreements were repudiated by Italy, who remained in occupation of the Dodecanese after the non-ratification of the Treaty of Sèvres By the Treaty of Lausanne (July 24, 1923) Turkey renounced in favour of Italy all rights over the Dodecanese, and recognized Greek sovereignty over the remaining islands as conferred by the Conference of London, subject to certain provisions for their demilitarization, with the exception of Imbros and Tenedos, which were retroceded to Turkey on condition that they should enjoy full local autonomy—a condition which remained unfulfilled

The World War.—Greece thus emerged from the Balkan wars with a very large acquisition of territory in Epirus, Macedonia, Crete and the Aegean Islands, with a total population of over 1,800,000, or almost as much as that of "Old Greece" Turkey's refusal to recognize the ruling of the London Conference was accompanied by a boycott of Greek shipping and an organized persecution of the Greeks in Asia Minor But her evident intention of re-opening hostilities with Greece was anticipated by the outbreak of the World War While King Constantine inclined to Germany, Venizelos' government strongly supported the Western powers, and prepared to move against Bulgaria, if necessary, in accordance with the Graeco-Serb treaty

In Feb 1915, when Britain definitely required Greek help for attacking the Dardanelles, the proposals of Venizelos for specific Greek forces to co-operate with the British fleet were unanimously approved by his own majority in the Chamber, and by a Crown Council of all the political leaders in the kingdom King Constantine however dismissed Venizelos and dissolved the Chamber (April 10, 1915) The new premier, Gounaris, represented Venizelos as inspired only by love of war and hatred of the king King Constantine was thus brought into party politics as a personal opponent of Venizelos and leader of the policy of neutrality In mid-June the electors nevertheless returned the Liberal (Venizelist) party with a majority But when Venizelos, after a delay excused by the king's illness, at last returned to office (Aug 22), his efforts to immobilize Bulgaria by threatening Greek action were useless, because Germany had already been secretly informed that Greek neutrality would be guaranteed by King Constantine even in the event of a Bulgarian attack on Serbia Bulgaria mobilized on Sept 19, 1915, and King Constantine allowed his prime minister to order a counter-mobilization, and even to suggest to Britain and France that they might reinforce the Graeco-Serbian co-operation with some of their own troops, a suggestion which led to the Allied landing at Salonika But as soon as Venizelos, on the eve of the Bulgarian attack, explained once more his policy of defending Serbia and received a vote of confidence, he was abruptly dismissed, and M Zaimes was put up to explain that the Graeco-Serbian Treaty had a "purely Balkan character" The Chamber was again dissolved and elections held in December. The Liberals abstained from the polls, as a protest against this second and unconstitutional dissolution, and a government was formed under M Skouloudes (Nov 6), who declared "very benevolent neutrality" towards the Entente

The "Three Protecting Powers," Britain, France and Russia, demanded certain administrative changes which might prevent any connivance between the government and the German espionage (June 21, 1916). The Greek army, which owing to the known sentiments of its general staff threatened the Allied base at Salonika, was at last demobilized; whereupon the Bulgarians invaded Macedonia and seized Kavalla. Meanwhile King Constantine frequently changed his premiers, and asked the French *or* British minister to suggest terms on which it might suit him to abandon his "neutrality" When, in August, Rumania joined the Allies and the king still refused to move, Venizelos seceded to Salonika (Sept. 25, 1916) with General Dangles and Admiral Coundouriotes, set up a provisional government and began to organize a state militant The Allies at first refused official recognition to the Salonika government At Athens the French admiral suggested that King Constantine might surrender some of his war material The king was understood to consent; but when French and British marines landed to take delivery they were shot down by Greek troops (Dec 1, 1916)

The Allies then broke off relations with the king, but, owing to the hesitations of Russia and Italy, did not demand his abdication till June 1917 He retired to Switzerland (June 12) and his second son Alexander was put on the throne Venizelos returned to Athens as prime minister, recalled the Chamber, which had been unconstitutionally dissolved in Nov. 1915, and formally declared war against Germany, Turkey and Bulgaria (June 29) In July 1918, 250,000 Greek troops shared in the Macedonian offensive which culminated in the capitulation of Bulgaria (Sept 30, 1918)

Treaty of Sèvres and Fall of Venizelos.—By the Treaty of Neuilly (*q v*) to which was annexed a Graeco-Bulgarian convention for the protection of racial minorities, etc (Nov 27, 1919), Bulgaria was cut off from the Aegean, the Allies undertaking to ensure her an "economic outlet" The Treaty of Sèvres (*q v*) (Aug 10, 1920) assigned to Greece the greater part of Thrace, and also the basin and *Hinterland* of Smyrna under a strictly controlled régime Greek troops had landed at Smyrna at the request of the Supreme Council on May 15, 1919. Venizelos had meanwhile lost touch with his people, and the government at Athens had proved incompetent The resulting discontents were exploited by Constantine's agents King Alexander having died (Oct 25) and his younger brother Prince Paul having refused the government's offer of the throne, the restoration of King Constantine became the real issue at the general election On Nov 14, 1920, Venizelos was heavily defeated at the polls He resigned, and with many of his ministers left the country A government was formed by the aged Demetrios Rhalles which entrusted the regency to the Dowager Queen Olga After a plebiscite King Constantine returned to Athens (Dec 19, 1920) The Allied Powers refused to recognize him officially, withdrew their financial assistance, and agreed to reconsider the Treaty of Sèvres, which though signed had not been ratified Greece was isolated, France and Italy both, overtly or covertly, supported Turkey, and Great Britain declined to embark on Eastern adventures

Graeco-Turkish War.—Yet the new premier M Kalogeropoulos (Feb 7, 1921) and his successor M Gounaris (April 7) rejected the moderate proposals of a conference of the Three Powers (Britain France and Italy) which met in London (Feb 21) to reconsider the Treaty of Sèvres, and instead promoted an offensive which, after seizing Afiun Qarahisar and Eskishehr, was disastrously defeated King Constantine left for Smyrna, rejecting the friendly mediation of the Allied Powers The Greek forces opened their new offensive in July, but in August were defeated on the river Sakkaria with very heavy losses King Constantine returned to Athens and Gounaris and his foreign minister Baltatzes left for London and placed the interests of Greece without reserve in the hands of Lord Curzon Meanwhile the French "Franklin-Bouillon" agreement with Kemal had been signed at Angora on the anniversary of Navarino (Oct 20) and Lord Curzon's ability to make peace was limited by the difficulty of coming to a preliminary agreement with France and Italy Gounaris gave up all claim to the balance of credits guaranteed to Greece by the Allies during the Great War and received in return permission to raise a loan on the open market When the Near East Conference met in Paris, proposals for an armistice and the evacuation of Asia Minor by the Greek army were transmitted to Athens and the two Turkish governments of Constantinople and Angora

A few days before, Gounaris had privately addressed to Lord Curzon a desperate appeal for help On May 11, 1922, he resigned and joined M Stratos in a coalition under the premiership of M. Protopapadakes, who had previously as Minister of Finance raised a forced internal loan by cutting in half all the bank-notes in circulation The first act of the new government was to remove the commander-in-chief, General Papoulas, and to appoint in his stead General Hadjianestes In July the government had the independence of Ionia proclaimed by the high commissioner of Smyrna, M Sterghiades The Turks attacked on Aug 26 and entered Smyrna on Sept 9, 1922, five days later the whole city, with the exception of the Turkish quarter, was burned to the ground

Revolution of Chios.—The government resigned on Sept. 8 after ordering the demobilization of the troops Many units landed on Chios, and there a revolution headed by Colonel Plasteras broke out on Sept 26. King Constantine left the country and died in the following January at Palermo His eldest son, George, became king Eight of his principal ministers and advisers indicted by a special commission of enquiry were tried before an extraordinary court-martial of 11 officers Six of the accused (Gounaris, Stratos, Baltatzes, Theotokes, Protopapadakes and Hadjianestes) were shot (Nov 28, 1922) The executions shocked Europe, and Great Britain withdrew her minister from Athens. A small but efficient army, re-formed on the Thracian frontier under the command of General Pangalos, greatly strengthened the hands of the Greek representative (Venizelos, who had consented to represent his country abroad) at the second conference of Lausanne which finally succeeded in signing peace with the Turks on July 24, 1923

Refugees and Minorities.—Meanwhile the revolutionary government after proclaiming an amnesty for all political offences was confronted with the problem of the 1,400,000 refugees from Asia Minor A loan of £10,000,000 was raised (Dec 1924) the administration of which was guaranteed by the League of Nations In 18 months the Refugee Settlement Commission of the League of Nations had settled more than half-a-million refugees in new villages and urban districts throughout Greece. This settlement increased the homogeneity of population on the Greek frontiers, where the problem of alien minorities had already been reduced by a system of exchanging populations, embodied in the Graeco-Bulgarian Convention (1919) for the voluntary emigration of minorities and the Graeco-Turkish Convention (Jan 30, 1923) for the compulsory exchange of Moslem and Greek-orthodox minorities The non-Greek population in Greek Thrace and Macedonia was reduced to a very small figure

Establishment of a Republic.—The revolutionary government attempted to return to a constitutional government An attempted counter-revolution, with which it was sought, without evidence, to connect George II, was suppressed in Oct 1923 This strengthened republican feeling, and the army and navy officers, especially General Pangalos and Captain Hadjikyriakos exercised such pressure that the government, to avoid disorder, requested the king to absent himself during the meeting of the national assembly which was to decide the future of the throne On Dec 18, 1923, the king and queen left for Rumania Admiral Coundouriotes was again appointed regent, and Venizelos, in response to an invitation, returned to Greece (Jan 4, 1924), but only temporarily, in order to put an end to civil war The revolutionary committee resigning he was, however, obliged to accept the premiership The agitation of the officers' league, which was now re-formed and demanded the immediate proclamation of a republic, caused Venizelos, who had proposed a plebiscite, to resign (Feb 4) and leave Greece (March 10) His successor, M Kaphandares, also resigned, and a government was formed by M Papanastasiou, who proposed to settle the fate of the throne

by a resolution of the Chamber, to be ratified by a subsequent plebiscite After the king had refused a generous offer, if he would abdicate voluntarily, the republic was proclaimed on March 25, 1924 The plebiscite was held on April 13; 758,742 voted for the republic and 325,322 for a monarchy. Admiral Coundouriotes became provisional president of the republic.

International Relations.—On Aug 27, 1923, the murder of the Italian member of the Graeco-Albanian frontier commission had led to the bombardment of the defenceless town of Corfu (*q v*) by Italy The dispute was settled by the League of Nations, but Greece had to pay a heavy indemnity. In July 1924 a frontier incident occurred with Bulgaria at Tareis. Here again Greece accepted the ruling of the League; but Yugoslavia, considering that the Greek attitude might have effects which she did not desire on her own Macedonian population, denounced her alliance with Greece on Nov 27 The Greek Chamber therefore refused, on Feb. 3, 1925, to ratify the protocol regarding Bulgarian minorities which its representatives had signed in Geneva on Sept. 29, 1924 Negotiations for a fresh Graeco-Yugoslav alliance were at once re-opened in Belgrade, but broke down over the Yugoslav demand for control and exploitation of the railway from Ghevgeli to Salonika and an extension of the Yugoslav free zone in Salonika Meanwhile, a dispute had arisen with Turkey At the conference of Lausanne the Turks had consented to maintain the Oecumenical Patriarch at the Phanar, provided that he exercised no civil or administrative powers On Jan 30, 1925, however, they expelled the holder of the office on the ground that he was not domiciled in Constantinople, and therefore an exchangeable subject under the Treaty of Lausanne The dispute was settled, after an appeal to the League, by the resignation of the Patriarch and the election of another

A second frontier incident with Bulgaria at Demir Kapou on Oct. 19 was also brought before the League which awarded damages against Greece

General Pangalos Dictator.—Meanwhile the new National Assembly had not yet succeeded in voting the new constitution On June 26, 1925, the premier, M Micalakopoulos, was compelled to resign by an ultimatum from General Pangalos and Admiral Hadjikyriakos, who formed a government, the former being minister president, and dissolved the assembly. General Plasteras was expelled from Athens and two officials publicly hanged for embezzlement under a decree which made the death penalty retrospective In November Pangalos admitted two royalists to his cabinet, but on Jan 3, 1926, and in subsequent proclamations he announced that the senatorial and parliamentary elections would be indefinitely postponed and that his government had decided to concentrate all executive and administrative powers in its own hands; the press was forbidden to publish any articles written by the Republican chiefs Admiral Hadjikyriakos and M Sechiotes immediately resigned At the Ministry of Finance M Tantalides issued a forced loan similar to that of 1922, cutting 25% off the notes in circulation, while General Pangalos issued a decree regulating the length of ladies' skirts

General Pangalos, now dictator as well as premier, exiled to Santorin MM Kaphandares and Papanastasjou and General Kondyles, and, upon the resignation of the president on March 19, fixed the presidential election for April 4 and 11, and laid down the rules for the contest, in which he was himself a competitor. The republican leaders united on the candidature of M Demertzes, a moderate royalist and ex-minister of marine, who, however, withdrew when General Pangalos failed to give the desired guarantees for freedom of election In these circumstances the dictator, as sole candidate, was elected president He then sought a premier who would be a puppet, and finally persuaded M. Eutaxias, an old ex-minister of the time of Delyannes, to accept the post His brief premiership was chiefly remarkable for the conventions with Yugoslavia, signed by M Rouphos, who had remained at the Foreign Office These conventions were considered unfavourable to Greece, and, before they could be ratified, the dictatorship was over. On Aug 22 General Kondyles, assisted by the dictator's own republican guard under Colonel Zervas, made a bloodless *coup d'état* in the absence of the dictator at Spetsai; General Pangalos endeavoured to escape on a torpedo boat, but was captured without resistance off Cape Matapan, and ultimately imprisoned in Fort Izzeddin in Crete. Admiral Coundouriotes "resumed" the presidency with General Kondyles as premier till a general election should express the popular will. The premier's dissolution of the republican guard led on Sept. 9 to bloodshed such as Athens had not witnessed for many years, and the communists seized the opportunity to intervene The elections, held on Nov. 7 with immense precautions, passed off in perfect quiet The royalists participated, and the republican majority was so small that, for the second time in Greek history, an "oecumenical" government of all the party chiefs (except the communists) was formed under the premiership of M Zaimes This cabinet was reconstituted on Aug 11, 1927, and again on Feb. 7, 1928 A crisis was caused by the return of Venizelos. The Government eventually resigned, May 29, and Venizelos took office. Elections (Aug 19) gave the Liberals an overwhelming majority On Sept 23 Venizelos signed a Pact of Amity with Italy, and negotiations began with Turkey and Yugoslavia. On Dec 12 a law was passed creating a Senate of 120 members, to be made up of 92 members elected by the people, 18 chosen by professional bodies, and 10 by the Chamber and Senate

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GREEK ARCHAEOLOGY. The scientific study of the material remains of the ancient Greeks is in the main a product of the 19th century Before then antiquaries such as Montfaucon (1655–1741), busied themselves with the collection and examination of Greek antiquities, but no one had attempted to adopt scientific principles of criticism for this study till Winckelmann (1717–68) who had for a contemporary Eckhel (1737–98), the founder of ancient numismatics The close of the 18th and the dawn of the 19th century saw an active interest in Greece connected with a long list of students and travellers, Stuart, Revett, Chandler, Dodwell, Gell, Quatremère de Quincy, Cockerell, Haller, Bronstedt, Stackelberg, and above all Leake, the pioneer of Greek topography. With the liberation of Greece (1821–29) the real exploration of her ancient remains became possible, and since then numerous scholars of all nations have been actively engaged in the discovery and study of the material remains of the great civilization of ancient Greece, such, among many, as Bockh and

Foucart, the epigraphists, Newton, the discoverer of the Mausoleum; Penrose and Dorpfeld who revealed the wonders of Athenian architecture; Brunn and Furtwangler, Ross and Beulé To-day a well organized Greek archaeological service is actively engaged in preserving and conserving antiquities, and there are American, Austrian, British, French, German and Italian archaeological schools in Athens devoted to the same object in collaboration with the Greek authorities.

Use of Subject.—The genius of the Greek people laid down for the whole western world the foundations of the study of literature, art, philosophy and science, including geometry, astronomy and mathematics, and such subjects as zoology and botany The Greek histories we possess, both those of Greek writers themselves and those produced by modern scholars based on wider sources of information, deal in the main with political affairs, and hardly touch on the culture of this gifted people from whom our civilization is derived Political history is apt to describe exclusively political manoeuvres, diplomatic and internal, the personalities of statesmen and generals, and the progress of campaigns and battles The material circumstances of life, public and private, are rarely discussed and the general tendency of culture at any given period and the various influences which affected it are seldom taken into consideration Yet the trend of thought in all forms of art, the fashion for a particular type of beauty, the popular style of the age, are essential factors in building up the moral character of a people The basic information for most of the elements necessary for this study is to be obtained from a proper use of archaeological evidence. The sources for Greek archaeology lie in two spheres, the literary and the material From the literature of ancient Greece we derive information about the social, political and economic life of the Greeks and some also about the material surroundings of their life But literature, except a few authors such as Pausanias who travelled in Greece about the time of Hadrian, did not consciously aim at describing this life for us The descriptions and allusions given were meant for a public already well familiar with such life from personal experience, and therefore are of comparatively little value unless they can be checked by comparison with the actual objects It is the function of archaeology to supply the material objects so far as they can be found and identified, and to interpret them

Excavations.—Except in certain cases where temples such as the Parthenon or the Temple of Apollo at Bassae have, though sadly damaged, stood erect from those days to the present, or fortifications such as those of Messene or Aegosthena have similarly survived the assaults of man and time, the materials for Greek archaeology have to be recovered by excavation from the earth which has covered and so preserved them Objects may be found by casual excavation by farmers tilling their lands, or by deliberate excavation intent on recovering the treasures of the past Many important objects have been revealed accidentally by the builder or even by the fisherman's net as in the case of the bronze youth from Marathon Most has been revealed by deliberate excavation, the only correct method, but it must be scientific, because all excavation is in a sense destruction The very act of digging and of removing objects from the ground destroys their context For instance a group of vases and jewellery found together in a tomb tell its story, they date each other, and give a picture of the culture of their age If, however, the jewellery be removed without keeping the pottery with it or at least taking proper note of it, that jewellery like the Aegina treasure in the British Museum can tell us hardly half its story Similarly a nest of vases found under the foundations of a temple gives a *terminus post quem* for its building, but if the vases are removed and no observations made as to their position and relationship their value as historical evidence is lost Thus many of the objects exhibited in museums are archaeologically dumb because they have been found either in the operations, usually illicit, of a professional excavator who digs for plunder to supply the cabinets of collectors or museums, or in the excavations of irresponsible archaeologists Never was the urgent need of patience, accuracy, and detailed observation more conspicuously demonstrated than in the case of the excavation of the sanctuary of Artemis Orthia at Sparta where thousands of small objects of all periods were found around the ruins of a temple and its altar. It was only the skilled restraint of the archaeologists, who slowly removed the earth almost inch by inch, that unravelled the complicated stratification, and gave us not only the history of one of the most important Spartan temples, but also an invaluable record of the culture of Sparta through 600 of the most momentous years of its existence. The change of soil, the various materials used in building, and all apparently minute points must be constantly watched and this record of the stratification if not made by the excavator can never be made by another and so irretrievable damage may be done A carelessly conducted excavation is even more disastrous than the burning of a library, for the archaeological evidence it has destroyed can never be replaced

Objects Found.—Objects from excavations may be found in the ruins of ancient temples and sanctuaries, or in those of public buildings such as theatres or colonnaded market-places, or fortifications, or in those of private houses, or in tombs, perhaps the most fruitful source of all Tombs are more apt to yield complete objects, temples and public buildings yield inscriptions, and both they and houses produce quantities of fragmentary small objects of everyday use which give us the stratification of culture on any particular site. In this way the evidence obtained from tombs and that from temples or inhabited sites supplement each other

HISTORY OF EXCAVATION

Scientific archaeological exploration of ancient Greek remains was rather long delayed, though a French expedition had undertaken some researches at Olympia in 1829 Some of the earliest archaeological expeditions worked on the coast of Asia Minor among the Greek colonies rather than on the sites of the motherland Thus Newton's work at Halicarnassus and Cnidus which enriched the British Museum with the remains of the Mausoleum and the Demeter of Cnidus and Wood's patient search for the Artemisium at Ephesus, though among the earliest excavations carried out with definite scholarly aims, belong rather to Asia Minor than to Greece.

German.—Not till 1875, however, were the great German excavations at Olympia begun, under a special treaty with the Greek Government This expedition under the leadership of Curtius, Adler and Treu, after six arduous campaigns, revealed what was left of the temples and other buildings of the Panhellenic sanctuary of Olympia Rich finds rewarded the efforts of the excavators, the pedimental sculptures of the great temple of Zeus, the Winged Victory by Paeonius, and greatest treasure of all, the Hermes of Praxiteles, the only undoubted original by one of the greatest masters of Greek sculpture These sculptures, whose date is indisputable, are of unrivalled value for the history of Greek art Since then German expeditions have done important work at several other sites At Thera the ancient town has been cleared and gives an excellent picture of an island community in the latter part of the classical age, while rich tombs of the early iron age were also found At Athens the theatre of Dionysus was excavated and also a large part of the Dipylon cemetery, providing much fresh information about Athenian funeral customs After preliminary campaigns in the early cemeteries of Samos, most useful for the light thrown on early Ionian art, especially the vases, the famous temple of Hera there has been laid bare and the history of another of the sacred sites of Greece is being made known This and similar work on the temples of Aphrodite and Aphaea at Aegina has yielded valuable facts towards the study of architecture, and the results of the complete excavation of the Aphaea temple now enable us to study in their right context the famous sculptures from it at Munich.

Greek.—Greece has taken a foremost part in the rediscovery and preservation of her treasures, and apart from many minor researches has carried out several major excavations—the Acropolis at Athens, at Eleusis, the Amphiaraeum by Oropus and at Epidaurus The history of the Acropolis was entirely rewritten by the results of excavation The successive stages of the Parthenon and the temples planned to precede it on the same site, the earlier Propylaea, and the old Athena temple all show

how closely the architectural monuments of the prime of Athens are to be co-ordinated with the history of the city herself. Fresh fragments of the sculptures of the Parthenon were found, but the most surprising artistic find was the hoard of statues damaged and overthrown in the Persian invasion of 480 B.C., which had been subsequently used to fill up a hollow during rebuilding. These, though damaged are at least unrestored originals, and show by the plentiful traces of bright painting still extant on them how the Greeks intended their sculptures to appear. A fundamental date for the history of Greek vase painting was another of the more important facts determined. At Eleusis the Hall of Mysteries was discovered and the progressive enlargement of this and of the sacred enclosure indicate both the gradual increase of culture and prosperity in Greece during the 6th and 5th centuries B.C., and the growth of the importance of the shrine itself. Many important sculptures and inscriptions were found. The Amphiaraeum and Epidaurus were the centres of cults connected with healing, but the latter is the more important as the central shrine of Asclepius himself. Here the whole sanctuary has been cleared with the theatre and all the subsidiary buildings. Valuable architectural results were obtained, and sculptures illustrating the style of Timotheus, a leading artist of the 4th century, with many historical inscriptions, and others giving interesting details about visitors to the shrine and their cures. This whole group of buildings with the theatre, accommodation for patients, gymnasium and music-hall gives a vivid picture of the life of a Greek spa during the first two centuries after Christ. The central sanctuary of the Aetolians at Thermon has been cleared and valuable material for the history of the development of architecture was unearthed and many important inscriptions. At Lycosura in the ruins of the temple were found the greater part of a colossal group by Damophon, a leading sculptor of the 2nd century B.C.

French.—The French school has excavated Delphi, the seat of the famous oracle of Apollo, which has produced sculptures of the first rank, such as the bronze charioteer, a masterpiece from the hand of an artist still unknown, and the marble frieze of the Cnidian treasury, a gem of archaic art. Besides these, the innumerable "treasuries" and shrines, the theatre and other buildings have added much fresh material for the study of architecture, and an immense harvest of inscriptions. At Delos the French have cleared the sanctuary of Apollo with its many temples and colonnades, but the complicated nature of the site makes the unravelling of its history rather difficult. A large part of the Hellenistic town has been cleared with its streets, houses, warehouses, port and theatre, and this combined with the sacred associations of the site, gives a panorama of the active life and trade of this town, a sanctuary of Panhellenic renown and a free port, the great entrepôt of the Aegean, especially for slaves. As the island itself produces little or nothing to sustain the life of even a small population and water is scarce, provisions of all kinds must have been extensively imported. Among other sites where French explorers have worked is Tegea, where the temple of Athena Alea has been excavated and some heads and other fragments of the pedimental sculptures have been recovered. These, though battered, are originals from the hand of Scopas, a master of the 4th century, a contemporary and rival of Praxiteles.

American.—The Americans, now about to undertake the arduous project of excavating the agora of Athens and the other buildings sacred and profane around it, have previously concentrated their efforts on Corinth, the most flourishing commercial city on the Greek mainland next to Athens itself. In 146 B.C. Mummius overthrew all its buildings except the temple of Apollo, some columns of which still stand. The Americans have cleared a large part of the Agora and a short length of the road leading to the port of Lechaeum, and have identified the theatre and other public buildings. The excavations show how complete was the rebuilding that took place when Caesar sent a colony to the site and how thorough was the destruction by Mummius. The elaborate arrangements for the water supply of the city have been revealed in the fountains of Peirene and Glauke. The former which dates back to the 6th century emphasizes the importance attached by the tyrants to making proper provision for this essential for the well-being of their subjects. The ruins of Corinth indicate that this too was a prosperous city, and that the site was eminently adapted by nature for a trading centre. An American expedition also excavated the Heraeum, the national sanctuary of Argos. This site was continuously occupied from the early bronze age till late classical times, and was especially rich in finds of the archaic period of art that illustrate the varied influence notably those from the east, affecting Greece at that date. The architecture of the temple rebuilt after a fire in 423 B.C. and of the other buildings in the precinct forms an interesting contrast to Attic work of the same date; in addition a few interesting sculptures were discovered.

British.—The first British excavation was that of Megalopolis, and apart from the problems involved in the architecture of the theatre and the Thersilion, the council chamber of the Arcadian confederacy, the results hardly came up to expectations. Otherwise apart from valuable contributions to Aegean archaeology by excavations in Crete, at Mycenae, in Melos and in Thessaly, the great excavations of the British school have been at Sparta. Here the classic sanctuaries of Artemis Orthia and Athena Chalcioecus and of Helen and Menelaus have been discovered, and entirely new light has been thrown on Spartan art which now appears to have been extremely flourishing in the archaic period when oriental and Ionian influence were much in evidence. In later times only the growth of a narrow military policy stifled the natural Hellenic tendency towards artistic expression in all the accompaniments of life. The tracing of the walls has determined the size of the city and the excavation of the theatre and the innumerable inscriptions of the early imperial period show that Sparta flourished under the Pax Romana as a provincial capital.

Other nations have taken an active part in excavations in Greece. The Austrians have been at work in Elis, the Dutch at Argos, the Danes at Lindos, the Czechs at Samothrace and the Swedes at Calaureia, while the latter and the Italians have specially distinguished themselves in Aegean archaeology.

SEVEN BRANCHES OF ARCHAEOLOGY

Greek archaeology subdivides naturally into seven branches. These are —

I **Topography.**—This is naturally linked with geography and consists in the exploration of Greek lands and the noting of the ancient ruins they contain, the observation of their natural resources, and finally the co-ordination of the results of such research with the knowledge of the country to be derived from ancient writers. This sifting of the evidence forms the basis of our knowledge of the political and historical geography of Greece. A full understanding of the physical aspects of the country and its natural products, mineral or other, coupled with as full a survey as is possible of the ruins of ancient towns and hamlets, is essential to enable us to picture the land where the drama of Greek history was played, and art and literature had their birth. A classic example of topographical work is Leake's *Travels in Northern Greece* and a modern work of the same type is Stahlin's *Das Hellenische Thessalien*, while Frazer's monumental *Commentary on Pausanias* is the outstanding instance of an attempt to stabilize our knowledge of Greece by the correlation of archaeological and literary material and of ancient and modern topography.

II **Epigraphy.**—The study of ancient inscriptions which may vary from a grave inscription of a few words to lengthy laws or decrees and fall into two large groups. (A) Inscriptions proper, by which we mean words inscribed on monuments or objects to denote their purpose, often mentioning the name of the deity or person concerned. These subdivide into: (1) Epitaphs, perhaps the largest class of all, these can be of historical importance, as, for instance, the epitaph of Dexileos, an Athenian cavalryman who fell in the Corinthian War about 395 B.C.; (2) Dedications, varying from the official dedication of a building to a word or two scratched on a small bronze offered to a god. The serpent column from Delphi (now in the Hippodrome at Constantinople) recording the names of the Greek cities that won the battle of Plataea against the Persians, and the bronze Etruscan helmet

dedicated by Hieron, king of Syracuse, at Olympia after the battle of Cumae (now in the British Museum) show the historical value of such inscriptions The fragments of the metrical dedication of the Athenians celebrating their victories over Boeotia and Chalcis in 506 B C is a useful check on the accuracy of Herodotus who quotes it Most of the inscriptions celebrating victories at games, such as the famous inscription of Damonon of Sparta, who boasted that he and his son had won more races than anyone else, fall into this class (3) Honorary inscriptions, such as the lines inscribed on the bases of statues erected to persons like Alexander and Hadrian, or those recording honours granted by a State to citizens or to natives of other States, when the honours usually consisted of the right to a front seat at festivals and *proxenia* and certain exemptions and immunities. (*See* INSCRIPTIONS) (B) Documents both public and private or, on another classification, sacred and profane These subdivide into: (1) Treaties and alliances, such as the treaty between Athens, Mantinea and Argos, which corrects the text quoted by Thucydides; (2) Laws such as the famous laws of Gortyn, which from their archaic language and their legal contents rank high in importance; (3) Decrees of the State or letters from kings, Roman emperors, or some other authority, regulating the affairs of subordinate States, such as the decrees of Eressos about tyrants which were confirmed by letters of Philip Arrhidaeus and Antigonus; (4) Financial records such as the famous tribute lists which form the basis for the study of Athenian finance in the 5th century, or the records of the treasures of the temple at Delos, (5) Building inscriptions such as those of the Erechtheum at Athens which give important architectural details, (6) Lists of names such as those recording the manumission of slaves, some of which from Athens give interesting information about trades, and lists of soldiers killed in battle or of ephebi, (7) Boundary stones recording political boundaries, the limits of sacred areas and the bounds of private property, the last including mortgage stones which give the name of the mortgagee and the amount of the mortgage Among miscellaneous inscriptions come the potsherds scratched with the names of politicians which were used in voting at an ostracism in Athens Several of these bear the name of Themistocles himself, others that of Xanthippus, the father of Pericles, and yet others the name of the great political opponent of Pericles, Thucydides the son of Melesias, whose ostracism in 444 B C. left Pericles free to carry out his policy

III **Numismatics,** the study of Greek coins, which includes complicated subjects such as metrology, weight standards, the ratio of the metals to one another as well as the classification of the coins themselves and their study as original objects of art.

IV **Architecture,** the study of Greek construction which has had a profound influence on subsequent building Apart from the great temples such as the Parthenon at Athens and all the smaller shrines, there are hundreds of ancient buildings of more secular use, such as the Propylaea or gateway to the Acropolis at Athens, the Stoa of Attalus in the market of Athens, and the theatres, colonnades, and other buildings to be found on every important Greek site. With them can be grouped fortifications and private houses The study of the gradual development of Greek architecture, and the methods by which the ancients overcame the problems confronting them, provide lessons of the greatest value to modern architects True, of many Greek buildings little more than the foundations exist, but a study of these and of the fallen blocks of the superstructure enables us to reconstruct the building on paper even if only in part, and the evidence of a single stone when observed by the trained eye may lead to important results. Thus the discovery of the foundations of a building is of the greatest assistance in visualizing it

V **Ceramics,** the study of ancient pottery, which has in recent years been highly developed. Broken pottery is the commonest of all objects found on an ancient site, and is intrinsically the most worthless, and therefore for the archaeologist in many ways the most valuable, for it is unlikely to be stolen or to be forged Whole vases found in tombs have of course a market value, but these may have no archaeological value if removed from the ground by illicit or irresponsible excavators Thus on the excavation of an ancient site it is *a priori* probable that the latest pottery will be found near the surface and the oldest deepest down, and so on. (*See* STRATIGRAPHY and SEQUENCE DATING) Thus by careful excavation stratum by stratum the archaeologist can obtain a stratified sequence of the potsherds from any given site These can be dated by the evidence of inscriptions or by that previously obtained from other sites, and thus provide a ceramic history of the site in question and a test by which buildings and other objects can be dated in their turn, and they even serve to correct false impressions or ideas that have hitherto held the field A classic instance of stratification is the "Persian Stratum" on the Acropolis of Athens which consists of damaged objects used as filling on the restoration of the buildings on the Acropolis after the destruction of Athens in 480 B C. The study, too, of the pottery that prevails in a given stratum shows the commercial and cultural influences prevailing at that period and throws light on the economic or political orientation of the city where it is found, and on the social customs and the prosperity of its citizens There are of course pitfalls for the unwary or the inexperienced The strata are not always laid down on mathematically level ground, but may slope down the side of a mound The earlier strata may be dug into in laying the foundations of a later building and so be partially disturbed, but proper observation of this enables the later building to be more nearly dated Again, when the accumulation of debris over a long period of years has made a mound, the site may be levelled for later constructions by cutting off the top and throwing down to the sides as was done at Troy by the builders of the 9th, or Graeco-Roman city Further, when in early days a particular type of pottery has been very commonly used on a site the soil becomes so full of fragments of it that every later stratum can hardly help containing a few pieces This sometimes leads to error, as occasionally attempts are made to date a building by the earliest objects found in it As a rule unless there are special circumstances to be taken into account a building, tomb or whatever it is should be dated by the latest object found

Greek pottery divides into the following groups —

Neolithic —This in turn subdivides into that found on the mainland and that found in Crete (*See* AEGEAN CIVILIZATION)

Bronze Age, which has three divisions. Early, about 3,500–2,200 B C , Middle 2,200–1,600 B C , Late 1,600–1,100 B C , and the pottery of these three periods is further subdivided according to the regions where it is found as Minoan, Cycladic or Helladic Under Middle Minoan comes the pottery formerly called Kamares ware, under Early Helladic Urfirnis ware, under Middle Helladic Minyan ware and Matt-painted ware, and the pottery called Mycenaean is to be classified according to its provenance as Late Minoan, Late Cycladic or Late Helladic Each of the three divisions of the Bronze age has further chronological subdivisions. (*See* AEGEAN CIVILIZATION)

Early Iron Age —The pottery of this period is still far from well known and is marked by the gradual predominance of geometric ornament, by the introduction of new shapes, by a different quality of paint, and in general by an artistic decadence which so often coincides with an improvement in the material concomitants of life

Geometric Pottery —By 900 B C. the Iron Age was well established in Greece and the geometric style of ornament predominated This is sometimes known as Dipylon pottery, because it first became known from vases found in the cemetery outside the Dipylon gate at Athens About 800–750 B C. the geometric style began to modify under the influence of oriental motives derived through the Greek colonies on the coast of Asia Minor and Cyprus, and probably, too, through contact with Phoenician traders This modification is known as Phaleron ware from the site of its first discovery Then about 750 B C what is known as Proto-Corinthian pottery had a great vogue This consists of small vases delicately made with fine linear ornamentation carefully designed and often combined with friezes of animals and warriors, well and minutely drawn These vases are called Sicyonian, from the view recently advanced that they were manufactured there They are, however, the forerunners in many

respects of the next great phase of Greek pottery.

Orientalizing.—Towards the end of the 8th century B.C oriental influence which had gradually permeated the geometric style became the chief characteristic of Greek pottery Just as the geometric style, though uniform, had many local variations all over Greece according to the circumstances of the place of manufacture and of the quality of the clay employed, so now the orientalizing style throughout the Greek world produced a great number of local styles, and many of these have not yet been definitely placed The style flourished more in the islands and along the Asiatic littoral where we find Aeolic, Clazomenian, Milesian, Samian, Rhodian, Delian and Melian wares Even Naucratis had a special fabric of its own, and on the mainland we have Corinthian, Chalcidian, Boeotian, Attic and Laconian wares Many of these local wares, like the Boeotian and the Laconian developed on their own lines in the succeeding periods, but never attained to any great importance, for Attic pottery eclipsed the rest of the Greek fabrics and became the great standard It seems to have been extensively exported, especially to Etruria, where its products found a ready market among the Etruscan nobles Thus Attic pottery from the 6th century onwards is the great centre of Greek ceramics, and we have two main styles (1) Black-figured ware in which the designs are painted in black on the red ground of the vase and picked out with incisions and with added purple or white paint This ware flourished during the 6th century, and shortly before 500 B C gave way to another style which was practically its converse; (2) Red-figured ware, in which the ground is painted black and the designs are reserved in the red colour of the vase, while details are rendered with black lines These last two classes of pottery, from the elegance and beauty of their drawing, rank more as paintings than as pottery With them must be grouped a contemporary ware in which the designs were painted on a white ground Particularly noticeable are the white *lekythoi* which were made specially to be placed in graves and decorated with unfixed paint These provide us with some of the best Greek paintings and drawings known

With the degeneration of the red-figured style in Attica at the close of the 5th century the Greek colonies in Italy took the lead and produced quantities of large vases decorated in a florid and over elaborate style In Greece itself the red-figured wares gave place to less pretentious vases intended more for use than as works of art Good pottery covered with the excellent black glaze which was the secret of the Attic potters, was produced in great quantities, but the ornament was limited to incisions assisted by simple patterns in white paint laid on the black surface Certain simple forms of white grounded ware were still made, but ordinary designs of flowers, fruit, musical instruments and the like were the sole decoration The principal decorated ware from the 4th century onwards was moulded pottery which includes a large class of vases usually known as Megarian bowls These are often covered with a uniform black glaze which is seldom of good quality and in later examples tends to be thin and grey The decoration at first consisted of figure subjects as on the earlier black and red-figured wares, and Homeric subjects were specially popular Designs based on the acanthus, shells, scales and other motives popular in Greek decorative art are common and figures of Erotes are often added With these comes a class of black pottery ornamented with moulded medallions or figures applied to the surface Here the motives employed are usually figures of maenads, satyrs, and other Dionysiac subjects, amazons and gods and goddesses Moulded wares became popular in Italy as Arretine pottery and so spread throughout the Roman world as "Samian Ware" (now usually called *terra sigillata*) which was the characteristic tableware of the first two centuries of the Christian era. Two probable reasons may be assigned for the decay of Greek pottery after the 5th century The general increase of wealth and luxury due to the renewed intercourse with the riches of Asia especially after the campaigns of Agesilaus and Alexander, inspired the upper classes, the patrons of the vase painters, with the fashion of using silver plate for their tables At the same time the new age of adventure beginning in the 4th century caused a change in art which was henceforward practised more for its own sake than as the means of ennobling objects of ordinary domestic and social use

VI. **Sculpture,** which properly comes under art and embraces all forms of plastic and toreutic, and can be subdivided into the following groups: (1) Sculpture proper, which is limited to figures carved in the round or in relief by the artist direct from the stone or marble A minor branch is gem engraving in which subjects are carved either in intaglio or in cameo directly on the stone; (2) Modelling, which applies to figures small or large modelled in clay intended as independent works of art or else as models for large figures to be executed in marble or bronze. The votive terra-cotta statuettes which are found in such numbers in excavating Greek sanctuaries and tombs, though usually cast in moulds, fall into this class and so do the well-known Tanagra and similar figurines which were made in moulds for funeral furniture; (3) Metal casting especially bronze, the favourite material for many of the greatest Greek sculptors. Polyclitus for instance worked principally in this technique A subdivision of this group is jewellery made by casting in gold and silver small objects which were then fitted together to make earrings, necklaces, and other ornaments; (4) Metal chasing, which is practically confined to the precious metals, (5) Carving in materials other than stone or marble, which is usually restricted to small objects such as statuettes of ivory, but in the earlier days of Greek art according to the literary evidence there were statues of wood which have not been preserved.

VII **Painting.**—We have nothing left of the frescoes or easel pictures of the great masters of Greek painting like Polygnotus or Apelles and a history of Greek painting has to be constructed mainly from the literary sources The vase paintings, however, of the Attic black and red-figured styles and of the white grounded vases supply much beautiful and valuable material for estimating the style and manner of the Greek painters The painted grave stones from Pagasae which are not earlier than the 4th century represent industry rather than art, but still provide useful evidence as to methods and technique

None of the seven branches of Greek archaeology are absolutely independent for they often over-lap each other Inscriptions may be found on buildings, on statues, on vases and on coins. Coins themselves, being struck from engraved dies in intaglio approach one of the subdivisions of sculpture, and ceramics and vase-painting are also closely connected Famous statues, too, were often imitated in coin types Then topography and study of the ancient remains from the geographical point of view take into account practically all the other branches Thus a hoard of coins containing a large number of bronze coins of a city, the site of which is doubtful may solve its identification. Still every Greek archaeologist, though he naturally specializes in one or two branches only, should have a sound working knowledge of the others.

CHRONOLOGICAL DIVISIONS

In addition to the seven great branches which divide Greek archaeology according to subject, there are two chronological divisions, the pre-historic and the historic It is hard to say where the first ends and the second begins, but for practical purposes the division may be put at 776 B C, the Greeks' own traditional date for the first Olympiad and the beginning of their chronology.

Prehistoric.—The prehistoric age subdivides into the usual periods. Palaeolithic, Neolithic, Bronze Age, Early Iron Age. The Palaeolithic Age is not yet established for Greece, though a few isolated palaeoliths are reported The Neolithic and Bronze Ages are described under AEGEAN CIVILIZATION. The Early Iron Age is a natural evolution from the last phase of the Bronze Age affected by the infiltration of external elements, probably northern, which the Greeks described as the Dorian Invasion or the Return of the Heracleidae It is characterized by the use of the "geometric" pottery mentioned above, iron swords of a Danubian type, bronze safety-pin brooches often with spiral ornaments, bronze figurines of animals, long bronze pins and sometimes ivory plaques and figurines. This culture is not that of a particular

tribe or people, but of a phase in the evolution of Greek art, for in the civilization of a people community of inspiration is more important than community of race Early in the 8th century a great increase in oriental influence due partly to Phoenicians and Etruscans and partly to the Greek colonies in Asia Minor inaugurated the orientalizing period of Greek art and here the historic age begins.

Historic.—With this, the classical age, our outlook is different In the time of unwritten history or legend archaeology itself is history, because the incidents of a people's life are reflected in its material remains. In other words prehistoric archaeology is a manuscript from which history can be deciphered On the other hand in the classical age history is written Archaeology then becomes an illuminator and interpreter of history and is best studied under its separate branches described above which form the subjects of special articles. (*See* ARCHITECTURE, ART, CERAMICS, EPIGRAPHY, NUMISMATICS)

RELATIONS TO OTHER COUNTRIES

Greek archaeology is not complete in itself, because inevitably it impinges upon the archaeology of the countries that are the neighbours of Greece Man is a social animal and lives by contact with his own kind Archaeology is one way of studying the material results of the contact of man and man Similarly no race can live for long in a state of complete isolation and the result of the contact between one race and another is reflected in their archaeology which thus provides a means of gauging the extent of the influence of one race upon another For pre-historic times there is archaeological evidence that Greece was in contact with surrounding races The marked influence which Egypt and Crete exerted upon each other is well known So we find connections between the Aegean civilization and Palestine, Cyprus and Asia Minor, where Troy is the classic example Northwards there are clear evidences of intercourse between prehistoric Greece and Macedonia and the Danubian and Carpathian areas Westwards there are hints of relations with Italy, and the Aegean civilization (*q v*) touched Sicily and Sardinia So no true student of the Aegean civilization can appreciate its full value without considering its neighbours and in chronology the Egyptian connections are of vital importance With the beginning of the classical period and the dawn of history the relations of Greek archaeology naturally became more intricate The connection with Egypt and Asia Minor still remains and there is great uncertainty as to the amount of the debt of Greece to Phoenicia during the orientalizing age These contacts are of the utmost value for chronological questions Northwards again Macedonia, Thrace, and the Danubian and Euxine districts become of genuine historical importance through their contacts with Greek archaeology The dating of the monuments in those regions is due in large part to our knowledge of Greece. For the Adriatic the same holds true and further west in Italy the case is far stronger Sicily and southern Italy were studded with Greek colonies and their relations with the indigenous cultures provide a reflex of their relative importance and also most useful chronological comparisons, and Etruscan archaeology is throughout illuminated by our knowledge of Greece Sardinia, the east coast of Spain and the south coast of France were fringed with Greek colonies, and so Greek archaeology illustrates these with great profit to history These instances show how important it is not to allow the detailed study of Greek archaeology to exclude all view of any other Two further points of the utmost importance for study of human development occur for note When Alexander overran the Persian empire and through Macedonia made Greece mistress of the Near East he spread Greek culture which is illustrated by hundreds of monuments throughout the East as far as the borders of India The influence of Greece on Asia is revealed by Greek archaeology and it was upon this union of East and West that the foundations of Christianity were laid Secondly, when Rome became mistress of the Mediterranean the culture she adopted was that of Hellenistic Greece, the very culture which Alexander and his successors had propagated Greek archaeology reveals this to us in the houses of Rome and Pompeii and the adoption by Rome of Hellenistic culture, which Greek archaeology verifies, assisted the rapid growth of Christianity under the Roman empire Constantine's official adoption of Christianity was one of the greatest landmarks in world history and Greek archaeology helps in no small measure to appreciate why and how this change was inevitable

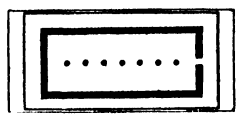
MUSEUMS

The materials for the study of Greek archaeology are housed in various museums all over Europe and in America. The museums of Greece take precedence because their contents are mainly the product of scientific excavations and have not lost their contexts and the sculptures they contain have not suffered from restoration The National museum at Athens is famous for its sculptures, vases, bronzes, the Acropolis museum for archaic sculptures, the Epigraphical museum for inscriptions The museums of Olympia, Delphi and Delos house the great finds from the excavations of those sites and that of Candia contains the finds from Cnossus and Crete in general Other important museums in Greece are those at Thebes, Volos (for paintings), Samos (for sculptures), Nauplia and Corinth (both for prehistoric pottery), Sparta (for Spartan art), Thera, Corfu, Chalcis, Thermon and several others In Italy Rome leads the way with the Museo delle Terme for sculpture, the Vatican for sculpture and vases, the Capitoline museums for sculpture and the Villa Giulia for vases At Naples the National museum has unrivalled sculptures, as also has the Uffizi at Florence, where in the Museo Archeologico are Greek objects found in Etruria The museums of Palermo for sculpture, Syracuse for vases, Taranto for vases and terra-cottas are important, and there are many other museums with Greek objects all over Italy In France the Louvre is the principal museum with great treasures of Greek art. In Germany there are many museums Berlin has in the State museums fine sculptures and vases and in the Ethnological museum Schliemann's finds from Troy At Munich the Glyptothek contains the Aegina pedimental figures and other sculptures and the Museum fur Antike Kleinkunst contains valuable vases Dresden (Albertinum), Cassel, Heidelberg, Hildesheim and other German towns have good collections In Great Britain the British Museum in London has the Elgin Marbles and a fine series of vases, the Fitzwilliam museum in Cambridge and the Ashmolean at Oxford have vase collections, too, and the latter a fine prehistoric collection as well In Turkey the Constantinople museum has good sculptures and some of the finds from Troy, and in Egypt the Alexandria museum has a good collection of objects illustrating the later stages of Greek art In Denmark at Copenhagen the Ny-Carlsberg Glyptothek has sculptures and the National museum vases In Holland the Scheurleer museum at The Hague and the Leyden museum, and in Belgium the Musée du Cinquantenaire at Brussels have good vases and terra-cottas In Russia the Hermitage museum at Leningrad has sculptures and vases, and several of the south Russian towns such as Odessa have good collections from the Greek colonies on the Black Sea In America the Metropolitan museum in New York and the Museum of Fine Arts in Boston both have good collections of sculpture and vases, while the university museums at Baltimore, Philadelphia, and Harvard have useful collections

BIBLIOGRAPHY —The publication of the results of research in all seven branches of Greek archaeology and of the material yielded by excavations is catered for by a large number of periodicals in the principal countries of Europe and in America and by the issue by specialists and others of learned monographs treating some particular section of the whole field The principal periodicals are in Greece the *Ephemeris Archaiologike*, and the *Archaiologikon Deltion*, in Austria the *Jahreshefte* of the Austrian Archaeological institute, in France the *Revue Archéologique* and the *Bulletin de Correspondance Hellénique*, in Germany by the *Jahrbuch* of the German Archaeological institute, the *Athenische Mitteilungen*, and many others, in Great Britain by the *Journal of Hellenic Studies* and the *Annual of the British School at Athens;* in Italy by the *Monumenti Antichi* of the Accademia dei Lincei and the *Annual* of the Italian school at Athens; and in the United States by the *American Journal of Archaeology* The monographs dealing with special aspects of Greek archaeology fall into three classes (1) Monumental collections or catalogues of a particular class of object, such as the great Corpus of Greek inscriptions (*Inscriptiones Graecae*) issued by the Berlin academy or the *Corpus Vasorum Antiquorum* published under the auspices of the *Union Académique Internationale* and scientific catalogues of famous museums such as the German catalogue of the Vatican sculptures and

the British catalogue of the Capitoline collections and the British Museum catalogue of Greek coins. (2) Comprehensive publications of the objects found in great excavations with full and scientific commentaries such as the German publications of the excavations at Olympia, Thera and Aegina; the French publications dealing with Delphi and Delos which are still in progress, and the Greek publications dealing with Epidaurus and the Acropolis at Athens (3) Monographs on particular topics which range from handbooks of the usual type for students, such as the histories of Greek sculpture by E. Gardner, Overbeck, Collignon, and Picard, to scientific monographs of the first class which lay the foundations for the study of a particular subject Here we can class in topography Woodhouse's *Aetolia,* in epigraphy Cavaignac's treatise on the *Trésor d'Athènes,* in numismatics Svoronos' *Nomismata ton Ptolemaion;* in architecture Penrose's *Principles of Athenian Architecture,* and the American monograph on the Erechtheum, in Ceramics Beazley's books on Attic black and red-figured vases, in sculpture Joubin's *Sculpture Archaique,* or Furtwängler's *Masterpieces* and in painting Pfuhl's *Meisterwerke Griechischer Zeichnung und Malerei.* Of equal importance are the great portfolios of plates of sculpture and of portraits published by Messrs. Bruckmann of Munich *See* also A Michaelis, *Ancient Marbles in Great Britain* (1882), and *A Century of Archaeological Discoveries* (1908); J. P. Droop, *Archaeological Excavation* (1915). (A J B W.)

GREEK ARCHITECTURE. To the Greeks fell the rôle of inventing the grammar of conventional forms on which all subsequent European architecture was based The materials at their disposal, wood and stone as well as mud, induced them to adopt a post-and-lintel system, as in Egypt (*see* EGYPTIAN ARCHITECTURE), instead of massive walls and vaults, as in Mesopotamia (*see* WESTERN ASIATIC ARCHITECTURE, ARCHITECTURAL ARTICLES, etc) However, for moulding their supports they chose conventional rather than naturalistic forms, therein resembling their Aegean predecessors, particularly Greek was the patient genius with which they perfected every element, rarely deviating from the forward path to invent new forms or new solutions of old problems This conservative adherence to older types led to such masterpieces as the Parthenon and Erechtheum



FROM ANDERSON & SPIERS AND DINSMOOR "THE ARCHITECTURE OF ANCIENT GREECE (BATSFORD)

FIG 1 —TEMPLE AT NEANDRIA

Primitive Period (1100–600 B.C.).—While Greek domestic architecture began with the Dorian invasion, monumental religious architecture first appeared in the 9th century Mere open areas with altars (Aegina, Sparta, Ephesus) no longer sufficed when gods were represented in large images, requiring special temples The houses of men furnished the patterns from the circular nomadic hut developed the horseshoe or apsidal plan (Eretria, Gonnoi), the oblong plan with curved walls (Thermon), and eventually the normal straight-sided oblong, the axis running east-and-west, and the entrance always at one end A porch (*pronaos*) might be added in front, a sanctuary (*adytum*) at the rear Walls were of mud-brick resting on stone socles, their free ends (*antae* and door jambs) encased in wooden sheathing Simultaneously the roof developed from the nomadic thatched beehive, through the long ogival mud-brick vault, to the sloping hipped roof with wooden rafters, supported by girders resting on the side walls

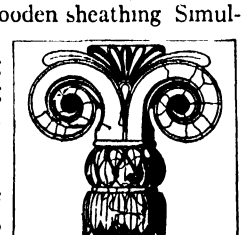


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FIG 2 —PROTO-IONIC CAPITAL

In wider temples these cross girders had to be reinforced by columns placed in single file along the main axis (Selinus, Priniias, Locri, Sparta, Neandria, Samos) Thus came into Greek architecture the characteristic post-and-lintel system At first mere wooden posts, these internal supports were gradually moulded on opposite sides of the Aegean sea into two different types Proto-Doric and Proto-Ionic The former, with its circular moulded capital and square abacus, was copied in wood from such surviving Aegean works as the Lion Gate at Mycenae The Proto-Ionic type originated as an elongated capital, early transformed into stone, slender unfluted shafts (sometimes with special bases) were capped by garlands of drooping leaves from which spring vertical volutes (Lesbos, Neandria, Larissa), an Egyptian motive transmitted by Phoenicians and Hittites

In an open pronaos, a central column repeated the axial colonnade (Locri, Priniias); next, because central columns obscured the cult image, the axis was opened by using two internal colonnades and so two columns *in-antis* on the front. Thus the column first appeared on the exterior and introduced a new problem, the creation of an entablature The transverse girder formed the architrave, a single solid beam in the Doric, compounded of superposed planks (fascias) in the Ionic; upon this rested the ends of ceiling beams, heavy and widely spaced (triglyphs) in the Doric, light and closely spaced (dentils) in the Ionic. Mutular eaves formed by overhanging rafters characterized the Doric cornice, the Ionic was merely hollowed to shed rainwater The light wooden Ionic entablature is best known through imitations in native rock-cut tombs of Asia Minor, the Doric forms are revealed through the survival of terracottas which protected the bulky timbers, black or blue triglyphs casing the fibrous ends of ceiling beams, gaily painted terracotta metopes occupying the interstices, and facings with conventional patterns on the cornice The ridge of the hipped roof was soon prolonged to the front, forming a gable (pediment), the rear end sometimes remaining hipped (Thermon, Sparta) The gutter (*sima*) which had hitherto crowned the cornice on all four sides was only momentarily retained under the pediment (Syracuse, Geloan treasury at Olympia), but the mutules, equally anachronistic symbols of rafters under a pediment, remained even on the façade Semicircular terracotta tiles covered the joints between the concave pan tiles, terminating at the eaves in semicircular antefixes

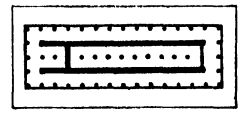

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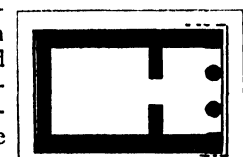
FIG 3 —TEMPLE AT THERMON

While the Ionians limited themselves to the pronaos *in-antis,* the emergence of the column and the development of the order inspired Dorian architects to further embellishments The pronaos might be repeated in a rear porch (*opisthodomus*), or the whole temple surrounded by a peristyle From the five lines of the flank walls and the axial and flank colonnades resulted pentastyle façades (Thermon), two internal colonnades required hexastyle façades (Heraeum at Olympia), the flanks were long in proportion, with 15 or 16 columns The height of the wooden columns, $1\frac{3}{4}$ axial spacings (Olympian Heraeum) each of $4\frac{3}{8}$ diameters (Argive Heraeum), seems to have been 7 diameters; the entablature was about two-fifths of the column height

Archaic Period (600–500 B.C.).—The new-rich western colonies transformed the peripteral temple into limestone, the Ionian East soon followed with the greater splendour of marble But the motherland of Hellas remained conservative, during eight centuries the columns of the Olympian Heraeum were gradually replaced in stone, as late as 513 B C marble was limited to one ostentatious temple façade (Delphi) Limestone, however, was coated with fine marble stucco, sandstone was often used in the West for carved members, terracotta cornice revetments were gradually eliminated and the terracotta gutters and even roof tiles replaced in more important temples by marble.

A few primitive types of plans survived, either apsidal (Delphi Athens, Corinth, Olympia) or with axial colonnades (Olympia, Delos, Paestum, Metapontum) The simple diastyle *in-antis* plan long prevailed in Hellas, at Athens a double temple had porches at both ends But the most favoured temple plan was the hexastyle peripteral, sometimes (in Sicily) with the façade doubled for greater magnificence The opisthodomus (rear porch) was customary in Hellas, the closed adytum (secret chamber) in the West, the interior might have two rows of columns (in Hellas) or none at all (in Sicily) The East outdid the West by doubling the colonnade on all sides, giving the octastyle dipteral plan (Ephesus, Samos, Magnesia), imitated also at Athens (Olympeium); at Corcyra and Selinus ("GT") the inner lines of columns were omitted, becoming pseudodipteral; at Acragas (Olympeium), while retaining the same vast total dimensions as at Selinus, the number of columns was reduced and the scale thereby so enlarged



FROM SAME SOURCE AS FIG 1

FIG 4 —TEMPLE AT RHAMNUS









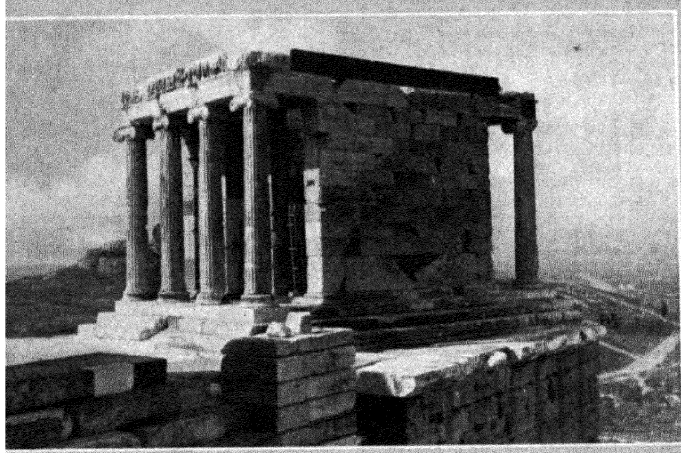
BY COURTESY OF (3, 6) B. T. BATSFORD, FROM DINSMOOR, "THE ARCHITECTURE OF ANCIENT GREECE"; PHOTOGRAPHS, (4) EWING GALLOWAY, (1, 5, 7) PUBLISHERS PHOTO SERVICE, (2) KEYSTONE VIEW COMPANY

EXAMPLES OF DORIC TEMPLES

1. Temples at Paestum; at the right the so-called Basilica, really an archaic temple (*c.* 540 B.C.). At the left the so-called Temple of Poseidon (*c.* 460 B.C.), showing heavy transitional proportions relieved by numerous flutes; one of the best preserved of Greek temples (for interior *see* fig. 5)
2. Temple of Apollo at Corinth (*c.* 540 B.C.), showing the seven standing columns, with sturdy archaic proportions, monolithic shafts, and high architrave (frieze and cornice missing). View from interior, with Acrocorinth in background
3. Temple of Zeus at Olympia (*c.* 465–457 B.C.); Libon of Elis, architect. East front (restored), showing heavy proportions as at Paestum because of its transitional date and colossal scale, the effect being relieved by pediment sculpture (the shields are Roman additions). Overthrown by earthquakes, little now existing above the platform level
4. The Parthenon on the Acropolis at Athens (447–432 B.C.); Ictinus and Callicrates, architects. The masterpiece of the Doric style, with the lighter proportions of the culminating period. This west front is nearly intact apart from the loss of the pediment sculptures; the flank colonnades were partly demolished by bombardment in 1687 (for interior *see* fig. 7)
5. Interior of the Temple of Poseidon at Paestum (*see* fig. 1), showing the usual Doric treatment with superposed tiers of heavy Doric columns to support the ceiling
6. Interior of the Temple of Apollo at Bassae (*c.* 450–420 B.C.); Ictinus, architect. This shows the later scheme of employing single tiers of slender Ionic columns to support the ceiling, even though the temple is Doric externally
7. Interior of the Parthenon (*see* fig. 4) from the west, with the internal colonnades (in two tiers as at Paestum) and walls and parts of the flank colonnades blown out by the explosion. The dark patch of pavement in the distance is the site of the gold-and-ivory statue

GREEK ARCHITECTURE







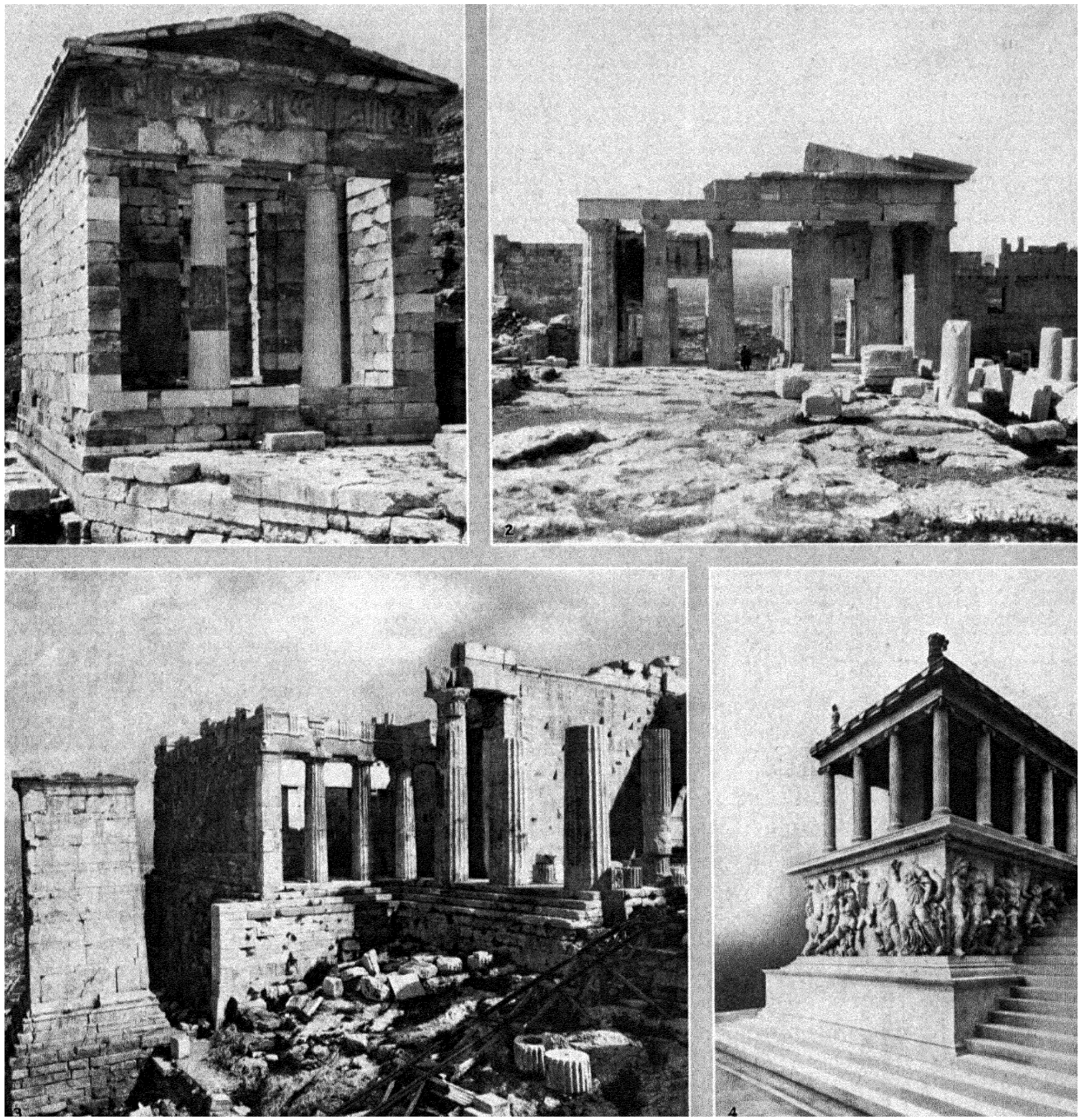




BY COURTESY OF (4) B. T. BATSFORD FROM DINSMOOR, "THE ARCHITECTURE OF ANCIENT GREECE"; PHOTOGRAPHS, (1) PUBLISHERS PHOTO SERVICE, (2) ALINARI, (5) EWING GALLOWAY

IONIC AND CORINTHIAN TEMPLES

1. The Erechtheum on the Acropolis at Athens (*c.* 421–405 B.C.); Mnesicles probably the original architect. View from the southwest, showing the irregular plan resulting from the limitations imposed on the architect by religion. There are three different Ionic orders (the east porch of six columns, one visible at extreme right; the north tetrastyle porch at extreme left, compare fig. 4; the sham portico of four engaged columns at the west) and at the south is the Caryatid porch. Rebuilt by the Greek authorities, 1903–1908. 2. Temple of Athena Nikė (Nikė Apteros) at Athens (*c.* 426 B.C.) as seen from the northeast; Callicrates, architect. situation on a bastion of the Acropolis. 3. Temple of Apollo at Didyma near Miletus (332 B.C.–A.D. 41), Paeonius and Daphnis, architects. Detail of colossal east façade, showing special stairway in the centre, adapted to human requirements, and varied column bases. 4. North porch of the Erechtheum (*see* fig. 1), the open proportions and elaborate decoration contrasting with the solidity and simplicity of the neighbouring Parthenon. 5. The Olympieum at Athens (174 B.C.–A.D. 131); Cossutius, architect. The only colossal Corinthian temple of the Greek period, with heavily proportioned columns; the frieze and cornice exist



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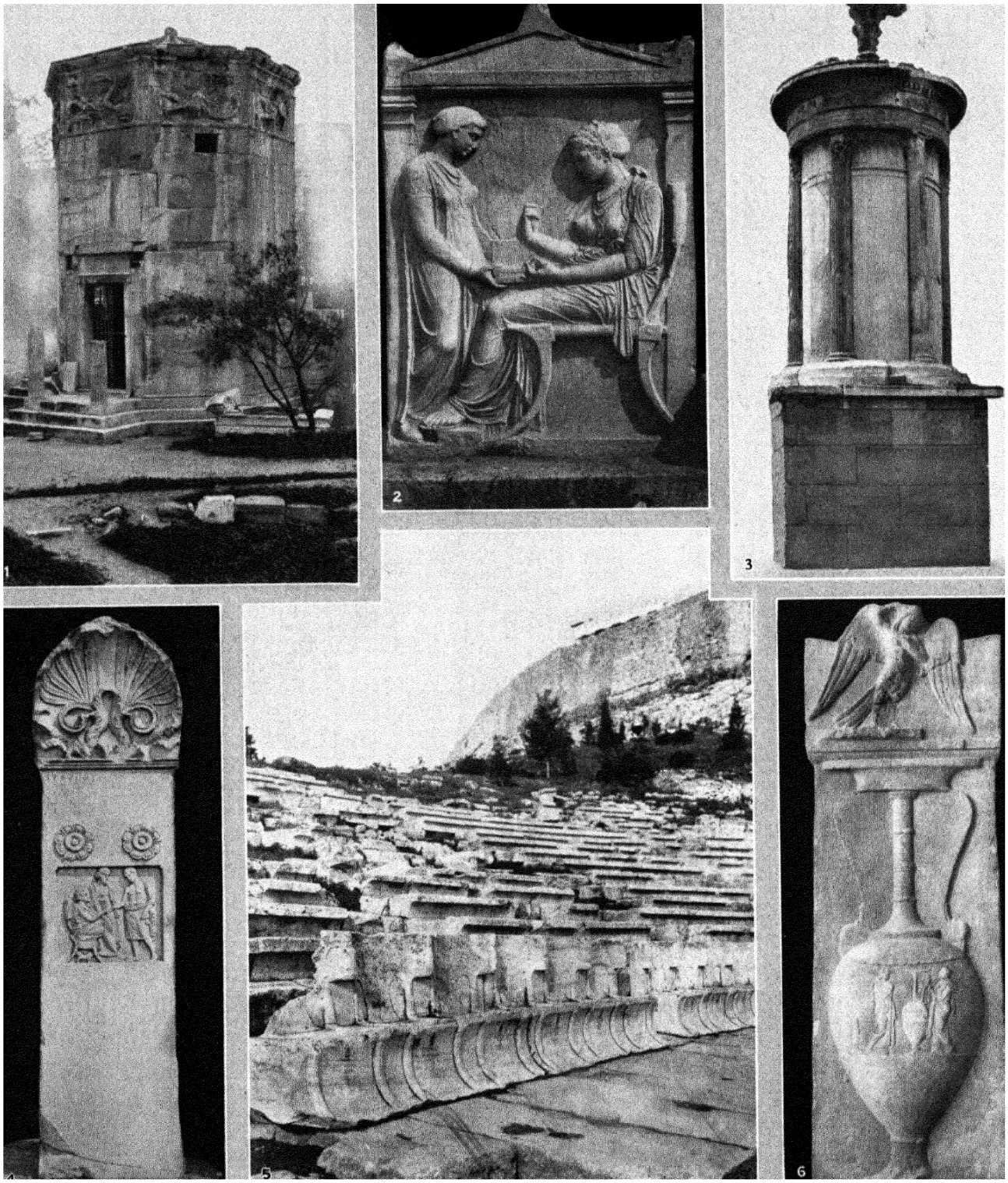
GREEK RELIGIOUS PRECINCTS

1. Athenian Treasury at Delphi (*c.* 515 B.C.), in the form of a small Doric temple, executed wholly in marble, originally with elaborate sculptured decoration (of which only casts of the metopes are in place). Rebuilt by the French authorities 1903–06, by fitting together the scattered fragments
2. The Propylaea of the Acropolis at Athens (437–432 B.C.); Mnesicles, architect. Inner or east front, showing the form of the Doric central porticoes, and the middle intercolumniation widened for processions. The parts above the columns were overthrown by an explosion about 1645, and rebuilt by the Greek authorities 1909–17. At the right appears the unfinished wall of the proposed northeast hall
3. The Propylaea at Athens (*cf.* fig. 2), showing outer or west front (injured by bombardment in 1687) and steeply sloping approach, with enframing wings at north and south (the latter not shown) terminating in pedestals which were to have enframed gateways to lower precincts. Upon the frustration of the latter portion of the scheme, the Temple of Athena Niké was built on the south (426 B.C., *see* Plate II., fig. 2), and the great pedestal of Agrippa on the north (174 B.C.), at extreme left
4. The Great Altar of Zeus at Pergamum, built for Eumenes II. (197–159 B.C.). Detail of the reconstruction in Berlin, showing podium decorated with colossal frieze, interrupted by stairs which ascend to a colonnaded court enclosing the altar. Only the foundations remain on the actual site

GREEK ARCHITECTURE



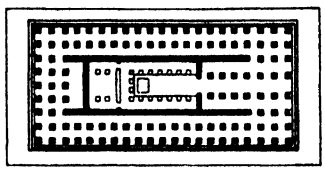
PHOTOGRAPHS, (1, 5) PUBLISHERS PHOTO SERVICE, (2, 4, 6) ALINARI, (3) EWING GALLOWAY

GREEK MONUMENTS AND SECULAR BUILDINGS

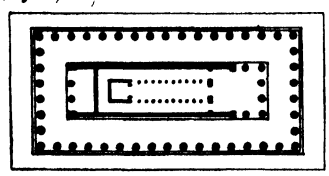
1. Tower of the Winds at Athens (*c.* 100 B.C.), designed by the astronomer Andronicus Cyrrhestes; view showing one of the two porches, each of which was composed of two Corinthian columns. Sundials on each of the eight sides, an allegorical frieze of the eight winds at the top, a conical roof surmounted by an octagonal capital and a bronze Triton as weather-vane, completed the design. 2. Grave stele of Hegeso (soon after 400 B.C.), tombstone of wide pedimental type from the Ceramicus cemetery at Athens; slightly projecting lateral antae enclosing scene of parting in relief. 3. Choragic Monument of Lysicrates at Athens (334 B.C.), showing thin walls, and the conical roof and trefoil finial originally supporting a bronze tripod. 4. Grave stele of Bion (4th century B.C.), tombstone of narrow type from the Ceramicus cemetery at Athens, with palmette acroterion embellished with acanthus leaves, and two rosettes above the relief. 5. Theatre of Dionysus at Athens (*c.* 350–325 B.C.), on the south slope of the Acropolis, showing the marble thrones forming the lowest tier, and the ordinary limestone seats rising behind (*cf.* Plate V., fig. 2). 6. Grave stele of a maiden (4th century B.C.), tombstone of narrow type from the Ceramicus cemetery at Athens, with funeral vase (loutrophoros) in relief

that the intervals were filled with walls, becoming pseudoperipteral. The employment of colossal dimensions, with stylobates measuring up to 180×365 ft., column diameters up to 14 ft. (Acragas), column spacings up to 28¾ ft. (Ephesus), afforded the tyrants of this period opportunities for lavish display

The geographical cleavage between the styles continued The western temples at Syracuse, Selinus, Acragas, Paestum, Pompeii, Tarentum, Metapontum and Corcyra, and those in Hellas at



FROM SAME SOURCE AS FIG 1
FIG 5 —TEMPLE AT EPHESUS (RESTORED)

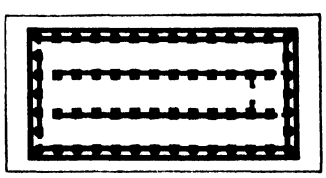


FROM SAME SOURCE AS FIG 1
FIG 6 —TEMPLE "GT" AT SELINUS

Athens, Rhamnus, Delphi, Eretria, Aegina and Corinth, all were Doric In the East, Naucratis, Ephesus, Samos, Naxos, Paros, Chios, Miletus and Magnesia furnish important landmarks of the archaic Ionic development The Doric temple invaded the East, at Assos, suffering the intrusion of the Ionic frieze; reciprocally the Ionic temple penetrated the West, at Locri and Hipponium

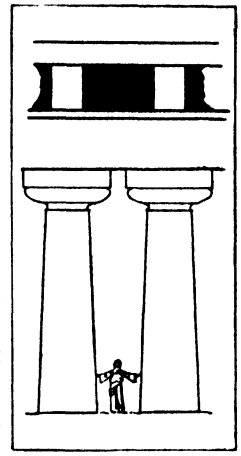
In the Doric order the sudden change of material, and timidity as to the strength of stone, caused violent changes Not only were column shafts often constructed as monoliths, but proportions became heavier, with column heights ranging from 6½ to 4 diameters as they increased in size, and with intervals as close as ¾ diameter, so that the spreading capitals were nearly contiguous With growing confidence, larger columns were eventually raised to 5 or even 5⅝ diameters, with intervals up to 1¾ diameters, only for constructive reasons were the colossal columns at Acragas limited to 4½ diameters, the intervals at Selinus and Acragas to 1¼ and ⅞ diameters Spacings and diameters were often enlarged on the façades in Hellas; uniform diameters but different spacings characterize the western peristyles Bulky architraves, and other members in proportion, made the height of the entablature more than half of the column, this proportion being reduced gradually to two-fifths or three-eighths

The heavy shafts were relieved by tapering and by flutes, 16 to 50 in number, 20 being the final preference The hollow necking and astragal inherited from Aegean prototypes gradually disappeared, until three or four incisions alone distinguished necking from shaft The abacus spreading to 2½ times the upper column diameter (forming slabs up to 13 ft square), making the echinus curve almost horizontal, contracted and the echinus stiffened Triglyphs at first appeared only above columns, leaving horizontal oblong metopes between; interpolated triglyphs next reduced the metopes to vertical oblongs, which gradually approached squareness, the half mutules above the narrow metopes then becoming of full width Relief sculpture succeeded painting in the metopes and pediments, changing in the latter to free statues, human and animal forms replaced the semicircular acroteria, and the antefixes changed from semicircles to prismatic forms, surmounted by palmettes Such vagaries as flutes ending in petals, the echinus carved with rosettes or lotus, the architrave carved as a frieze or crowned by heavy Ionic mouldings, the frieze omitted, triglyphs unrelated to columns, pentaglyphs substituted for triglyphs—these show that the style was yet in a formative and uncanonized stage



FROM SAME SOURCE AS FIG 1
FIG 7 —OLYMPIUM AT ACRAGAS

The Ionic column, carrying a lighter entablature and longer habituated to stone, was more slender from the very beginning (about 8 diameters), with greater intervals (1½ to 2½ diameters), particularly noteworthy were the enormous intervals of the façades. Bases became more complex, a torus horizontally fluted above and a disc fluted or with two deep scotias below The shaft had narrow flutes with sharp arrises, 18 to 48 according to size, the flutes later deepening with separating fillets, 24 in number. The capitals show pendent leaves transformed into egg-and-dart, at first deeply undercut; volutes changing direction to the horizontal and becoming connected; "canals" at first convex, then concave, with "eyes" appearing late in the development, the abacus long and narrow Exceptional were sculptured lower drums and rosetted volutes at Ephesus, flowered neckings at Naucratis, Samos and Locri Though the entablature was friezeless, broad bands of relief sculpture were inserted wherever possible, as on the sima at Ephesus But in Hellas a new type of Ionic entablature was created to vie with Doric proportions, the fascias of the architrave were suppressed, the dentils omitted and a high frieze inserted between architrave and cornice (Ionic treasuries at Delphi)

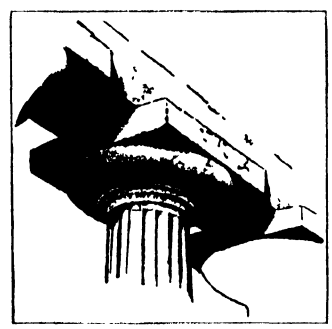


FROM SAME SOURCE AS FIG 1
FIG 8 —EARLY ARCHAIC DORIC PROPORTIONS

Both orders were awkward at the corners of peristyles In the Doric, the difficulty lay in reconciling triglyph and column spacings, while bringing a triglyph out to the corner of the entablature, in the West it was met by widening the angle triglyph or the adjacent metope, in Hellas by contracting the end columnar interval, finally, metope expansion was combined with column contraction In the Ionic, the bracket capital seemed incapable of turning the corner, until at Ephesus was devised an awkward L-shaped capital with an angle volute

Other forms displaying the versatility of the archaic designers were the hybrid Doric-Ionic capitals of Amyclae, the basket capitals of Delphi, and the use of human figures as supports, both male (Atlantes of Acragas) and female (Caryatids of Delphi) Other types of buildings yielded new opportunities,—simple temple-like treasuries (Olympia, Delphi), the square hypostyle hall (Telesterion) at Eleusis, the archaic circular tholos at Delphi, the apsidal senate-house at Olympia, altars as at Miletus and Delphi, the throne at Amyclae, porticoes such as the Athenian Stoa at Delphi, the primitive orchestra circle at Athens, and elaborate fountains built by the tyrants (Athens, Megara, Corinth, Samos) And in some of these minor works, as in votive columns and grave monuments, migratory architects mingled the styles

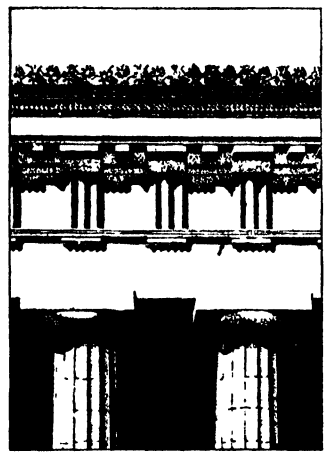
Transitional Period (500–450 B.C.).—The grammar of forms and the types of buildings having been largely determined, the next step was that of refinement The problem was all the more concentrated because the political subjection of the East now restricted architectural initiative to the Doric style of Hellas and the West, which, furthermore, received fresh impetus from the victories over Persia and Carthage And in particular at Athens the discovery of copious marble quarries contributed to the refinement of design



FROM KOLDERWEY AND PUCHSTEIN, "DIE GRIECHISCHEN TEMPLE IN VUTERITALISU UND SICILISU" (JULIUS SPRINGER)
FIG 9 —DORIC CAPITALS

Freedom was now abandoned in favour of strict canonization, resulting almost in monotony Hexastyle peripteral Doric temples became universal in Hellas at Sunium, Athens (the unfinished Older Parthenon), Aegina, Delphi and Olympia, in the West at Syracuse, Himera, Gela, Caulonia, Acragas, Croton and Paestum (with simple *in-antis* plans at Acragas and Camarina) Work was continued on the never-finished colossi at Selinus and Acragas, with distinct changes of details A reaction toward heavier proportions is everywhere noticeable, the column height ranged between 5⅝ and 4¼ diameters, the intervals between 1¼ and 1 diameter with smaller or larger columns; the entablature remained about two-fifths of the column height In the West, columns were of uniform diameters and (except at Paestum) uniformly spaced on front and flank, apart from the contracted end intervals, but in

Hellas some emphasis of the front, either with heavier columns or with wider spacing, was still prevalent, or the corner columns alone might be enlarged The West adopted the opisthodomus of Hellas, sometimes in addition to the adytum; but cella colonnades appeared in the West only at Paestum, apart from the huge octastyle at Selinus. Such internal colonnades were two (at Selinus three) storeys in height, separated by architraves and carrying only ceiling and roof; the few known galleries (Aegina, Olympia) were later insertions; and the stone staircases (Selinus, Acragas, Paestum) ascended merely to storerooms above the ceilings



FROM SAME SOURCE AS FIG 1

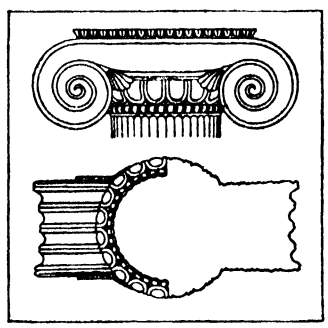
FIG 10.—ENTABLATURE AT SELINUS (RESTORED)

In this period the Ionic temple first appeared in Hellas (Sunium), with the peristyle strangely confined to one front and one flank, and with the typical mainland form of entablature without fascias or dentils

Among other types of buildings, additional treasuries at Olympia, the reconstructed oblong Telesterion at Eleusis and the similar Cnidian Lesche (clubhouse) at Delphi, the Old Propylon of the Athenian Acropolis, great porticoes such as the Royal and Painted Stoas at Athens, the reformed Athenian theatre with wooden scene buildings, and the imitation of the oriental gridiron city plan at Miletus, all paved the way for the masterpieces of the following period

The Culmination at Athens (450–400 B.C.).—The middle period of the evolution centred at Athens, which signed peace with Persia in 448 B.C., and now in the absence of military requirements was free to use the wealth of the Athenian confederacy in rebuilding the temples ruined by the Persians. Under the personal initiative of Pericles, and in the hands of architects like Ictinus, Callicrates and Mnesicles, and the sculptors Phidias and Callimachus, Greek architecture reached its zenith

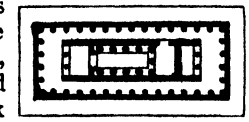
The Doric style of Hellas naturally retained the leading place, and was employed not only in hexastyle temples at Bassae, Rhamnus, Sunium and Athens ("Theseum"), but also in the octastyle Parthenon on the Acropolis; besides these erected by Athenian architects, we find hexastyles near Argos (Heraeum), at Acragas (temple of Concord), Segesta and Delos (the last prostyle) Most of these structures were comparatively small, owing their effect rather to perfection of design and execution, and, in the case of those in Attica, to the beauty of marble Columns were now more slender, 6 to 5½ diameters high, with intervals of 1⅔ to 1¼ diameters, as columns were smaller or larger; the entablature was reduced to one-third of the column height Only Bassae retained the older system with heavier columns on the main façade and reduced spacing on both flanks; elsewhere uniformity prevailed, except at the corners Cella colonnades were omitted except in the work of Ictinus and at the Argive Heraeum, Ictinus obtained a new effect by returning the colonnade across the back, at Bassae separating adytum from cella (the lateral columns being engaged to the flank walls), in the Parthenon forming an ambulatory around the statue The false gallery with two storeys of Doric columns appeared for the last time in the Parthenon and Argive Heraeum, a single Ionic order was preferred at Bassae (with three Corinthian capitals across the rear) and in the rear chamber of the Parthenon The coalescence of the styles was marked by the inclusion of other Ionic elements, mouldings and continuous friezes (Parthenon, Theseum, Sunium). Sculptured reliefs in friezes and metopes, pediments filled with statues and crowned by great floral acroteria, these and the fine mouldings and the marble ceilings enhanced by colour and gilding, broad masses of colour on triglyphs and in shadowed cornice soffits further relieved the simplicity of Doric forms.



BY COURTESY OF JAMES CRAMER WATT

FIG 11.—ARCHAIC IONIC CAPITAL

The Ionic style was also employed independently in three non-peripteral temples at Athens (on the river Ilissus, the Nike temple and Erechtheum on the Acropolis); its foothold in Hellas was now assured The amphiprostyle tetrastyle plan was preferred, though in the Erechtheum the rising ground at the east so elevated the stylobate that six columns were required in the width; and the tetrastyle portico originally planned for the west end was revolved to the north flank to respect the sacred olive-tree, balanced by the miniature Caryatid portico on the south, and replaced on the west by a sham portico of engaged columns, producing an irregular T-shaped plan Columns tended toward slenderness but with great variety of proportion, from 7½ to 10 diameters, with intervals from 2 to 3 diameters, as columns were smaller or larger; the Doric rule was reversed to emphasize Ionic lightness. Bases, after an experimental flaring type at Bassae, assumed the Attic profile with one scotia between two tori. Capitals, apart from the experimental form at Bassae with angular volutes, connected by an arched cushion without an abacus, remained elongated brackets, those of the Erechtheum were specially enriched by intermediate fillets in the volutes, inlaid gilded stems ending in palmettes, an extra torus moulding with coloured glass beads, and a flowered necking The architrave, plain at first, soon resumed its fascias; but the frieze had come to stay and in consequence the dentils were omitted, except in the Caryatid Portico which reproduces the Asiatic form; and with these higher proportions the entablature was one-fourth or two-ninths of the column height. Rampant antefixes above the sima of the Erechtheum, and its elaborately carved mouldings, exceptional in the 5th century, foreshadow the elaboration of the following period



FROM BOORMANN, "GESCHICHTE DER BAUKUNST" (ALFRED KRONER VERLAG)

FIG 12.—TEMPLE AT BASSAE

Another symptom of change was the creation of a third style, the Corinthian, first appearing inside the temple at Bassae Like the Ionic capitals in the same colonnade, the Corinthian capitals represent an attempt to invent a form symmetrical on all sides, the basket capitals of Delphi being further elaborated with acanthus leaves, scrolls and palmettes

Among buildings other than temples, the Propylaea at Athens take first rank in brilliance of conception A cruciform plan 224 ft in length (about equal to the Parthenon) would have formed a frontispiece across the west end of the Acropolis, with wings projecting westward to enframe the ascent, by war and priestly conservatism the design was curtailed until it resembled a lopsided T, only 154 ft in length The central building, with its Doric hexastyles and pediments dominating the low hipped roofed north and south arms and west wings (without columns except on the return faces of the wings), formed the entrance, the central intercolumniation widened 6 ft to allow the passage of festal processions, and the five doorways graded in width like the intercolumniations, with heights varying in proportion; the west ceiling was supported by six Ionic columns in immediate juxtaposition with the Doric Hardly less notable were the redesigned Telesterion at Eleusis, a great square with four rows of five columns within (planned with an outer pseudodipteral colonnade), and the Odeum at Athens with internal columns arranged in nine rows of nine; both had clerestory lanterns above the roofs Corresponding advances in city planning were the importation of the gridiron system to Hellas (Peiraeeus) and the West (Thurii), and the in-

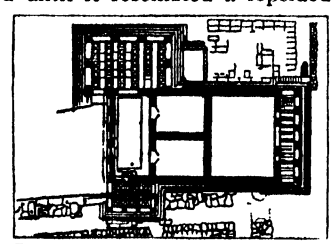
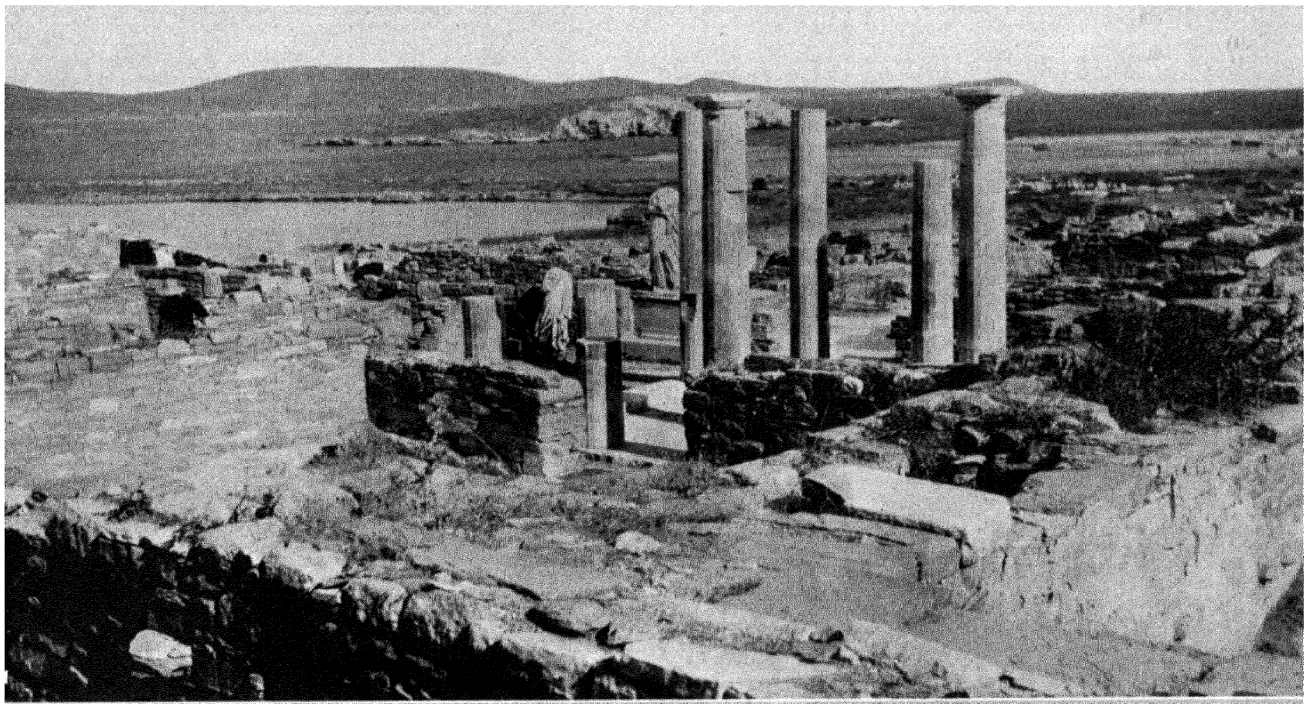
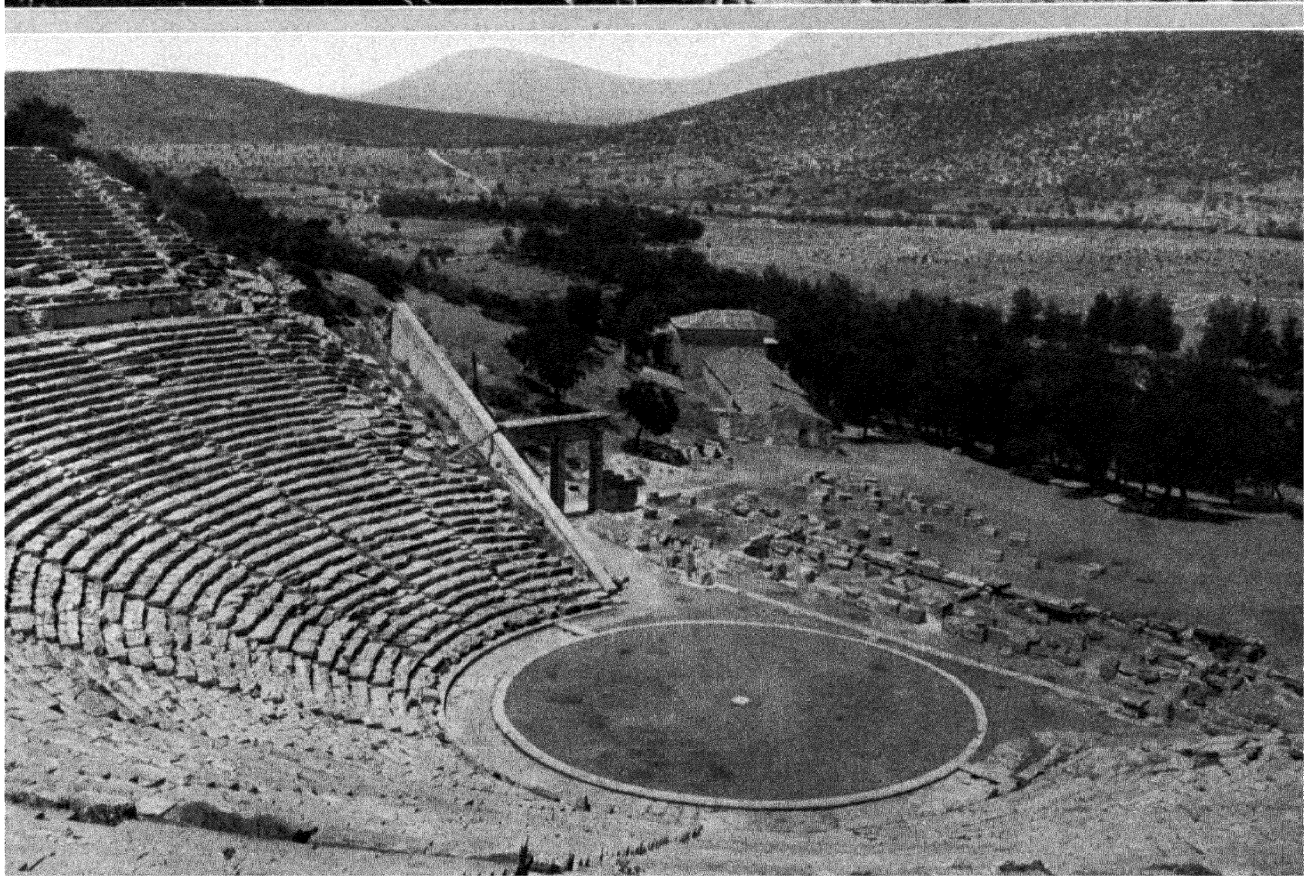


FIG 13.—ERECHTHEUM, DRAWN BY GORHAM P STEVENS





PHOTOGRAPH, (2) EWING GALLOWAY

GREEK SECULAR BUILDINGS

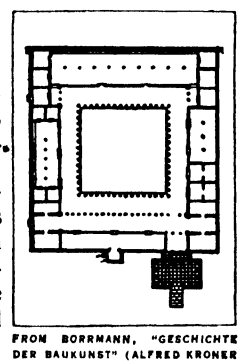
1. "House of Cleopatra" at Delos (138 B.C.), a private house with peristyle court, the slender marble columns supporting a wooden entablature, and surrounding an impluvium with a mosaic floor and a cistern beneath
2. Theatre at Epidaurus (*c.* 325 B.C.); Polycleitus the Younger, architect. View showing the circular orchestra 66½ ft. in diameter, with the foundation for the central altar, the surrounding auditorium occupying three-fifths of the circumference, the left entrance (parodos) gateway. The scene building, of which only the foundations remain, is of later construction

triglyphs and columns. The few who adhered to the style sought new methods of appeal: engaged columns, lighter proportions with slender columns (up to 7 or 7½ diameters) and thin entablatures requiring the interpolation of extra triglyphs, columns with Ionic fluting or even bases, the echinus, abacus and taenia moulded. Wall surfaces were modelled, with emphasized joints and belt courses The cella might even have an internal apse (Lebadea, Samothrace), or projecting aisles at the sides (Lusoi)

The Ionic style, now the successor rather than rival of the Doric, is best exemplified in three beautiful pseudodipteral octastyles (Messa, Smintheum, Magnesia), less successful are smaller examples at Teos, Magnesia and Pergamum Bases changed from the Asiatic to the Attic form, with plinths, capitals contracted in length, the rising echinus eliminated the downward droop of the cushion, and *rinceaux* filled the cushion and baluster. The entablature included the Attic frieze, and the dentils became small and meaningless, being used as decoration even in the raking cornice These forms, and this moment of the Ionic supremacy, are reflected in the volume wherein Vitruvius interpreted Greek architecture to the Romans, using the Ionic as the typical order.

Now, however, the Ionic supremacy began to be threatened by the Corinthian style, best exemplified at Tralles and in the dipteral octastyle Olympieum at Athens (174 B C) Its merits were most obvious in peristyles, the capital being symmetrical on all sides and the entablature unhampered by triglyphs, but its popularity extended even to distyle porches (Messene)

Even more important than temples, however, were numerous other types of buildings Monumental sacrificial altars rose at Syracuse (74×653 ft), Pergamum (the "Seat of Satan," 112×120 ft), Priene, and Magnesia Doric porticoes surrounding the temples (Ephesus, Priene, Magnesia); vast stoas built by Hellenistic kings for the cities of Asia (Pergamum, Assos, Priene) and Hellas (Delos, Delphi, Athens, Megalopolis, Olympia), or, with slight modifications, used as market-halls (Aegae, Alinda, Assos) and libraries (Pergamum), monumental propylaea (Samothrace, Delos, Lindos, Epidaurus, Olympia and Selinus), the tholos at Samothrace, the hypostyle hall at Delos and gymnasia (Epidaurus, Priene); all repeated earlier forms with slight variation The long "Hall of the Bulls" at Delos surmounted at one end by a tower, the soaring lighthouse of 400 ft at Alexandria, and small senate-houses with semicircular or rectangular auditoria imitated from the theatre (Miletus, Priene), were innovations The theatre itself received a colonnaded stone proscenium before the scene building, of which the great openings were elevated to an upper storey (Oropos, Epidaurus, Priene, Ephesus) Commemorative monuments were more lofty, high pedestals (Delphi, Athens) or pair of columns supporting entablatures (Delphi), forerunners of the Roman triumphal arch Private houses changed from the megaron type to the peristyle court (Priene, Delos), and in their likeness were designed great hotels with central courts (Epidaurus, Olympia) The market-place became a formally enclosed rectangle (Magnesia) rather than a picturesque group of colonnades and public buildings The roads outside the city gates were lined with an ever increasing variety of sepulchral monuments, including the Mausoleum type (Acragas, Mylasa) and tumuli with vaulted chambers (Pergamum)

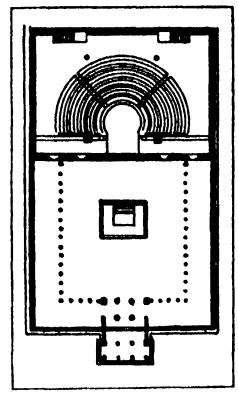


FROM BORRMANN, "GESCHICHTE DER BAUKUNST" (ALFRED KRONER VERLAG)

FIG 18 —GYMNASIUM

The conquest of the Orient had brought Greece into contact with the arch and vault, now freely used in supporting great masses over openings, as in city gates, retaining walls, corridors, staircases and sepulchral chambers Sloping or intersecting barrel vaults were not uncommon The post-and-lintel system was by no means supplanted, but the vaulting system of the Orient was being perfected, ready for the Romans to assimilate with their Etruscan traditions (*see* ROMAN ARCHITECTURE)

Graeco-Roman Period (100 B.C.–A.D. 300).—Many of the buildings erected in Greek lands during the Roman domination were still characteristically Greek. Doric was used in propylaea at Athens and Eleusis, and in temples at Eleusis and Kourno Greek Ionic appears in the circular temple on the Athenian Acropolis, in a propylon at Priene, and particularly in a series of octastyle pseudodipteral temples in Asia Minor (Aezani, Ancyra, Aphrodisias) A hybrid Corinthian style with mixed Doric-Ionic entablatures occurs at Eleusis and Paestum A simple type on Corinthian capital was used in the clock-tower ("Tower of the Winds") at Athens. But the developed Corinthian orders of temples at Sagalassus, Euromus, Cnidus, Pargamum and Isthmia are hardly to be differentiated from those of imperial Rome



FROM BORRMANN, "GESCHICHTE DER BAUKUNST" (ALFRED KRONER VERLAG)

FIG 19 —BOULEUTERION

Even though the decorative orders might be those of Rome, some buildings were still distinctive in type Side by side with true Roman theatres, with wide low stages and semicircular orchestras (Appendus), were erected theatres of a compromise type, with equally wide but lofty stages and three-quarter circular orchestras (Termessus), both types had lofty scene buildings incrusted with columns, sometimes connecting with colonnades at the top of the auditorium The stadium likewise remained characteristically Greek, with further elaboration, such as semicircles at both ends and colonnades at the top The interior of the Telestrion at Eleusis was rebuilt in a Greek form, though with a new disposition of the columns But the basilicas, baths, triumphal arches and other forms which flourished everywhere in Greece and Asia Minor at this epoch can with more propriety be considered as part of the purely Roman development

See also ARCHITECTURAL ARTICLES, ARCHITECTURE and GREEK ART

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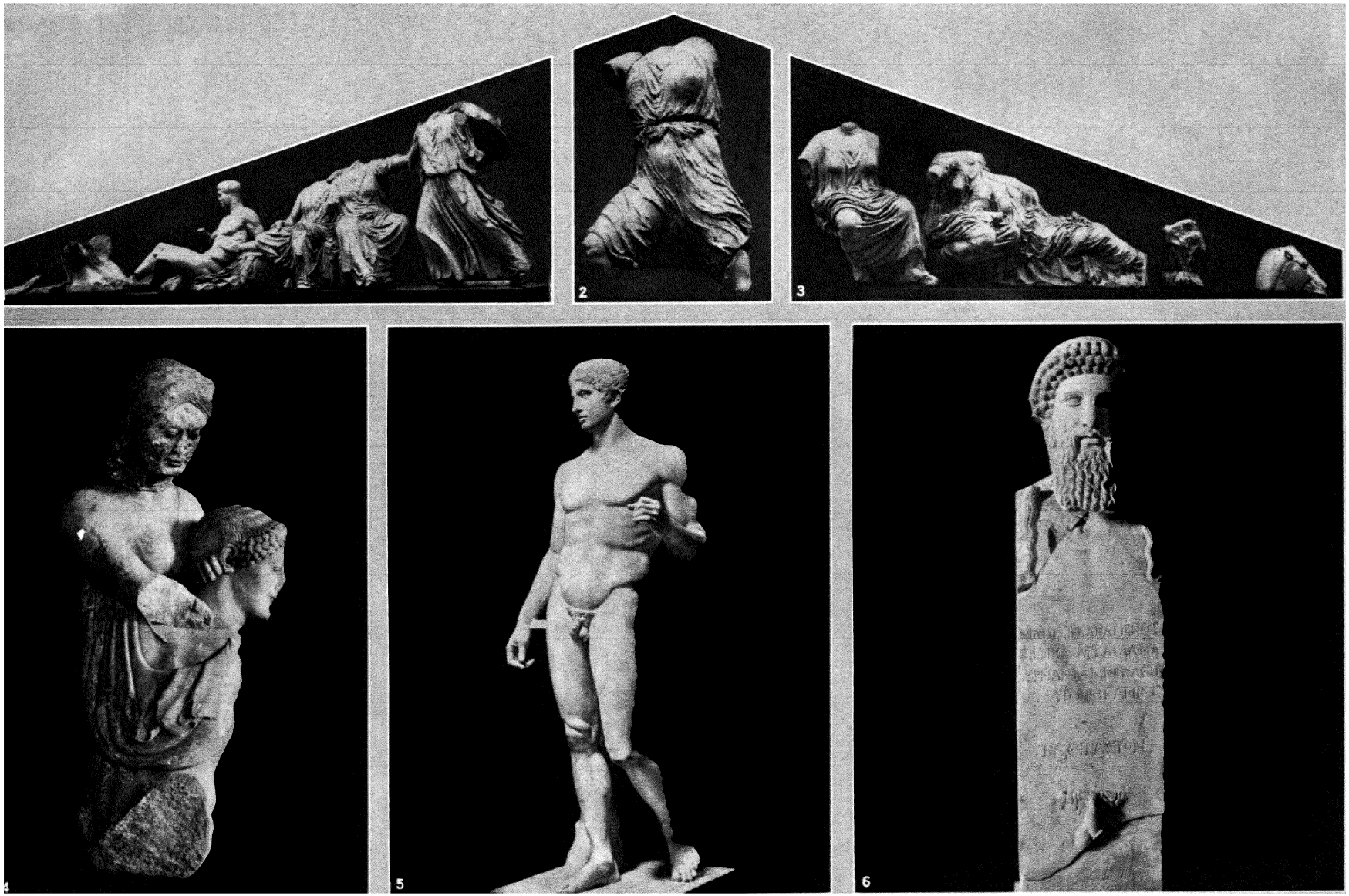
GREEK ART. It is proposed in the present article to give a brief account of the history of Greek art and of the principles embodied in that history. The products of the various arts practised by a people constitute an objective and most important record of the spirit of that people But all nations have not excelled in the same way some have found their best expression in architecture, some in music, some in poetry The Greeks most fully embodied their ideas in two ways, first in their splendid literature, both prose and verse, and secondly, in their plastic and pictorial art, in which matter they have remained to our days among the greatest instructors of mankind The three arts of architecture, sculpture and painting were brought by them into a focus; and by their aid they produced a visible splendour of public life such as has seldom been elsewhere attained

The volume of the remains of Greek civilization is so vast, and the learning with which these have been discussed is so ample, that it is hopeless to attempt to find in a work like the present any complete account of either. Rather we shall be frankly eclectic, choosing for consideration such results of Greek art as are most noteworthy and most characteristic. In some cases it will be



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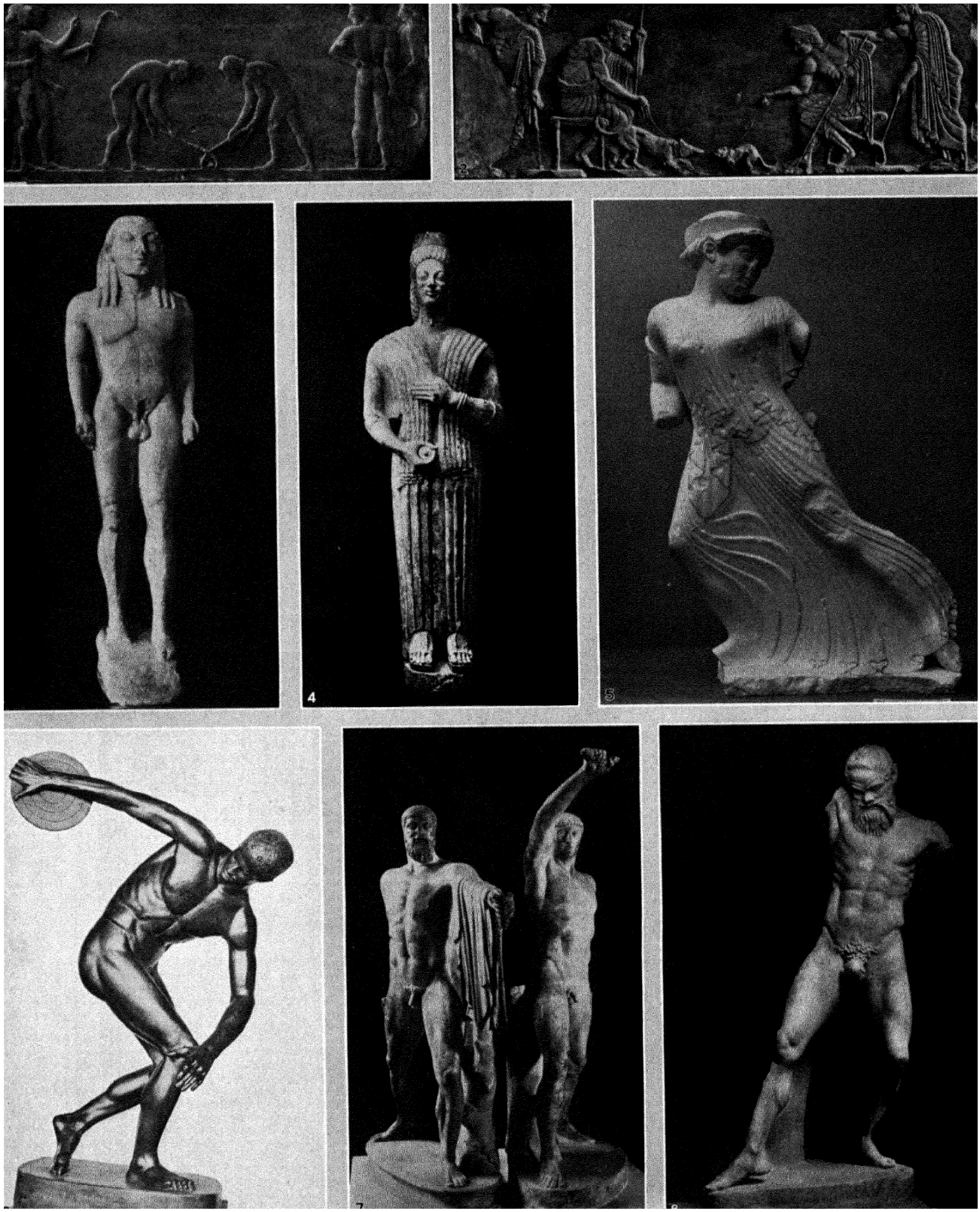
ARCHAIC AND FIFTH CENTURY SCULPTURE

1. East pediment of the Parthenon, left end, the birth of Athena; 5th century B.C.
2. Figure of Victory from one of the pediments of the Parthenon (probably not from the East pediment, parts of which are shown in figs. 1 and 3)
3. East pediment of the Parthenon, right end, three female figures called the Three Fate-
4. Theseus and Amazon (Eretria), Archaic period
5. Roman copy of the Doryphorus or spear-bearer of Polyclitus, type of the 5th century B.C. National Museum, Naples
6. Roman copy of the Hermes of Alcamenes (head), type of the 5th century B.C. Museum, Constantinople

GREEK ART



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GREEK SCULPTURE OF THE VI. AND V. CENTURIES B.C.

1 and 2. Reliefs from statue bases found in the ruins of the wall of Themistocles, Athens, in 1922. 3. Cleobis, at Delphi, by an Argive sculptor, 6th century; earliest example of Greek portrait sculpture. 4. Standing maiden. Museum, Berlin. 5. Statuette of girl running, early 5th century; a cast, original in Museum of Eleusis. 6. Discobolus, by Myron, 5th century; restored by Prof. A. Furtwängler. 7. Harmodius and Aristogiton, probably Roman copies of Greek works of 477–76 B.C. National Museum, Naples. 8. Marsyas, by Myron, 5th century; copy. Lateran Museum, Rome

possible to give a reference to a more detailed treatment of particular monuments in these volumes under the heading of their authors or the places to which they belong. Architectural detail is relegated to ARCHITECTURE and allied articles. Coins and gems (*q.v.*) are treated apart, as are vases (POTTERIES AND PORCELAINS); in the article ARCHAEOLOGY will be found many references bearing on the rediscovery of Greek art and on the discovery of individual monuments and sites; and in the bibliography which closes this article an effort is made to direct those who wish for further information in any particular branch of our subject.

THE GENERAL PRINCIPLES OF GREEK ART

The study of Greek art is one which is eminently progressive. It has over the study of Greek literature the immense advantage that its materials increase far more rapidly. And it may well be maintained that a sound and methodic study of Greek art is as indispensable as a foundation for an artistic and archaeological education as the study of Greek poets and orators is as a basis of literary education. The extreme simplicity and thorough rationality of Greek art make it an unrivalled field for the training and exercise of the faculties which go to the making of the art critic and art historian

Before proceeding to sketch the history of its rise and decline, it is desirable briefly to set forth the principles which underlie it (*see* also P Gardner's *Principles of Greek Art*)

As the literature of Greece is composed in a particular language, the grammar and syntax of which have to be studied before the works in poetry and prose can be read, so Greek works of art are composed in what may be called an artistic language To the accidence of a grammar may be compared the mere technique of sculpture and painting, to the syntax of a grammar correspond the principles of composition and grouping of individual figures into a relief or picture By means of the rules of this grammar the Greek artist threw into form the ideas which belonged to him as a personal or a racial possession

No nation is in its works wholly free from the domination of climate and geographical position; least of all a people so keenly alive to the influence of the outer world as the Greeks. They lived in a land where the soil was dry and rocky, far less hospitable to vegetation than that of western Europe, while the land horizon was on all sides bounded by hard and jagged lines of mountain The sky was extremely clear and bright, sunshine for a great part of the year almost perpetual, and storms, which are more than passing gales, rare It was in accordance with these natural features that temples and other buildings should be simple in form and bounded by clear lines Such forms as the cube, the oblong, the cylinder, the triangle, the pyramid abound in their constructions. Just as in Switzerland the gables of the chalets match the pine-clad slopes and lofty summits of the mountains, so in Greece, amid barer hills of less elevation, the Greek temple looks thoroughly in place. But its construction is related not only to the surface of the land, but also to the character of the race. Émile Boutmy, in his interesting *Philosophie de l'architecture en Grèce,* has shown how the temple is a triumph of the senses and the intellect, not primarily emotional, but showing in every part definite purpose and design It also exhibits in a remarkable degree the love of balance, of symmetry, of a mathematical proportion of parts and correctness of curvature which belong to the Greek artist

Here, however, our concern is not with the purposes or arrangements of a temple, but with its sculptural decoration, and we would note that elaborate decoration is reserved for those parts of the temple which have, or at least appear to have, no strain laid upon them It is true that in the archaic age experiments were made in carving reliefs on the lower drums of columns (as at Ephesus) and on the line of the architrave (as at Assus). But such examples were not followed. Nearly always the spaces reserved for mythological reliefs or groups are the tops of walls, the spaces between the triglyphs, and particularly the pediments surmounting the two fronts, which might be left hollow without danger to the stability of the edifice. Detached figures in the round are in fact found only in the pediments, or standing upon the tops of the pediments And metopes are sculptured in higher relief than friezes

"When we examine in detail even the simplest architectural decoration, we discover a combination of care, sense of proportion, and reason The flutings of an Ionic column are not in section mere arcs of a circle, but made up of a combination of curves which produce a beautiful optical effect, the lines of decoration, as may be best seen in the case of the Erechtheum, are cut with a marvellous delicacy Instead of trying to invent new schemes, the mason contents himself with improving the regular patterns until they approach perfection, and he takes everything into consideration Mouldings on the outside of a temple, in the full light of the sun, are differently planned from those in the diffused light of the interior. Mouldings executed in soft stone are less fine than those in marble The mason thinks before he works and while he works, and thinks in entire correspondence with his surroundings." (*Principles of Greek Art,* p 44)

Greek architecture, however, is treated under ARCHITECTURE; we will therefore proceed to speak briefly of the principles exemplified in sculpture Existing works of Greek sculpture fall easily into two classes. The first comprises what may be called works of substantive art, statues or groups made for their own sake and to be judged by themselves Such are cult-statues of deities from temple and shrine, honorary portraits of rulers or of athletes, dedicated groups and the like The second comprises decorative sculptures, such as were made, usually in relief, for the decoration of temples and tombs and other buildings, and were intended to be subordinate to architectural effect

Speaking broadly, it may be said that the works of substantive sculpture in our museums are in the great majority of cases copies of doubtful exactness and very various merit. The Hermes of Praxiteles (Pl VI, fig 3) is almost the only marble statue which can be assigned positively to one of the great sculptors; we have to work back towards the productions of the peers of Praxiteles through works of poor execution, often so much restored in modern times as to be scarcely recognizable Decorative works, on the other hand, are very commonly originals, and their date can often be accurately fixed, as they belong to known buildings They are thus infinitely more trustworthy and more easy to deal with than the copies of statues of which the museums of Europe, and more especially those of Italy, are full They are also more commonly unrestored But yet there are certain disadvantages attaching to them Decorative works, even when carried out under the supervision of a great sculptor, were but seldom executed by him Usually they were the productions of his pupils or masons Thus they are not on the same level of art as substantive sculpture And they vary in merit to an extraordinary extent, according to the capacity of the man who happened to have them in hand, and who was probably but little controlled Every one knows how noble are the pedimental sculptures of the Parthenon. But there is no reason why they should be so vastly superior to the frieze from Phigalia; nor why the heads from the temple at Tegea should be so fine, while those from the contemporary temple at Epidaurus should be comparatively insignificant From the records of payments made to the sculptors who worked on the Erechtheum at Athens it appears that they were ordinary masons, some of them not even citizens, and paid at the rate of 60 drachms (about 60 francs) for each figure, whether of man or horse, which they produced Such piece-work would not, in our days, produce a very satisfactory result

1. Works of substantive sculpture may be divided into two classes, the statues of human beings and those of the gods The line between the two is not, however, very easy to draw, or very definite For in representing men the Greek sculptor had an irresistible inclination to idealize, to represent what was generic and typical rather than what was individual, and the essential rather than the accidental And in representing deities he so fully anthropomorphized them that they became men and women, only raised above the level of everyday life and endowed with a superhuman stateliness. Moreover, there was a class of heroes represented largely in art who covered the transition from men to gods. For example, if one regards Heracles as a deity and Achilles as a

man of the heroic age and of heroic mould, the line between the two will be found to be very narrow

Nevertheless one may for convenience speak first of human and afterwards of divine figures. It was the custom from the 6th century onwards to honour those who had done any great achievement by setting up their statues in conspicuous positions The earliest example we have is the portraits of the twins Cleobis and Biton from Delphi mentioned by Herodotus (Pl II , fig 3) Another of the earliest examples is that of the tyrannicides, Harmodius and Aristogiton, a group, a copy of which has come down to us (Pl II., fig 7). Again, people who had not won any distinction were in the habit of dedicating to the deities portraits of themselves or of a priest or priestess, thus bringing themselves, as it were, constantly under the notice of a divine patron The rows of statues before the temples at Miletus, Athens and elsewhere came thus into being But from the point of view of art, by far the most important class of portraits consisted of athletes who had won victories at some of the great games of Greece, at Olympia, Delphi or elsewhere. Early in the 6th century the custom arose of setting up portraits of athletic victors in the great sacred places We have records of numberless such statues executed by all the greatest sculptors. When Pausanias visited Greece he found them everywhere far too numerous for complete mention

It is the custom of studying and copying the forms of the finest of the young athletes, combined with the Greek habit of complete nudity during the sports, which lies at the basis of Greek excellence in sculpture Every sculptor had unlimited opportunities for observing young vigorous bodies in every pose and in every variety of strain. The natural sense of beauty which was an endowment of the Greek race impelled him to copy and preserve what was excellent, and to omit what was ungainly or poor Thus there existed, and in fact there was constantly accumulating, a vast series of types of male beauty, and the public taste was cultivated to an extreme delicacy. And of course this taste, though it took its start from athletic customs, and was mainly nurtured by them, spread to all branches of portraiture, so that elderly men, women, and at last even children, were represented in art with a mixture of ideality and fidelity to nature such as has seldom been reached by the sculpture of any other people.

The statues of the gods began with stiff and ungainly figures cut out of the trunk of a tree In the Greece of late times there were still standing rude pillars, with the tops sometimes cut into a rough likeness to the human form And in early decoration of vases and vessels one may find Greek deities represented with wings, carrying in their hands lions or griffins, bearing on their heads lofty crowns But as Greek art progressed it grew out of this crude symbolism In the language of Brunn, the Greek artists borrowed from Oriental or Mycenaean sources the letters used in their works, but with these letters they spelled out the ideas of their own nation What the artists of Babylon and Egypt express in the character of the gods by added attribute or symbol, swiftness by wings, control of storms by the thunderbolt, traits of character by animal heads, the artists of Greece work more and more fully into the sculptural type; modifying the human subject by the constant addition of something which is above the ordinary level of humanity, until we reach the Zeus of Pheidias or the Demeter of Cnidus. When the decay of the high ethical art of Greece sets in, the gods become more and more warped to the merely human level They lose their dignity, but they never lose their charm

2 The decorative sculpture of Greece consists not of single figures, but of groups, and in the arrangement of these groups the strict Greek laws of symmetry, of rhythm, and of balance, come in. We will take the three most usual forms, the pediment, the metope and the frieze, all of which belong properly to the temple, but are characteristic of all decoration, whether of tomb, trophy or other monument.

The form of the pediment is triangular; the height of the triangle in proportion to its length being about 1 8. The conditions of space are here strict and dominant, to comply with them requires some ingenuity. To a modern sculptor the problem thus presented is almost insoluble; but it was allowable in ancient art to represent figures in a single composition as of various sizes, in correspondence not to actual physical measurement but to importance. As the more important figures naturally occupy the midmost place in a pediment, their greater size comes in conveniently. And by placing some of the persons of the group in a standing, some in a seated, some in a reclining position, it can be so contrived that their heads are equidistant from the upper line of the pediment.

The statues in a Greek pediment, which are after quite an early period usually executed in the round, fall into three, five or seven groups, according to the size of the whole As examples to illustrate this exposition we take the two pediments of the temple at Olympia, the most complete which have come down to us, which are represented in figs 13 and 14

The metopes were the long series of square spaces which ran along the outer walls of temples between the upright triglyphs and the cornice Originally they may have been left open and served as windows; but the custom came in as early as the 7th century, first of filling them in with painted boards or slabs of stone, and next of adorning them with sculpture The metopes of the Treasury of Sicyon at Delphi (Pl IV , fig 5) are as early as the first half of the 6th century This recurrence of a long series of square fields for occupation well suited the genius and the habits of the sculptor As subjects he took the successive exploits of some hero such as Heracles or Theseus, or the contemporary groups of a battle His number of figures was limited to two or three, and these figures had to be worked into a group or scheme, the main features of which were determined by artistic tradition, but which could be varied in a hundred ways so as to produce a pleasing and in some degree novel result

With metopes, as regards shape, may be compared the reliefs of Greek tombs, which also usually occupy a space roughly square, and which also comprise but a few figures arranged in a scheme generally traditional A figure standing, giving his hand to one seated, two men standing hand in hand, or a single figure in some vigorous pose, is sufficient to satisfy the simple and severe taste of the Greeks

In regard to friezes, which are long reliefs containing figures ranged between parallel lines, there is more variety of custom In temples the height of the relief from the background varies according to the light in which it was to stand, whether direct or diffused Almost all Greek friezes, however, are of great simplicity in arrangement and perspective Locality is at most hinted at by a few stones or trees, never actually portrayed There is seldom more than one line of figures, in combat or procession, their heads all equidistant from the top line of the frieze They are often broken up into groups; and when this is the case, figure will often balance figure on either side of a central point almost as rigidly as in a pediment An example of this will be found in the sections of the Mausoleum frieze shown in Plate IV , figs 1 and 2. Some of the friezes executed by Greek artists for semi-Greek peoples, such as those adorning the tomb at Trysa in Lycia, have two planes, the figures in the background being at a higher level

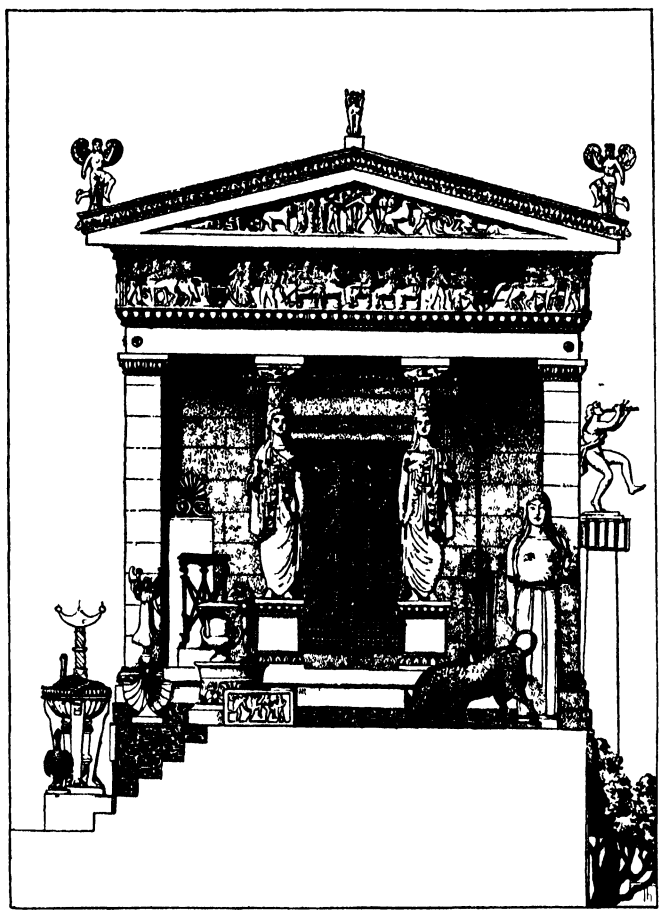
The rules of balance and symmetry in composition which are followed in Greek decorative art are still more clearly to be discerned in the paintings of vases, which must serve, in the absence of more dignified compositions, to enlighten us as to the methods of Greek painters Great painters would not, of course, be bound by architectonic rule in the same degree as the mere workmen. But in any case the fact must never be lost sight of that Greek painting of the earlier ages was of extreme simplicity It did not represent localities, save by some slight hint; it had next to no perspective; the colours used were but very few even down to the days of Apelles Most of the great pictures of which we hear consisted of but one or two figures; and when several figures were introduced they were kept apart and separately treated, though, of course, not without relation to one another Idealism and ethical purpose must have predominated in painting as in sculpture and in the drama and in the writing of history. The laws of balance and symmetry in Greek drawing are perhaps best shown in the decoration of vases (*see* POTTERY).

HISTORIC SKETCH

To begin with, there was a rise of national art, after the destruction of the Minoan and Mycenaean civilizations of early Greece by the irruption of tribes from the north (*see* ARCHAEOLOGY), and then the Roman age of Greece, after which the Greek art works in the service of the conquerors (*see* ROMAN ART) The period (roughly 800–?50 B.C.) is divided into four sections. (1) to the Persian Wars, 480 B C ; (2) the period of the early schools of art, 480–400 B C ; (3) that of the later great schools, 400–300 B C , (4) that of Hellenistic art, 300–50 B C In dealing with these successive periods this article is confined to sculpture and painting, which in Greece are closely connected The arts—pottery, gem-engraving, coin-stamping and the like—are treated under their separate headings, and the reader is also referred to the biographical accounts of the chief artists (PHEIDIAS, PRAXITELES, APELLES, etc).

PERIOD I. 800–480 B.C.

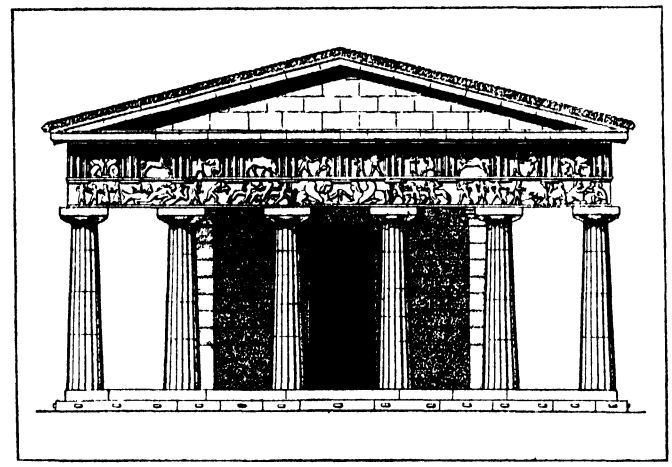
The Aegean or Mycenaean civilization was for the most part destroyed by what appears to have been a gradual invasion from the north, its racial character is much in dispute, though archaeological evidence abundantly proves that it was the conquest of a more by a less rich and civilized race In the graves of the period (900–600 B C) is found none of the wealthy spoil which has made celebrated the tombs of Mycenae and Vaphio (*q v*). The



FROM "FOUILLES DE DELPHES" (A FONTEMOING)

FIG 1 —RESTORATION OF THE TREASURY OF CNIDUS IONIC STYLE

character of the pottery and the bronze-work which is found in these later graves reminds one of the funerary art of Hallstatt and other sites belonging to what is called the bronze age of North Europe. Its predominant characteristic is the use of geometrical forms, the lozenge, the triangle, the maeander, the circle with tangents, in place of the elaborate spirals and plant-forms which mark Mycenaean ware. For this reason the period from the 9th to the 7th century in Greece passes by the name of "the Geometric Age " It is commonly held that in the remains of the geometric age is traced the influence of the Dorians, who, coming in as a hardy but uncultivated race, probably of purer Aryan blood than the previous inhabitants of Greece, not only brought to an end the wealth and the luxury which marked the Mycenaean age, but also replaced an art which was in character essentially southern by one which belonged rather to the north and the west The great difficulty inherent in this view, a difficulty which has yet to be



FROM PERROT AND CHIPIEZ, "HISTOIRE DE L ART" (CHAPMAN AND HALL, AND HACHETTE & CO)

FIG 2 —RESTORATION OF THE TEMPLE AT ASSUS, SHOWING THE FRIEZE OF ARCHAIC DECORATIVE SCULPTURES ALONG THE ENTABLATURE

met, lies in the fact that some of the most abundant and characteristic remains of the geometric age which we possess come, not from Peloponnesus, but from Athens and Boeotia, which were never conquered by the Dorians. For the early history of Greek work in gold and bronze we must refer to the articles BRONZE and GOLDSMITHS' AND SILVERSMITHS' WORK

Architecture and Sculpture.—The Greek temple in its character and form gives the clue to the whole character of Greek art It is the abode of the deity, who is represented by his sacred image, and the flat surfaces of the temple offer a great field to the sculptor for the depicting of sacred legend The process of discovery has emphasized the line which divides Ionian from Dorian architecture and art The Ionians were a people more susceptible than were the Dorians to oriental influences The dress, the art, the luxury of western Asia attracted them with irresistible force We may suspect, as Brunn has suggested, that Ionian artists worked in the great Assyrian and Persian palaces (and that the wall reliefs of those palaces were in part their handiwork Some of the great temples of Ionia have been excavated in recent times, notably those of Apollo at Miletus, of Hera at Samos, and of Artemis at Ephesus Very little, however, of the architecture of the 6th century temples of those sites has been recovered, though the French, who have been excavating at Delphi more or less continuously since 1892, have successfully restored the treasury of the people of Cnidus (fig 1), which is quite a gem of Ionic style, the entablature is supported in front not by pillars but by two maidens or Corae, and a frieze runs all round the building above But though this building is of Ionic type, it is scarcely in the technical sense of Ionic style, since the columns have not Ionic capitals, but are carved with curious reliefs The Ionic capital proper is developed in Asia by degrees (*see* ARCHITECTURE, ORDER and CAPITAL, also Perrot and Chipiez, *Hist de l'art*, VII ch 4)

The Doric temple is not wholly of European origin, yet it was developed mainly in Hellas and the west The most ancient example is the Heraeum at Olympia, next to which come the fragmentary temples of Corinth and of Selinus in Sicily With the early Doric temple we are familiar from examples which have survived in fair preservation to our own days at Agrigentum in Sicily, Paestum in Italy, and other sites

Of the decorative sculpture which adorned these early temples we have more extensive remains than we have of actual construction It will be best to speak of them under their districts On the coast of Asia Minor, the most extensive series of archaic decorative sculptures which has come down to us is that which adorned

the temple of Assus (fig 2). These were placed in a unique position on the temple, a long frieze running along the entablature, with representations of wild animals, of centaurs, of Heracles seizing Achelous, and of men feasting, scene succeeding scene without much order or method The only figures from Miletus which can be considered as belonging to the original temple destroyed by Darius, are the dedicated seated statues, some of which, brought away by Sir Charles Newton in the middle of the 19th century, are now preserved at the British Museum At Ephesus J T Wood was more successful (1869–74) and recovered considerable fragments of the temple of Artemis, to which, as Herodotus tells us, Croesus presented many columns The lower part of one of these columns, bearing figures in relief of early Ionian style, has been put together at the British Museum; and remains of inscriptions recording the presentation by Croesus are still to be traced Reliefs from a cornice of somewhat later date are also to be found at the British Museum Among the Aegean islands, Delos has furnished us with the most important remains of early

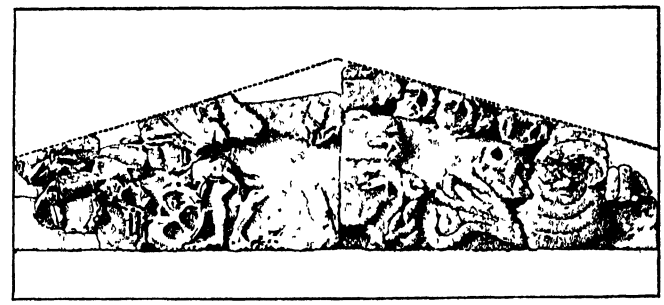


FROM COLLIGNON, "SCULPTURE GRECQUE"

FIG. 3 —STATUE OF NIKE OR VICTORY OF DELOS (RESTORED)

art French excavators have there found a very early statue of a woman dedicated by one Nicandra to Artemis, a figure which may be instructively compared with another from Samos, dedicated to Hera by Cheramues The Delian statue is in shape like a flat beam, the Samian, which is headless, is like a round tree The arms of the Delian figure are rigid to the sides, the Samian lady has one arm clasped to her breast A great improvement on these inexpressive figures is marked by another figure found at Delos, and connected, though perhaps incorrectly, with a bases recording the execution of a statue by Archermus and Micciades, two sculptors who stood, in the middle of the 6th century, at the head of a sculptural school at Chios The representation (fig 3) is of a running or flying figure, having six wings, like the seraphim in the vision of Isaiah, and clad in long drapery. It may be a statue of Nike or Victory, who is said to have been represented in winged form by Archermus The figure, with its neatness and precision of work, its expressive face and strong outlines, certainly marks great progress in the art of sculpture When the early sculpture of Athens is examined, reason is found to think that the Chian school had great influence in that city in the days of Peisistratus

Athenian Sculpture At Athens, in the age 650–480, may be traced two quite distinct periods of architecture and sculpture. In the earlier of the two periods, a rough limestone was used alike for the walls and the sculptural decoration of temples; in the later period it was superseded by marble, whether native or imported. Every visitor to the museum of the Athenian Acropolis stands astonished at the groups which decorated the pediments of Athenian temples before the age of Peisistratus—groups of large size, rudely cut in soft stone, of primitive workmanship, and painted with bright red, blue and green, in a fashion which makes no attempt to follow nature, but only to produce a vivid result. The two largest in scale of these groups seem to have belonged to the pediments of the early 6th century temple of Athena On

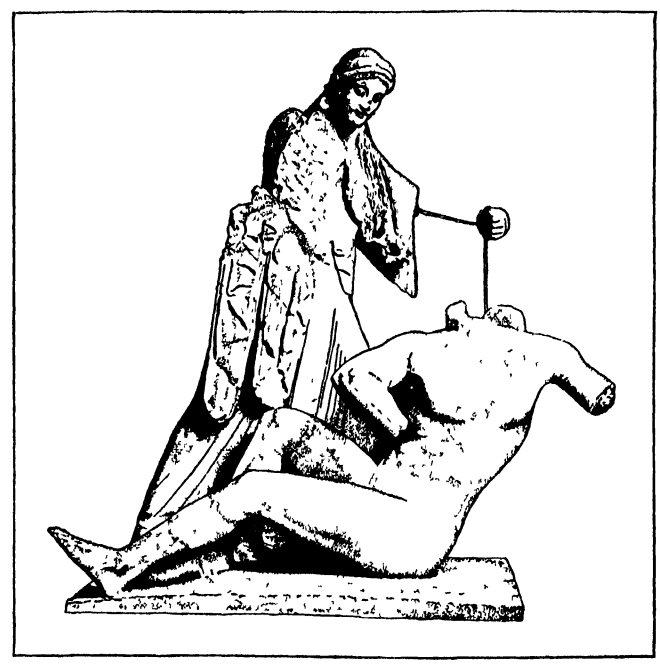


FROM "ATHEN MITTEIL DEUTSCH ARCH ' INST X 237

FIG 4 —ATHENIAN PEDIMENT REPRESENTING HERACLES SLAYING THE LERNAEAN HYDRA WHILE IOLAUS HOLDS THE REINS OF THE CHARIOT

other smaller pediments, perhaps belonging to shrines of Heracles and Dionysus, there are conflicts of Heracles with Triton or with other monstrous foes It is notable how fond the Athenian artists of this early time are of exaggerated muscles and of monstrous forms, which combine the limbs of men and of animals; the measure and moderation which mark developed Greek art are as completely absent as are skill in execution or power of grouping Fig 4 shows a small pediment in which appears in relief the slaying of the Lernaean hydra by Heracles The hero strikes at the many-headed water-snake, somewhat inappropriately, with his club Iolaus, his usual companion, holds the reins of the chariot which awaits Heracles after his victory On the extreme left a huge crab comes to the aid of the hydra

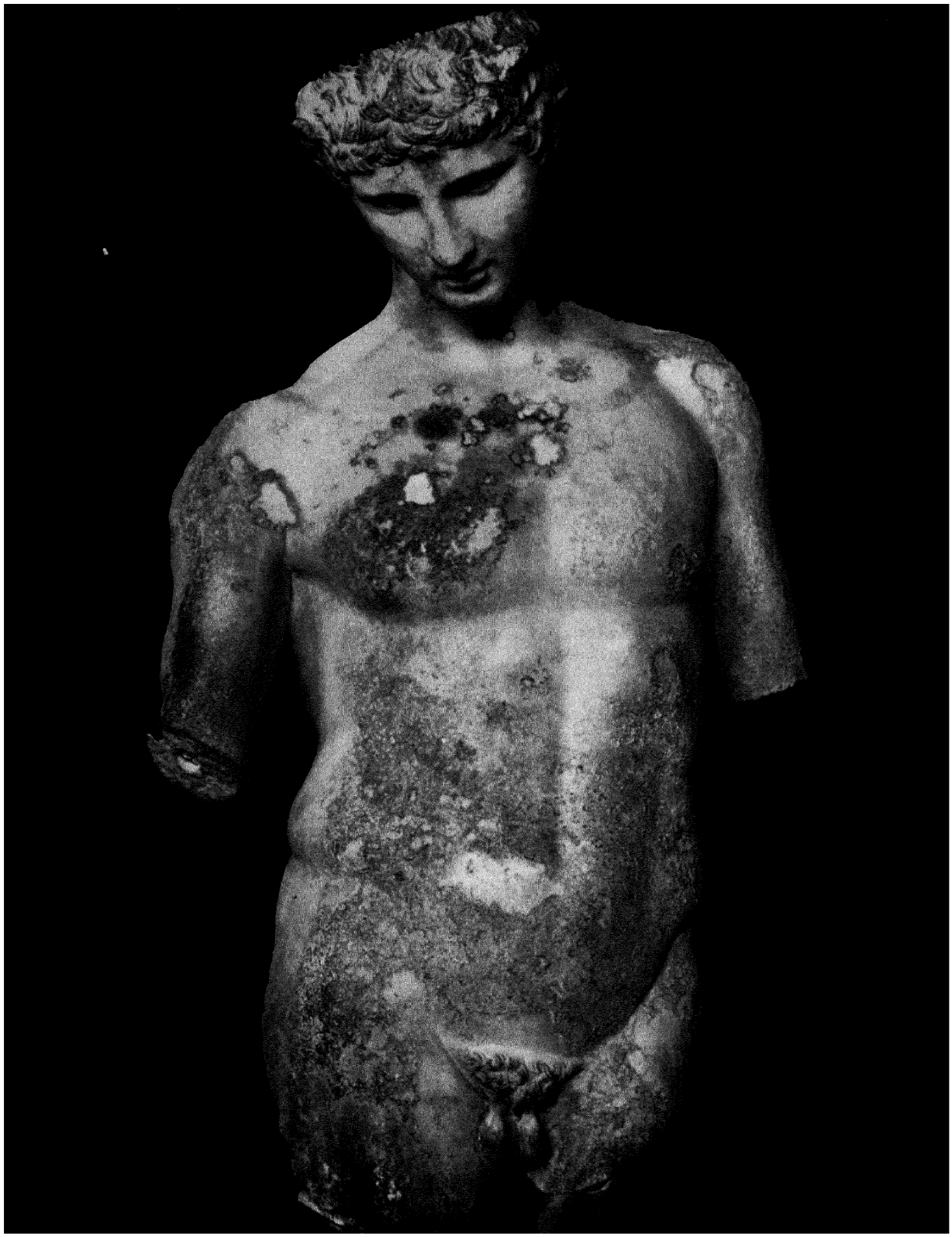
There can be little doubt that Athens owed its great start in art to the influence of the court of Peisistratus, at which artists of



FROM "ATHEN MITTEIL DEUTSCH ARCH "

FIG 5.—ATHENA STRIKING AT A PROSTRATE FOE, FROM A MARBLE PEDIMENT ON THE TEMPLE OF ATHENA

all kinds were welcome There was a gradual transformation in sculpture, in which the influence of the Chian and other progressive schools of sculpture was visible, not only in the substitution of island marble for native stone, but in increased grace and truth to nature, in the toning down of glaring colour, and the appearance of taste in composition. A transition between the

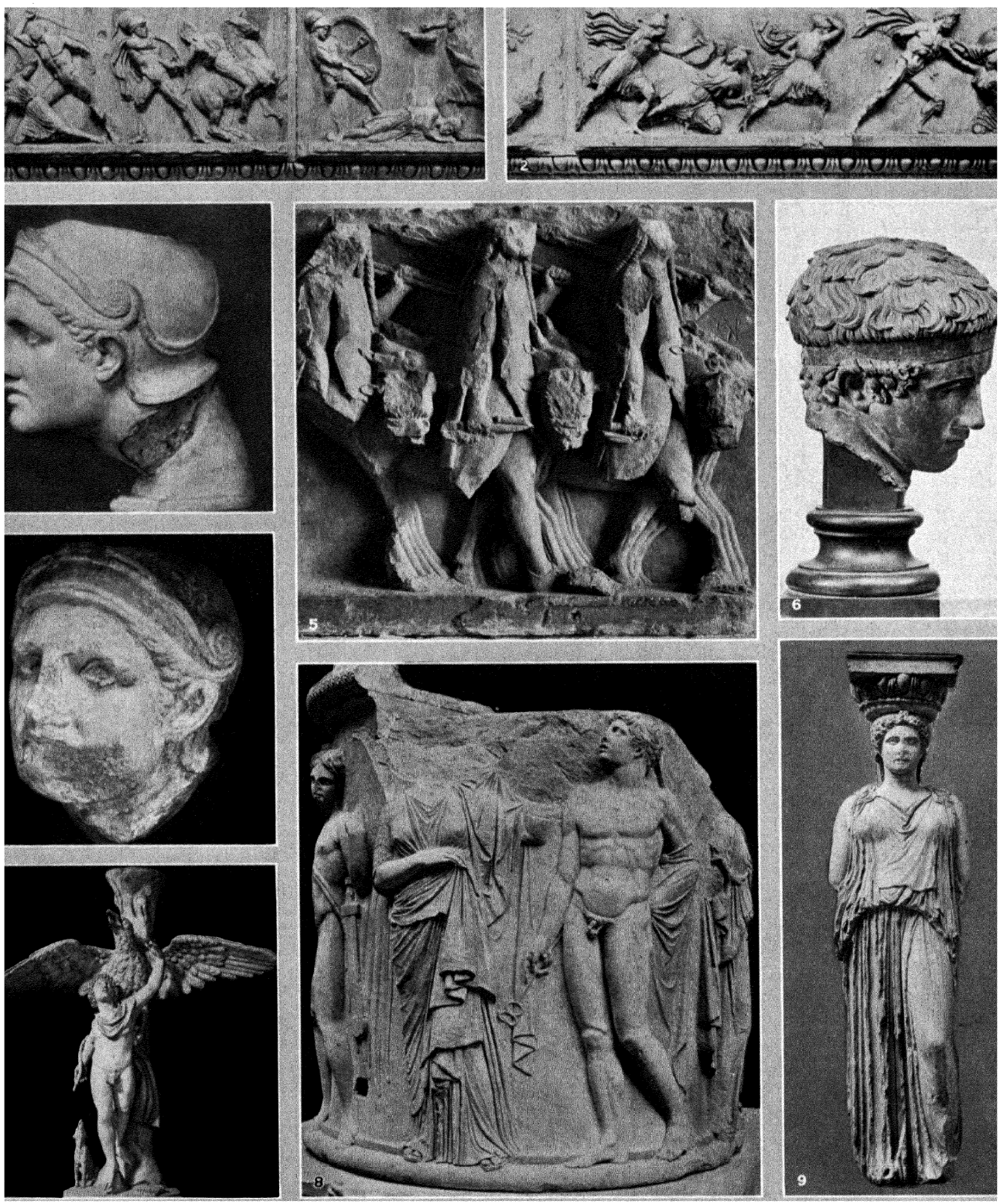


BY COURTESY OF THE MUSEUM OF FINE ARTS, BOSTON

YOUNG HERMES

In the Polyclitan style. It may represent Hermes Psychopompos, the Conductor of Souls, and was found near Capua. Roman copy, Graeco-Roman period, 100 B.C.–A.D. 200

GREEK ART



BY COURTESY OF (1, 2) CLARKE AND DAVIES, (3, 6) THE KEEPER OF THE ASHMOLEAN MUSEUM, OXFORD (4) CLARENCE KENNEDY, (8) THE TRUSTEES OF THE BRITISH MUSEUM; PHOTOGRAPHS, (5, 7) ALINARI, (9) R. B. FLEMING AND COMPANY

GREEK SCULPTURE

1 and 2. Portions of the frieze of the Mausoleum at Halicarnassus, Caria, c. 350 B.C. British Museum

3. Head of helmeted warrior from Tegea, 4th century B.C., restored by German sculptor. In the Ashmolean museum, Oxford

4. Head of warrior from Tegea, Scopas, 4th century B.C.

5. Metope of the Treasury of Sicyon, Delphi, first half of the 6th century B.C., Idas and the Dioscuri driving off cattle

6. Bronze head, restored, 5th century B.C. In the Ashmolean museum, Oxford

7. Ganymede borne aloft by the eagle, Leochares; Roman copy. Vatican

8. Drum of column from Ephesus, 4th century B.C. British Museum

9. Cora (Kore, or Caryatid) of Erechtheum, Athens, one of six figures supporting entablature of south porch, 5th century B.C. British museum

older and the newer is furnished by the well-known statue of the calf-bearer, an Athenian preparing to sacrifice a calf to the deities, which is made of marble of Hymettus, and in robust clumsiness of forms is not far removed from the limestone pediments The sacrificer has been commonly spoken of as Hermes or Theseus, but he seems rather to be an ordinary human votary.

In the time of Peisistratus or his sons a peristyle of columns was added to the old temple of Athena; and this necessitated the preparation of fresh pediments These were of marble. In one of them was represented the battle between gods and giants, in the midst Athena herself striking at a prostrate foe (fig 5) In these figures no eye can fail to trace remarkable progress On about the same level of art are the charming statues dedicated to Athena, which were set up in the latter half of the 6th century on the Acropolis, whose graceful though conventional forms and delicate colouring make them one of the great attractions of the Acropolis museum We show a figure (fig 6) which is the work of the sculptor Antenor, who was also author of a celebrated group representing the tyrant-slayers, Harmodius and Aristogiton To the same age belong many other votive reliefs of the Acropolis, representing horsemen, scribes and other votaries of Athena.



FIG 6 —FIGURE BY ANTENOR, UNRESTORED

Dorian Sculpture. From Athens we pass to the seats of Dorian art. And in doing so we find a complete change of character In place of draped goddesses and female figures, there are nude male forms In place of Ionian softness and elegance, hard, rigid outlines, strong muscular development, a greater love of and faithfulness to the actual human form—the influence of the palaestra rather than of religion. To the known series of archaic male figures modern exploration has added many examples More especially may be mentioned figures from the temple of Apollo Ptoos in Boeotia, probably representing the god himself Still more noteworthy are two colossal nude figures of Cleobis and Biton remarkable both for force and for rudeness, found at Delphi, the inscriptions of which prove them to be the work of an Argive sculptor (Pl II, fig 3) In the island of Crete was found the upper part of a draped figure, whether male or female is not certain, which should be an example of the early Daedalid school, whence the art of Peloponnesus was derived, it is hardly a characteristic product of that school, rather the likeness to the dedication of Nicandra is striking

Another remarkable piece of Athenian sculpture, of the time of the Persian Wars, is the group of the tyrannicides Harmodius and Aristogiton, set up by the people of Athens, and made by the sculptors Critius and Nesiotes These figures were hard and rigid in outline, but showing some progress in the treatment of the nude Copies are preserved in the museum of Naples (Pl II, fig 7)

Olympia, Sparta, Selinus Next in importance to Athens, as a find-spot for works of early Greek art, ranks Olympia Olympia, however, did not suffer like Athens from sudden violence, and the explorations there have brought to light a continuous series of remains, beginning with bronze tripods of the geometric age and ending at the barbarian invasions of the 4th century A D Notable among the 6th century stone-sculpture of Olympia are the pediment of the treasury of the people of Megara, in which is represented a battle of gods and giants, and a huge rude head of Hera which seems to be part of the image worshipped in the Heraeum Its flatness and want of style should be noted.

Among the temples of Greece proper the Heraeum of Olympia stands almost alone for antiquity and interest, its chief rival, besides the temples of Athens, being the other temple of Hera at Argos It appears to have been originally constructed of wood, for which stone was by slow degrees, part by part, substituted In the time of Pausanias one of the pillars was still of oak, and at the present day the varying diameter of the columns and other structural irregularities bear witness to the process of constant renewal which must have taken place The early small bronzes of Olympia form an important series, figures of deities standing or striding, warriors in their armour, athletes with exaggerated muscles, and women draped in the Ionian fashion, which did not become unpopular in Greece until after the Persian Wars

Excavations at Sparta have revealed interesting monuments belonging to the worship of ancestors, which seems in the conservative Dorian states of Greece to have been more strongly developed than elsewhere On some of these stones, which doubtless belonged to the family cults of Sparta, are shown the ancestor seated holding a wine-cup, accompanied by his faithful horse or dog, on some we see the ancestor and ancestress seated side by side (fig 7), ready to receive the gifts of their descendants, who appear in the corner of the relief on a much smaller scale The male figure holds a wine-cup, in allusion to the libations of wine made at the tomb The female figure holds her veil and the pomegranate, the recognized food of the dead A huge serpent stands erect behind the pair The style of these sculptures is as striking as the subject —lean, rigid forms with severe outline, carved in a very low relief, the surface of which is not rounded but flat The name of Selinus in Sicily, an early Megarian colony, has long been associated with some of the most curious of early sculptures, the metopes of ancient temples, representing the exploits of Heracles and of Perseus Even more archaic metopes have in recent years been brought to light, one representing a seated sphinx, one the journey of Europa over the sea on the back of the amorous bull, a pair of dolphins swimming beside her In simplicity and rudeness of work these reliefs remind us of the limestone pediments of Athens (fig 4), but they are of another and a severer style, the Ionian laxity is wanting

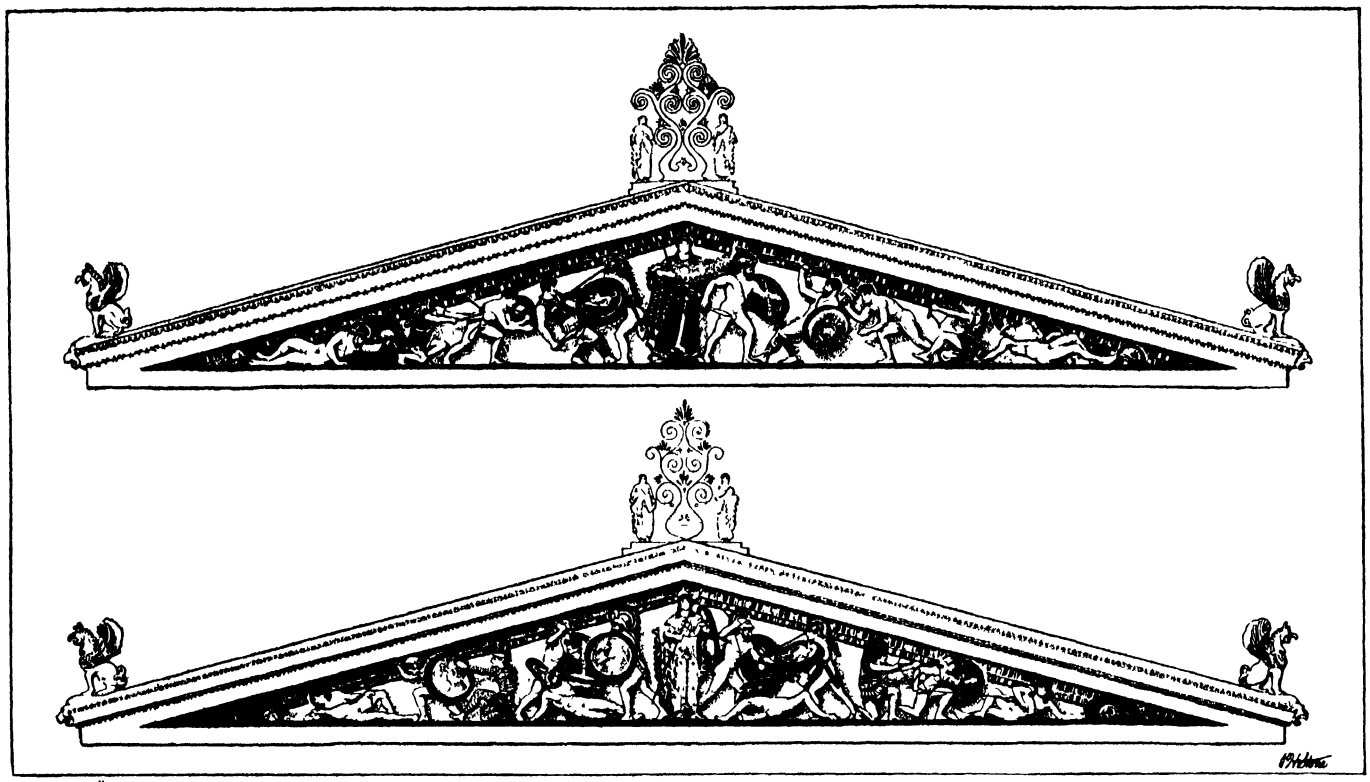
Delphi The French excavations at Delphi add a new and important chapter to the history of 6th century art Of the archaic temple of Apollo, built as Herodotus tells us by the Alcmaeonidae



BY COURTESY OF THE OLD MUSEUM, BERLIN

FIG 7 —SPARTAN TOMBSTONE REPRESENTING ANCESTOR WORSHIP

of Athens, the only sculptural remains which have come down to us are some fragments of the pedimental figures Of the treasuries which contained the offerings of the pious at Delphi, the most archaic of which there are remains is that belonging to the people of Sicyon To it appertains a set of exceedingly primitive metopes One depicts Idas and the Dioscuri driving off cattle (Pl IV, fig 5); another, the ship Argo, another, Europa on the bull, others merely animals, a ram or a boar The treasury of the people of Cnidus (or perhaps Siphnos) is in style some half a century later



FROM FURTWÄNGLER, "AEGINA" (A BUCHHOLZ)

FIG 8 —EAST AND WEST PEDIMENTS OF THE TEMPLE AT AEGINA AS RESTORED BY FURTWÄNGLER

(*see* fig 1) To it belongs a long frieze representing a variety of curious subjects. a battle, perhaps between Greeks and Trojans, with gods and goddesses looking on, a gigantomachy in which the figures of Poseidon, Athena, Hera, Apollo, Artemis and Cybele



FIG 9 —METOPE FROM SELINUS EUROPA ON BULL NOW AT PALERMO

can be made out, with their opponents, who are armed like Greek hoplites, Athena and Heracles in a chariot, the carrying off of the daughters of Leucippus by Castor and Pollux, Hephaestus with his fire The treasury of the Athenians, erected at the time of the Persian Wars, was adorned with metopes of singularly clear-cut and beautiful style, but very fragmentary, representing the deeds of Heracles and Theseus

The most interesting and important of all Greek archaic sculptures are the pediments of the temple at Aegina (*q v*) These groups of nude athletes fighting over the corpses of their comrades are preserved at Munich, and are familiar to artists and students But the very fruitful excavations of Prof Furtwangler put them in quite a new light Furtwangler (*Aegina· Heiligtum der Aphaia*) entirely rearranged these pediments, in a way which removed the extreme simplicity and rigour of the composition, and introduced far greater variety of attitudes and motive We repeat here these new arrangements (fig 8), the reasons for which must be sought in Furtwangler's great publication The individual figures are not much altered, as the restorations of Thorwaldsen, even when incorrect, have now a prescriptive right of which it is not easy to deprive them Beside the pediments of Aegina must be set the remains of the pediments of the temple of Apollo at Eretria in Euboea, the chief group of which (Pl I, fig 4), Theseus carrying off an Amazon, is one of the most finely executed works of early Greek art

PERIOD II. 480–400 B.C.

The most marvellous phenomenon in the whole history of art is the rapid progress made by Greece in painting and sculpture during the 5th century B C As in literature the 5th century takes us from the rude peasant plays of Thespis to the drama of Sophocles and Euripides, as in philosophy it takes us from Pythagoras to Socrates; so in sculpture it covers the space from the primitive works made for the Peisistratidae to some of the most perfect productions of the chisel

In architecture the 5th century is ennobled by the Theseum, the Parthenon and the Erechtheum, the temples of Zeus at Olympia, of Apollo at Phigalia, and many other central shrines, as well as by the Hall of the Mystae at Eleusis and the Propylaea of the Acropolis Some of the most important of the Greek temples of Italy and Sicily, such as those of Segesta and Selinus, date from the same age It is, however, only of their sculptural decorations, carried out by the greatest masters in Greece, that we need here treat in any detail

Painting.—It is the rule in the history of art that innovations and technical progress are shown earlier in the case of painting than in that of sculpture, a fact easily explained by the greater ease and rapidity of the brush compared with the chisel. That this

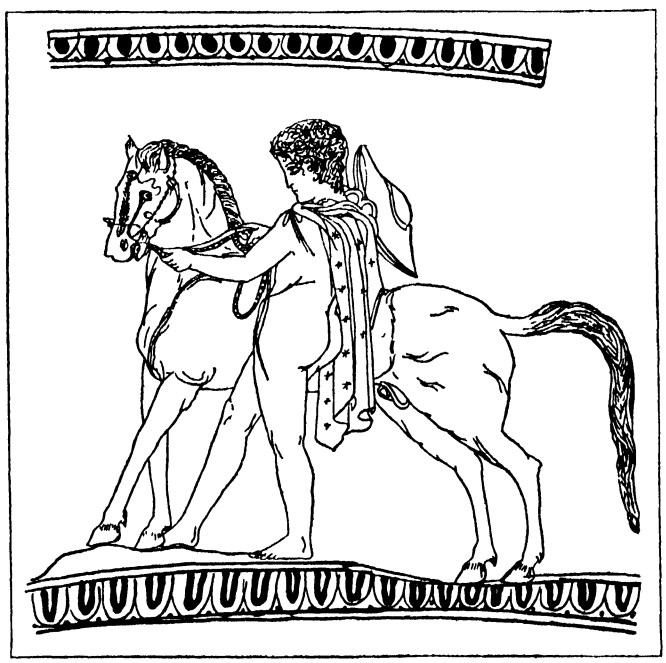
was the order of development in Greek art cannot be doubted But our means for judging of the painting of the 5th century are very slight. The noble paintings of such masters as Polygnotus, Micon and Panaenus, which once adorned the walls of the great porticos of Athens and Delphi, have disappeared There remain only the designs drawn rather than painted on the beautiful vases of the age, which in some degree help us to realize, not the colouring or the charm of contemporary paintings, but the principles of their composition and the accuracy of their drawing



FROM "MONUMENTI DELL' INSTITUTO DI CORRESPONDENZA ARCHEOLOGICA" VOL XI

FIG 10 —VASE PAINTING FROM ORVIETO IN THE STYLE OF POLYGNOTUS, SHOWING THE SLAYING OF NIOBE'S CHILDREN. 5TH CENTURY B C

Polygnotus of Thasos was regarded by his compatriots as a great ethical painter His colouring and composition were alike very simple, his figures quiet and statuesque, his drawing careful and precise He won his fame largely by incorporating in his works the best current ideas as to mythology, religion and morals In particular his painting of Hades with its rewards and punishments, which was on the walls of the building of the people of Cnidus at Delphi, might be considered as a great religious work, parallel to the paintings of the Campo Santo at Pisa or to the

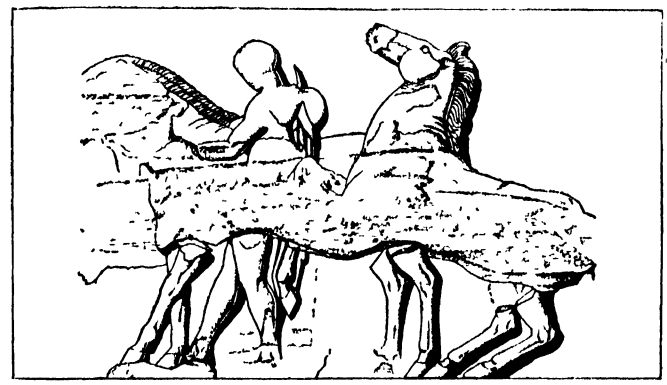


FROM "ARCH ZEIT"

FIG 11 —VASE PAINTING 5TH CENTURY B C

painted windows of such churches as that at Fairford But he also introduced improvements in perspective and greater freedom in grouping

It is fortunate for us that the Greek traveller Pausanias has left very careful and detailed descriptions of some of the most important of the frescoes of Polygnotus, notably of the Taking of Troy and the Visit to Hades, which were at Delphi A comparison of these descriptions with vase paintings of the middle of the 5th century has enabled us to discern with great probability the principles of Polygnotan drawing and perspective Prof Robert has even ventured to restore the paintings on the evidence of vases There is represented one of the scenes depicted on a vase found at Orvieto (fig 10), which is certainly Polygnotan in character It represents the slaying of the children of Niobe by Apollo and Artemis Here may be observed a remarkable perspective The different heights of the rocky background are represented by lines traversing the picture on which the figures stand;



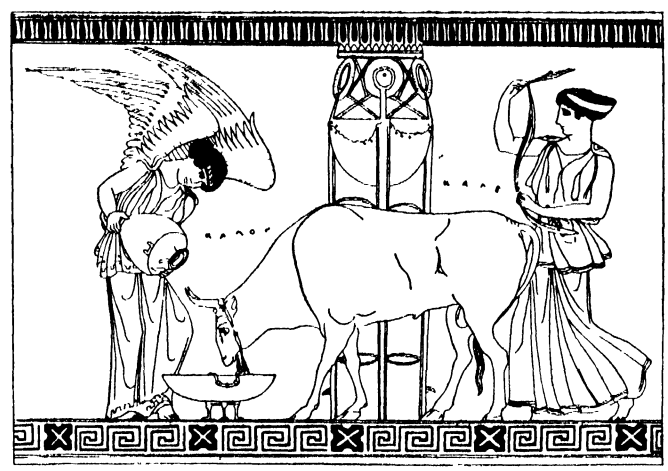
FROM "ARCH ZEIT"

FIG 12 —A GROUP FROM THE PANATHENAIC FRIEZE OF THE PARTHENON

but the more distant figures are no smaller than the nearer The forests of Mount Sipylus are represented by a single conventional tree The figures are beautifully drawn, and full of charm, but there is a want of energy in the action.

There can be little doubt that the school of Polygnotus exercised great influence on contemporary sculpture Panaenus, brother of Pheidias, worked with Polygnotus, and many of the groupings found in the sculptures of the Parthenon remind us of those usual with the Thasian master. At this simple and early stage of art there was no essential difference between fresco-painting and coloured relief, light and shade and aerial perspective being unknown Two vase-paintings are shown, one (fig 11), a group of man and horse which closely resembles figures in the Panathenaic frieze of the Parthenon (fig 12), the other (fig 13), representing Victory pouring water for a sacrificial ox to drink, which reminds us of the balustrade of the shrine of Wingless Victory at Athens

Most writers on Greek painting have supposed that after the middle of the 5th century the technique of painting rapidly improved This may well have been the case, but there is little means of testing the question Such improvements would soon raise such a barrier between fresco-painting and vase-painting—which by its very nature must be simple and architectonic—that vases can no longer be used with confidence as evidence for contemporary painting The stories told us by Pliny of the lives of



FROM GERHARD, "AUSERLESENE VASENBILDER"

FIG 13 —VASE PAINTING OF NIKE AND BULL. 5TH CENTURY B C

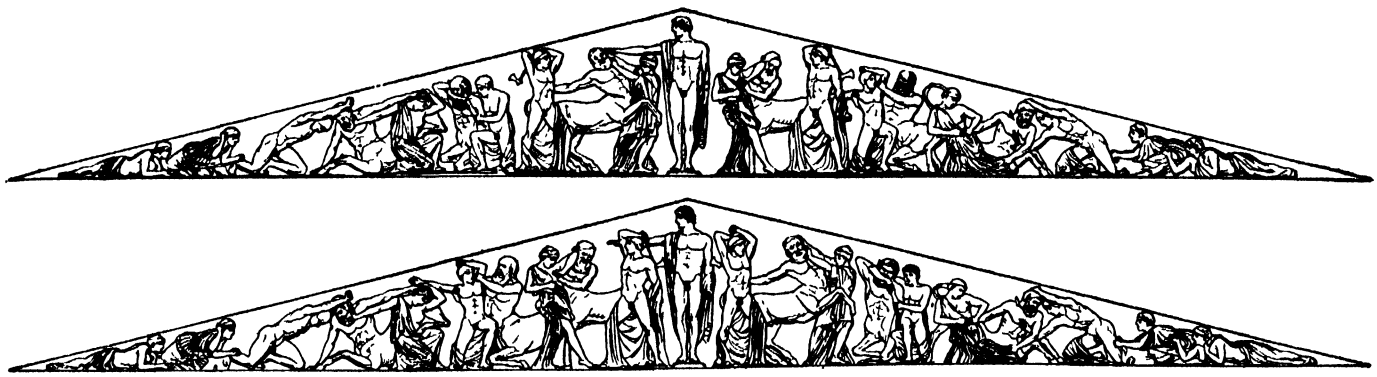


FIG 14 —TWO CONJECTURAL RESTORATIONS OF THE WESTERN PEDIMENT OF THE GREAT TEMPLE OF ZEUS AT OLYMPIA

Greek painters are mostly of a trivial and untrustworthy character, and in them there are discernible only a few general facts Of Agatharchus of Athens we learn that he painted, under compulsion, the interior of the house of Alcibiades, and we are told that he painted a scene for the tragedies of Aeschylus or Sophocles, thus leading some to suppose that he attempted illusive landscape But this is contrary to the possibilities of the time, and it is fairly certain that what he really did was to paint the wooden front of the stage building in imitation of architecture, in fact he painted a permanent architectural background, and not one suited to any particular play Of other painters who flourished at the end of the century, such as Zeuxis and Aristides, it will be best to speak under the next period

It is now generally held, in consequence of evidence furnished by tombs, that the 5th century saw the end of the making of vases on a great scale at Athens for export to Italy and Sicily And, in fact, few things in the history of art are more remarkable than the rapidity with which vase-painting at Athens reached its highest point and passed it on the downward road At the beginning of the century black-figured ware was scarcely out of fashion, and the masters of the severe red-figured style, Pamphaeus, Epictetus and their contemporaries, were in vogue The schools of Euphronius, Hiero and Duris belong to the age of the Persian wars With the middle of the century the works of these makers are succeeded by unsigned vases of most beautiful design, some of them showing the influence of Polygnotus In the later years of the century, when the empire of Athens was approaching its fall, drawing becomes laxer and more careless, and in the treatment of drapery we frequently note the over-elaboration of folds, the want of simplicity, which begin to mark contemporary sculpture

Olympia: Temple of Zeus.—Among the sculptural works of this period the first place may be given to the great temple of Zeus at Olympia The statue by Pheidias, which once occupied the place of honour in that temple, and was regarded as the noblest monument of Greek religion, has of course disappeared, nor are we able with confidence to restore it But the plan of the temple, its pavement, some of its architectural ornaments, remain The marbles which occupied the pediments and the metopes of the temple have been in large part recovered, having been probably thrown down by earthquakes and gradually buried in the alluvial soil The utmost ingenuity and science of the German archaeologists have been employed in the recovery of the composition of these groups, and, although doubt remains as to the places of some figures, and their precise attitudes, we may fairly say that we know more about the sculpture of the Olympian temple of Zeus than about that of any other great Greek temple The exact date of these sculptures is not certain, but with some confidence they may be placed between 470–460 B C (In speaking of them the opinion of Dr Treu is followed, whose masterly work in vol III of the great German publication on Olympia is a model of patience and of science) In the eastern pediment (fig 15), as Pausanias tells us, were represented the preparations for the chariot-race between Oenomaus and Pelops, the result of which was to determine whether Pelops should find death or a bride and a kingdom In the midst, invisible to the contending heroes, stood Zeus the supreme arbiter On one side of him stood Oenomaus with his wife Sterope, on the other Pelops and Hippodameia, the daughter of Oenomaus, whose position at once indicates that she is on the side of the newcomer, whatever her parents may feel Next on either side are the four-horse chariots of the two competitors, that of Oenomaus in the charge of his perfidious groom Myrtilus, who contrived that it should break down in the running, that of Pelops tended by his grooms At either end, where the pediment narrows to a point, reclines a river god, at one end Alpheus, the chief stream of Olympia, at the other his tributary Cladeus Only one figure remains, not noticed in the careful description of Pausanias, the figure of a handmaid kneeling, perhaps one of the attendants of Sterope The illustration gives two conjectural restorations of the pediment, that of Treu and that of Kekulé, which differ principally in the arrangement of the corners of the composition; that of the central figures and of the chariots can scarcely be called in question The moment chosen is one, not of action, but of expectancy, perhaps of preparation for sacrifice The arrangement is undeniably stiff and formal, and in the figures we note none of the trained perfection of style which belongs to the sculptures of the Parthenon, an almost contemporary temple Faults abound, alike in the rendering of drapery and in the representation of the human forms, and the sculptor has evidently trusted to the painter who was afterwards to colour his work, to remedy some of his clumsiness, or to make clear the ambiguous

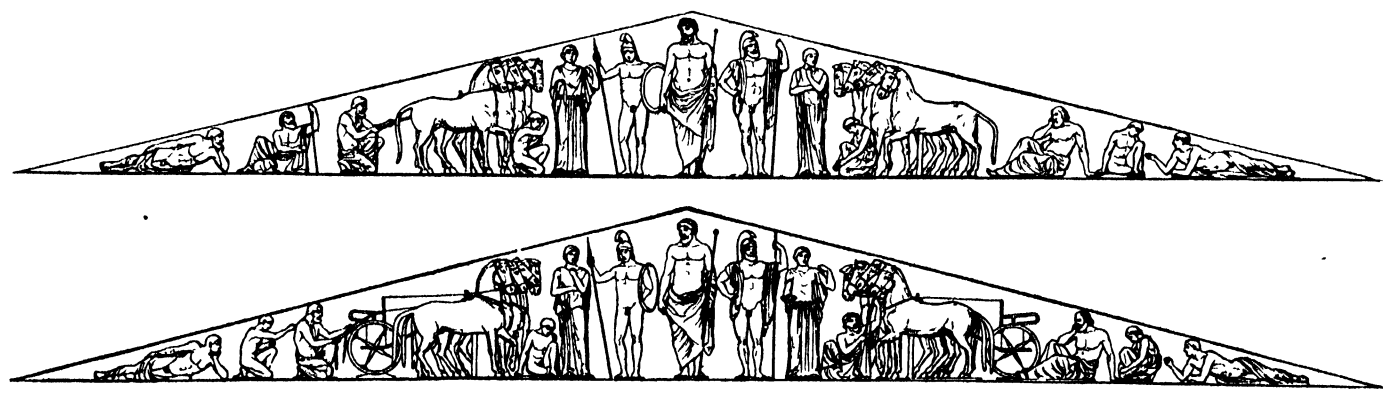
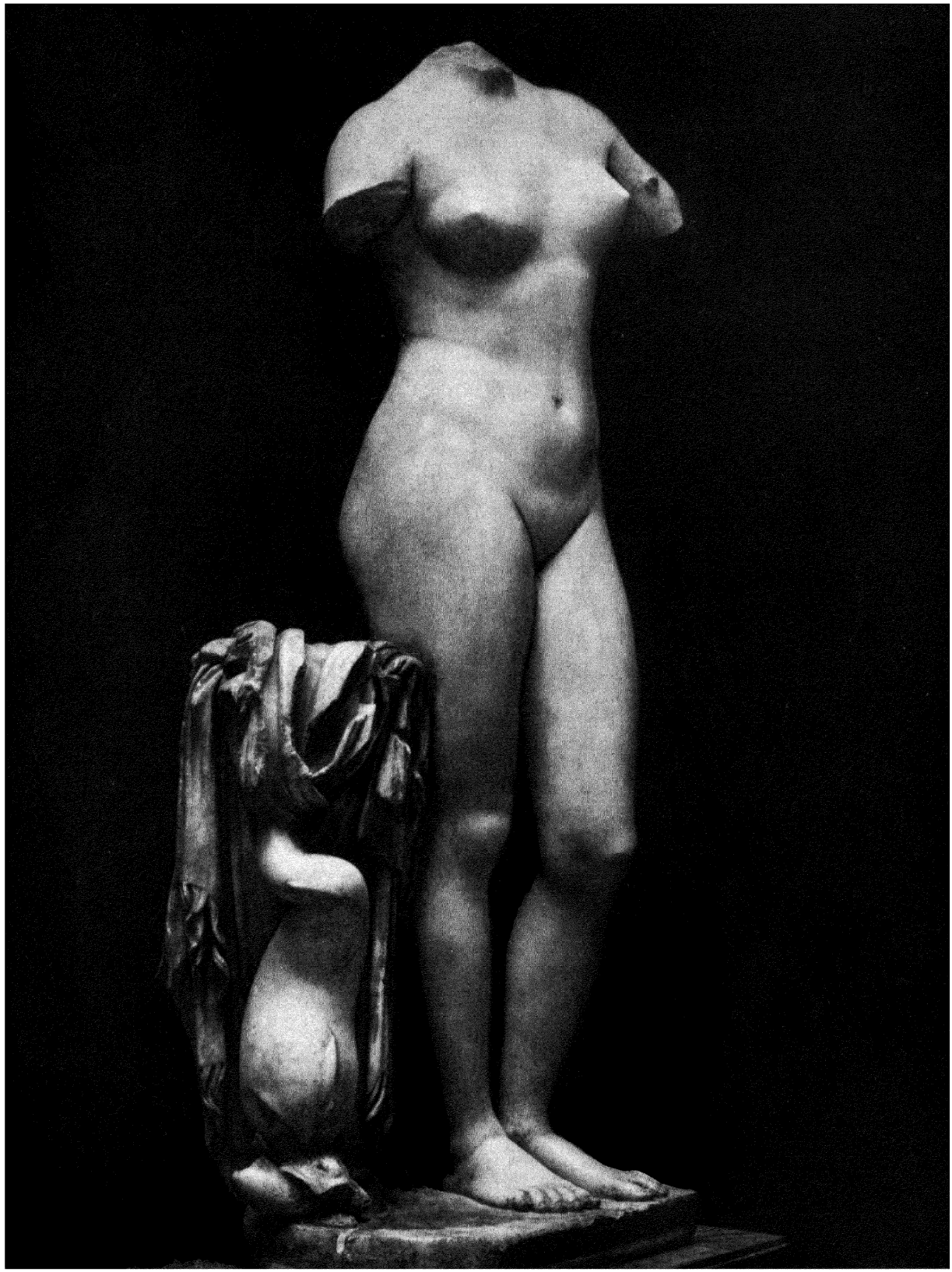


FIG 15 —TWO CONJECTURAL RESTORATIONS OF THE EASTERN PEDIMENT OF THE GREAT TEMPLE OF ZEUS AT OLYMPIA

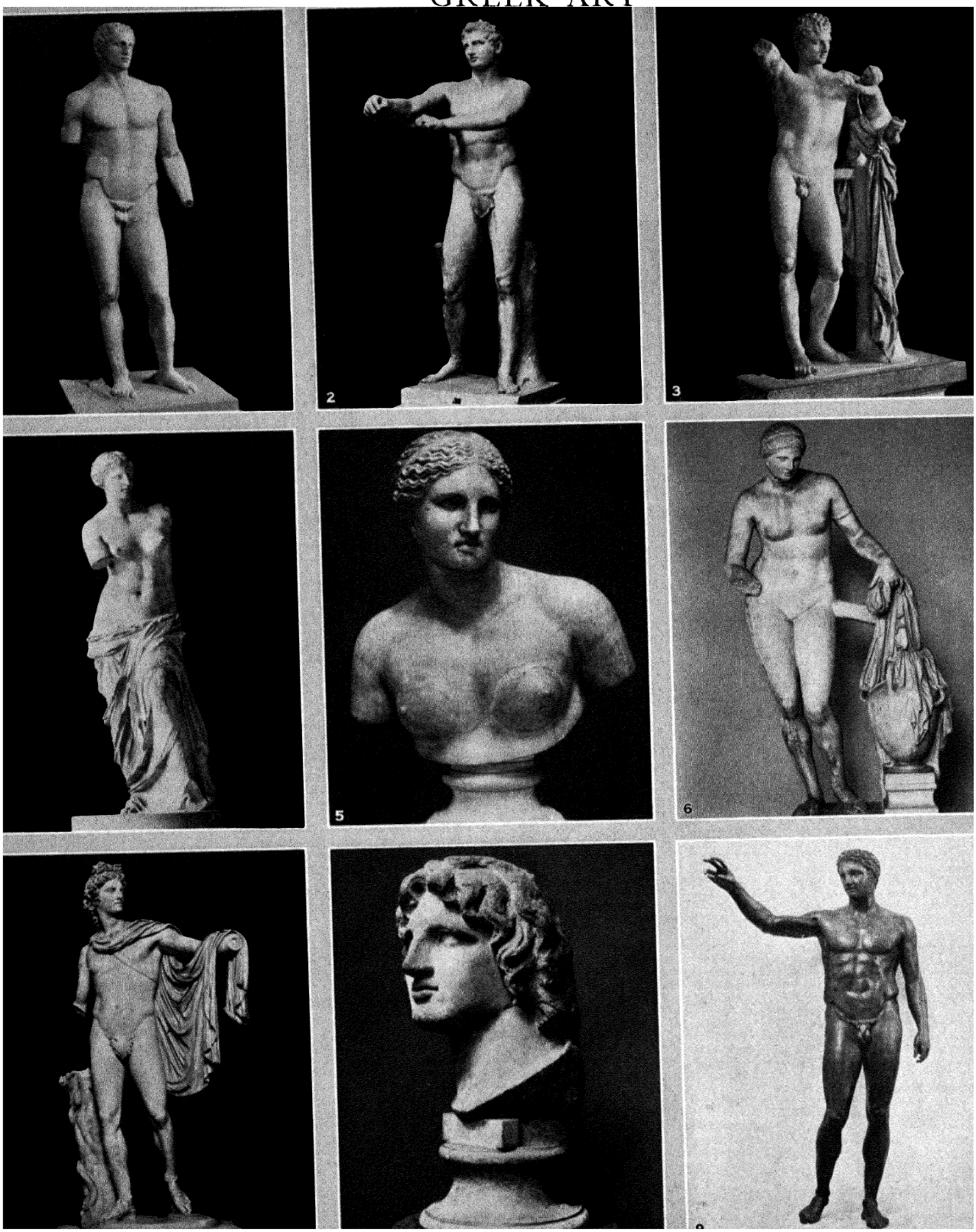


PHOTOGRAPH, ALINARI

APHRODITE OF CYRENE

This venus, found in the Thermae at Cyrene in December 1913, represented the goddess just risen from the sea and wringing out her hair. The support at the side represents a dolphin. The statue may be early Hellenistic, of the Alexandrine school, or possibly a Roman copy. Terme Museum, Rome

GREEK ART



BY COURTESY OF (5, 8) THE TRUSTEES OF THE BRITISH MUSEUM, (6) THE KEEPER OF THE ASHMOLEAN MUSEUM, OXFORD; PHOTOGRAPHS, (1, 3, 9) ALINARI, (2, 7) ANDERSON, (4) EWING GALLOWAY

GREEK SCULPTURE, IV. TO II. CENTURY B.C.

1. Agias, athlete, Delphi, 4th c. 2. Copy of Apoxyomenos, Lysippus, late 4th c. Vatican. 3. Hermes with the infant Dionysus, Praxiteles, 4th c. Olympia. Original found in 1877. 4. Aphrodite of Melos (Venus de Milo), 2nd c. Louvre. 5. Bust of Aphrodite of Praxiteles, 4th c. copy. British Museum. 6. Aphrodite of Cnidus, 4th c. copy, from a cast. Original in the Vatican. 7. Apollo of the Belvedere, 4th (?) c. Vatican. 8. Head of young Alexander from Cyrene, about 4th c. British Museum. 9. Bronze, athlete, found in the sea near Cythera, style of 4th c. Athens

Nevertheless there is in the whole a dignity, a sobriety and a simplicity, which reconcile us to the knowledge that this pediment was certainly regarded in antiquity as a noble work, fit to adorn even the palace of Zeus. In the western pediment (fig 14), the subject is the riot of the Centaurs when they attended the wedding of Peirithous in Thessaly, and, attempting to carry off the



FROM "OLYMPIA," VOL III, E TREU, EDITOR

FIG 16 —METOPE FROM THE TEMPLE OF ZEUS AT OLYMPIA REPRESENTING ONE OF THE 12 LABOURS OF HERACLES (UNRESTORED)

bride and her comrades, were slain by Peirithous and Theseus In the midst of the pediment, invisible like Zeus in the eastern pediment, stands Apollo, while on either side of him Theseus and Peirithous attack the Centaurs with weapons hastily snatched Our illustration gives two possible arrangements The monsters are in various attitudes of attempted violence, of combat and defeat; with each grapples one of the Lapith heroes in the endeavour to rob them of their prey In the corners of the pediment recline female figures, perhaps attendant slaves, though the farthest pair may best be identified as local Thessalian nymphs, looking on with the calmness of divine superiority, yet not wholly unconcerned in what is going forward Though the composition of the two pediments differs notably, the one bearing the impress of a parade-like repose, the other of an overstrained activity, the style and execution are the same in both, and the shortcomings must be attributed to the inferior skill of a local school of sculptors compared with those of Athens or of Aegina It even appears likely that the designs also belong to a local school Pausanias, it is true, says that the pediments were the work of Alcamenes, the pupil of Pheidias, and of Paeonius, a sculptor of Thrace, respectively, but it is almost certain that he was misled by the local guides, who would naturally be anxious to connect the sculptures of their great temple with well-known names

The metopes of the temple are in the same style of art as the pediments, but the defects of awkwardness and want of mastery are less conspicuous, because the narrow limits of the metope exclude any elaborate grouping The subjects are provided by the 12 labours of Heracles, the figures introduced in each metope are but two or at most three, and the action is simplified as much as possible. The example shown (fig 16), represents Heracles holding up the sky on a cushion, with the friendly aid of a Hesperid nymph, while Atlas, whom he has relieved of his usual burden, approaches bringing the apples which it was the task of Heracles to procure

Another of the fruits of the excavations of Olympia is the Floating Victory by Paeonius, unfortunately faceless (fig 17), which was set up in all probability in memory of the victory of the Athenians and their Messenian allies at Sphacteria in 425 B C. The inscription states that it was dedicated by the Messenians and people of Naupactus from the spoils of their enemies, but the name of the enemy is not mentioned in the inscription The statue of Paeonius, which comes floating down through the air with drapery borne backward, is of a bold and innovating type, and its influence may be traced in many works of the next age

Delphic Charioteer.—Among the discoveries at Delphi none is so striking and valuable to us as the life-size statue in bronze of a charioteer holding in his hand the reins Homolle maintained this to be part of a chariot-group set up by Polyzalus, brother of Gelo and Hiero of Syracuse, in honour of a victory won in the chariot-race at the Pythian games at Delphi (fig 18). The charioteer is evidently a high-born youth, and is clad in the long chiton which was necessary to protect a driver of a chariot from the rush of air The date would be about 480–470 B C Bronze groups representing victorious chariots with their drivers were among the noblest and most costly dedications of antiquity, the present figure is our only satisfactory representative of them In style the figure is very notable, tall and slight beyond all contemporary examples The contrast between the conventional decorousness of face and drapery and the lifelike accuracy of hands and feet is very striking, and indicates the clashing of various tendencies in art at the time when the great style was formed in Greece

Myron.—The three great masters of the 5th century, Myron, Pheidias and Polyclitus are all in some degree known to us from their works Of Myron we have copies of two works, the Marsyas with Athena (Pl II, fig 8), and the Discobolus The Marsyas (a copy in the Lateran Museum) represents the Satyr so named in the grasp of conflicting emotions, eager to pick up the flutes which Athena has thrown down, but at the same time dreading her displeasure if he does so More recently the Athena also has been identified The Discobolus has usually been judged from the examples in the Vatican and the British Museum, in which the anatomy is modernized and the head wrongly put on There are now photographs of the very superior replica in the Lancelotti gallery at Rome, the pose of which is much nearer to the original The illustration represents a restoration made at Munich, by combining the Lancelotti head with the Vatican body (Pl II, fig 6)



FROM OLYMPIA" VOL III

FIG 17 —FLOATING VICTORY BY PAEONIUS c 425 B C (RESTORED)

Pheidias.—Of the works of Pheidias we have unfortunately no certain copy, excepting the small replicas at Athens of his Athena Parthenos The larger of these was found in 1880 it is very clumsy, and the wretched device by which a pillar is introduced to support the Victory in the hand of Athena can scarcely be supposed to have belonged to the great original Tempting theories have been published by Furtwangler (*Masterpieces of Greek Sculpture*) and other archaeologists, which identify copies of the Athena Lemnia of Pheidias, his Pantarces, his Aphrodite Urania and other statues, but doubt hangs over all these attributions

A more pertinent and more promising question is, how far one may take the decorative sculpture of the Parthenon, since Lord Elgin's time the pride of the British Museum, as the actual work of Pheidias, or as done from his designs Here again we have no conclusive evidence, but it appears from the testimony of inscriptions that the pediments at all events were not executed until after Pheidias's death

Of course, the pediments and frieze of the Parthenon (*q v*),

whose work soever they may be, stand at the head of all Greek decorative sculpture. Whether we regard the grace of the composition, the exquisite finish of the statues in the round, or the delightful atmosphere of poetry and religion which surrounds these sculptures, they rank among the masterpieces of the world. The Greeks esteemed them far below the statue which the temple was made to shelter; but to us, who have lost the great figure in ivory and gold, the carvings of the casket which once contained it are a perpetual source of instruction and delight The whole is reproduced by photography in A. S. Murray's *Sculptures of the Parthenon*

An abundant literature has sprung up in regard to these sculptures, but it will suffice here to mention the discussions in Furtwangler's *Masterpieces,* and the very ingenious attempts of Sauer to determine by a careful examination of the bases and backgrounds of the pediments as they now stand how the figures must have been arranged in them The two ends of the eastern pediment (Pl I, figs 1, 2, 3), are the only fairly well-preserved part of the pediments.



AFTER ALINARI PHOTO

FIG. 18 —BRONZE CHARIOTEER FROM DELPHI 480–470 B C.

Among the pupils of Pheidias who may naturally be supposed to have worked on the sculptures of the Parthenon, the most notable were Alcamenes and Agoracritus Some fragments remain of the great statue of Nemesis at Rhamnus by Agoracritus, and an interesting light has been thrown on Alcamenes by the discovery at Pergamum of a professed copy of his Hermes set up at the entrance to the Acropolis at Athens (Pl I, fig 6) This, however, is conventional and archaistic in style, and we can scarcely regard it as typical of the master. Another noted contemporary who was celebrated mainly for his portraits was Cresilas, a Cretan Several copies of his portrait of Pericles exist, and testify to the lofty and idealizing style of portraiture in this great age

There have been found also admirable sculpture belonging to the other important temples of the Acropolis, the Erechtheum and the temple of Nike The temple of Nike is the earlier, being possibly a memorial of the Spartan defeat at Sphacteria The Erechtheum belongs to the end of our period, and embodies the delicacy and finish of the conservative school of sculpture at Athens just as the Parthenon illustrates the ideas of the more progressive school The reconstruction of the Erechtheum has been a task which has long occupied the attention of archaeologists (*see* the paper by Stevens in the *American Journal of Archaeology,* 1906). The illustration (Pl IV, fig 9), shows one of the maidens, called both Corae and Caryatides, who support the entablature of the south porch of the Erechtheum, in her proper setting This use of the female figure in place of a pillar is based on old Ionian precedent (*see* fig 1), and is not altogether happy, but the idea is carried out with remarkable skill, the perfect repose and solid strength of the maiden being emphasized

Polyclitus.—Beside Pheidias of Athens must be placed the greatest of early Argive sculptors, Polyclitus His two typical athletes, the Doryphorus or spear-bearer (Pl I, fig 5), and the Diadumenus, have long been identified, and though the copies are not first-rate, they recover the principles of the master's art Among the bases discovered at Olympia, whence the statues had been removed, are three or four which bear the name of Polyclitus, and the definite evidence furnished by these bases as to the position of the feet of the statues which they once bore has enabled archaeologists, especially Furtwangler, to identify copies of those statues among known works. Copies of Polyclitan works have also been discovered, and at Delos was found a copy of the Diadumenus, which is of much finer work than the statue in the British Museum from Vaison The Boston Museum of fine arts has a very beautiful statue of a young Hermes, who but for the wings on the temples might easily pass as a boy athlete of Polyclitan style (Pl III) In fact, as regards the manner of Polyclitus besides Roman copies of the Doryphorus and Diadumenus, there is quite a gallery of athletes, boys and men, who all claim relationship, nearer or more remote, to the school of the great Argive master, and in the Ashmolean museum is a very beautiful bronze head of the Polyclitan school (Pl IV, fig 6) It might have been hoped that the excavations, made under the leadership of Prof Waldstein (Walston) at the Argive Heraeum, would have brought enlightenment to us as to the style of Polyclitus Just as the sculptures of the Parthenon are the best monument of



FIG 19 —MARBLE FEMALE HEAD EXCAVATED AT THE ARGIVE HERAEUM

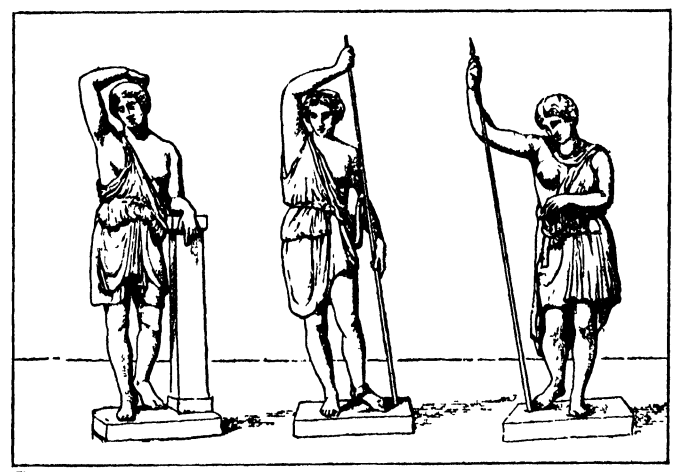
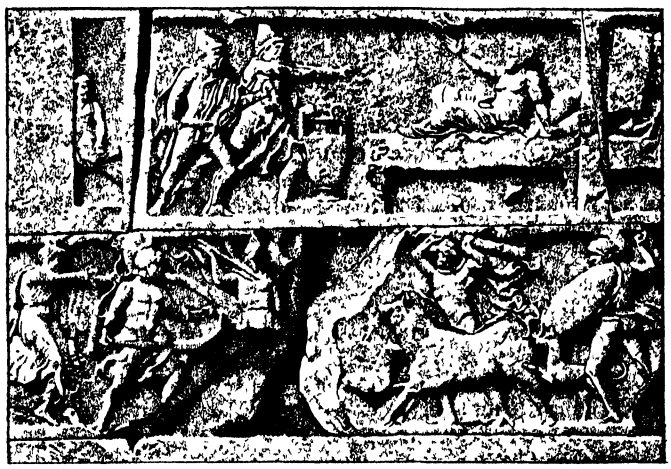


FIG 20 —TYPES OF 5TH CENTURY AMAZONS RESTORED BY MICHAELIS

Pheidias, so it might seem likely that the sculptural decoration of the great temple which contained the Hera of Polyclitus would show us at large how his school worked in marble, but unfortunately the fragments of sculpture from the Heraeum are few The most remarkable is a female head, which may perhaps come from a pediment (fig 19) . But archaeologists are not in agreement whether it is Polyclitan in style or whether it rather resembles in style Attic works Other heads and some highly-finished

fragments of bodies come apparently from the metopes of the same temple. (*See* also ARGOS.)

Another work of Polyclitus was his Amazon, made it is said in competition with his great contemporaries, Pheidias, Cresilas and Phradmon, all of whose Amazons were preserved in the great temple of Artemis at Ephesus. In the museums are many statues of Amazons representing 5th century originals These have usu-



FROM "HEROON OF GYEUL BASHI TRYSA"

FIG 21.—FRAGMENT OF A FRIEZE OF THE VIENNA TOMB ABOVE ULYSSES SHOOTING SUITORS, BELOW BOAR HUNTING

ally been largely restored, and it is no easy matter to discover their original type Prof Michaelis has recovered successfully three types (fig 20). The attribution of these is a matter of controversy The first has been given to Polyclitus; the second seems to represent the Wounded Amazon of Cresilas, the third has by some archaeologists been assigned to Pheidias. It does not represent a wounded Amazon, but one alert, about to leap upon her horse with the help of a spear as a leaping pole

Lycia.—It is impossible to devote little more than a passing mention to the sculpture of other temples and shrines of the later 5th century, which nevertheless deserve careful study The frieze from the temple of Apollo at Phigalia, representing Centaur and Amazon battles, is familiar to visitors of the British Museum, where, however, its proximity to the remains of the Parthenon lays stress upon the faults of grouping and execution which this frieze presents It seems to be the work of local Arcadian artists More pleasing is the sculpture of the Ionic tomb called the Nereid monument, brought by Sir Charles Fellows from Lycia Here we have not only a series of bands of relief which ran round the tomb, but also detached female figures, whence the name which it bears is derived, though these women with their fluttering drapery may be not nymphs of the sea, but personifications of sea-breezes

Lycian sculpture is well represented by the friezes, now in the Vienna Museum, which adorned a heroon near Gyeul Bashi and date from not much later than the middle of the 5th century In the midst of the enclosure was a tomb, and the walls of the enclosure itself were adorned within and without with a great series of reliefs, mostly of mythologic purport Many subjects which but rarely occur in early Greek art, the siege of Troy, the adventure of the Seven against Thebes, the carrying off of the daughters of Leucippus, Ulysses shooting down the Suitors, are here represented in detail Prof Benndorf, who has published these sculptures in an admirable volume, is disposed to see in them the influence of the Thasian painter Polygnotus Anyone can see their kinship to painting, and their subjects recur in some of the great frescoes painted by Polygnotus, Micon and others for the Athenians Like other Lycian sculptures, they contain non-Hellenic elements, in fact Lycia forms a link of the chain which extends from the wall-reliefs of Assyria to works like the columns of Trajan and of Antoninus, but is not embodied in the more purely idealistic works of the highest Greek art A small part of the frieze of the Vienna tomb is shown in fig 21; in this fragment are two scenes, one directly above the other, in the upper Ulysses, accompanied by his son Telemachus, is in the act of shooting the suitors, who are reclining at table in the midst of a feast, a cup-bearer, possibly Melanthius, is escaping by a door behind Ulysses; and in the lower is the central group of a frieze representing the hunting of the Calydonian boar, the boar being shown—as is usual in the best period of Greek art—as an ordinary animal and no monster

Portraits.—Archaeologists formerly paid little attention to an interesting branch of Greek art, that of sculptured portraits, but the known portraits of the 5th century now include Pericles, Herodotus, Thucydides, Anacreon, Sophocles, Euripides, Socrates and others As might be expected in a time when style in sculpture was so strongly pronounced, these portraits, as we may see from later copies, are notably ideal They represent the great men whom they portray not in the spirit of realism Details are neglected, expression is not elaborated, the sculptor tries to represent what is permanent in his subject rather than what is temporary Hence these portraits do not seem to belong to a particular time of life; they only represent a man in the perfection of physical force and mental energy And the race or type is clearly shown through individual traits In some cases it is still disputed whether statues of this age represent deities or mortals, so notable are the repose and dignity which even human figures acquire under the hands of 5th century masters The Pericles after Cresilas in the British Museum and the athlete-portraits of Polyclitus, are good examples

PERIOD III. 400–300 B.C.

The high ideal level attained by Greek art at the end of the 5th century is maintained in the 4th There cannot be any question of decay in it save at Athens, where undoubtedly the loss of religion and the decrease of national prosperity acted prejudicially But in Peloponnesus the time was one of expansion, several new and important cities, such as Messene, Megalopolis and Mantinea, arose under the protection of Epaminondas And in Asia the Greek cities were still prosperous and artistic, as were the cities of Italy and Sicily which kept their independence On the whole there is during this age some diminution of the freshness and simplicity of art, it works less in the service of the gods and more in that of private patrons, it becomes less ethical and more sentimental and emotional On the other hand, there can be no doubt that technique both in painting and sculpture advanced with rapid strides, artists had a greater mastery of their materials, and ventured on a wider range of subject

In the 4th century no new temples of importance rose at Athens, the Acropolis had taken its final form, but at Messene, Tegea, Epidaurus and elsewhere, very admirable buildings arose The remains of the temple at Tegea are of wonderful beauty and finish, as are those of the theatre and the so-called *Tholus* of Epidaurus In Asia Minor vast temples of the Ionic order arose, especially at Miletus and Ephesus The colossal pillars of Miletus astonish the visitors to the Louvre, while the sculptured columns of Ephesus in the British Museum (Pl IV, fig 8), show a high level of artistic skill The Mausoleum erected about 350 B C at Halicarnassus in memory of Mausolus, king of Caria, and adorned with sculpture by the most noted artists of the day, was reckoned one of the wonders of the world It has been in part restored in the British Museum, where also are models of various conjectural restorations A small part of the sculptural decoration representing a battle between Greeks and Amazons is shown (Pl IV, figs 1 and 2), wherein the energy of the action and the careful balance of figure against figure are remarkable We possess also the fine portraits of Mausolus himself and his wife Artemisia, which stood in or on the building, as well as part of a gigantic chariot with four horses which surmounted it

Another architectural work of the 4th century, in its way a gem, is the structure set up at Athens by Lysicrates, in memory of a choragic victory This still survives, though the reliefs with which it is adorned have suffered severely from the weather.

The 4th century is the brilliant period of ancient painting It opens with the painters of the Asiatic school, Zeuxis and Parrhasius and Protogenes, with their contemporaries Nicias and Apollodorus of Athens, Timanthes of Sicyon or Cythnus, and Euphranor of Corinth It witnesses the rise of a great school at

Sicyon, under Eupompus and Pamphilus, which was noted for its scientific character and the fineness of its drawing, and which culminated in Apelles, the painter of Alexander the Great, and probably the greatest master of the art in antiquity To each of these painters a separate article is given, fixing their place in the history of the art Of their paintings, unfortunately, but a very inadequate notion can be formed. Vase-paintings, which in the 5th century give us some notion at least of contemporary drawing, are less careful in the 4th century Now and then are found on them figures admirably designed, or successfully foreshortened, but these are rare occurrences The art of the vase decorator has ceased to follow the methods and improvements of contemporary fresco painters, and is pursued as a mere branch of commerce



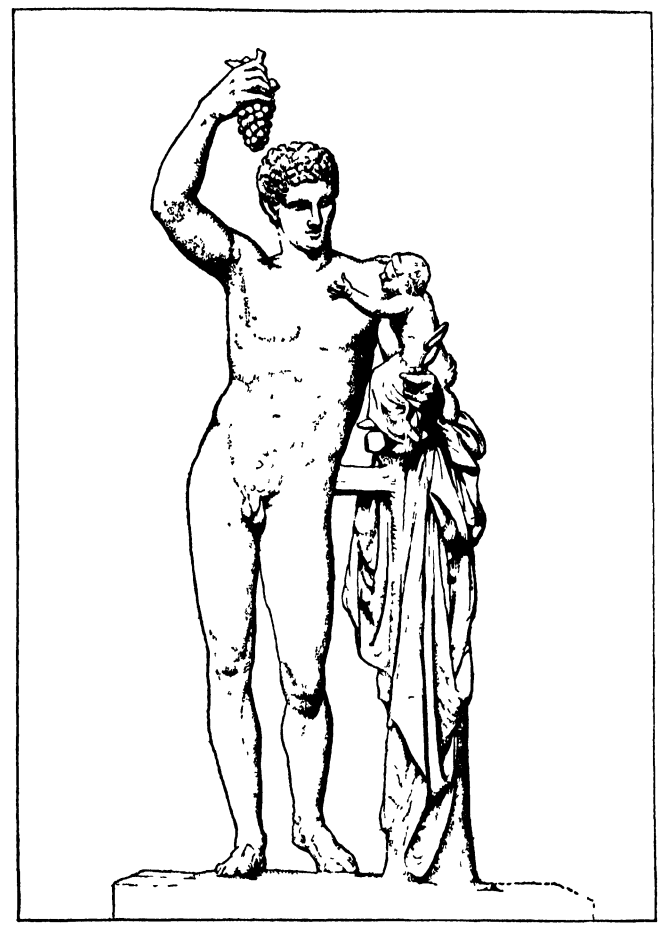
BY COURTESY OF THE NATIONAL MUSEUM, NAPLES

FIG 22 —DRAWING OF WOMEN PLAYING AT KNUCKLEBONES, 400 B C

But very few actual paintings of the age survive, and even these fragmentary remains have with time lost the freshness of their colouring, nor are they in any case the work of a noteworthy hand Our illustration (fig 22), represents the remains of a drawing on marble, showing a group of women playing knucklebones It was found at Herculaneum Though signed by one Alexander of Athens, who was probably a worker of the Roman age, Prof Robert is right in maintaining that Alexander only copied a design of the age of Zeuxis and Parrhasius In fact the drawing and grouping is so closely like that of reliefs of about 400 B C that the drawing is of great historic value, though there is no colouring Several other drawings of the same class have been found at Herculaneum, and on the walls of the Transtiberine Villa at Rome (now in the Terme museum)

Praxiteles.—Until about 1880 the knowledge of the great Greek sculptors of the 4th century was derived mostly from the statements of ancient writers and from Roman copies, or what were supposed to be copies, of their works, but there is now at least one undoubted original work of Praxiteles as well as sculptures executed under the immediate direction of, if not from the hand of, other great sculptors of that age—Scopas, Timotheus and others Among all the discoveries made at Olympia in 1877 none has become so familiar to the artistic world as that of the Hermes of Praxiteles, a first-rate Greek original by one of the greatest of sculptors Before its discovery almost all the statues in our museums were either late copies of Greek works of art, or else the mere decorative sculpture of temples and tombs, but the Hermes can be submitted to the strictest examination, and it can be seen in every line and touch that there is the work of a great artist This is more than can be said of any of the literary remains of antiquity—poem, play or oration Hermes is represented by the sculptor (Pl. VI., fig 3), in the act of carrying the young child Dionysus to the nymphs who were charged with his rearing On the journey he pauses and amuses himself by holding out to the child-god a bunch of grapes, and watching his eagerness to grasp them To the modern eye the child is not a success, only the latest art of Greece is at home in dealing with children But the Hermes, strong without excessive muscular development, and graceful without leanness, is a model of physical formation, and his face expresses the perfection of health, natural endowment and sweet nature The statue can scarcely be called a work of religious art in the modern or Christian sense of the word but from the Greek point of view it is religious, as embodying the result of the harmonious development of all human faculties and life in accordance with nature

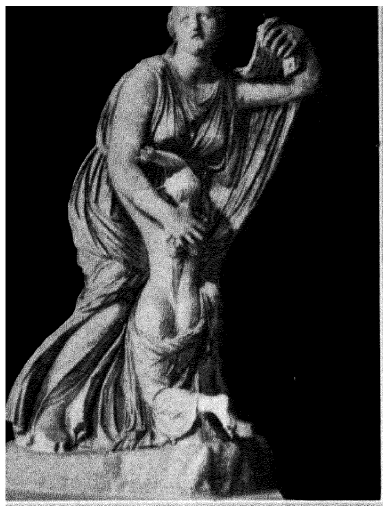
The Hermes not only added to our knowledge of Praxiteles, but also confirmed the received views in regard to him Already many works in galleries of sculpture had been identified as copies of statues of his school Noteworthy among these are, the group at Munich representing Peace nursing the infant Wealth, from an original by Cephisodotus, father of Praxiteles; copies of the Cnidian Aphrodite of Praxiteles, especially one in the Vatican which is here illustrated (Pl VI, fig 6), and a torso in the British Museum (Pl VI, fig 5); copies of the Apollo slaying a lizard (Sauroctonus), of a Satyr (in the Capitol museum), and



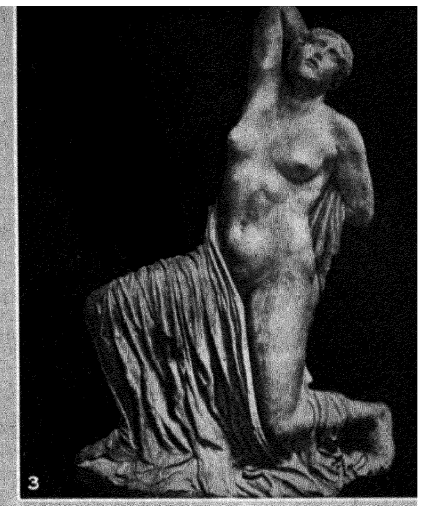
FROM "OLYMPIA"

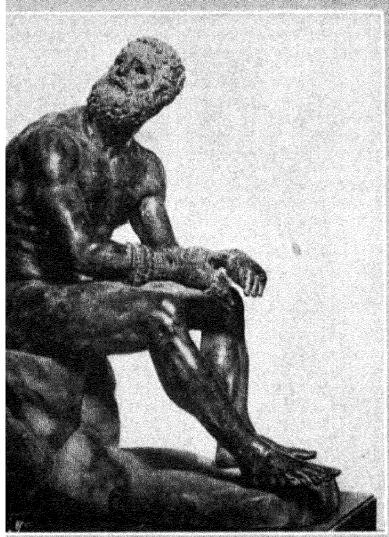
FIG 23 —THE HERMES OF PRAXITELES FROM OLYMPIA (RESTORED)

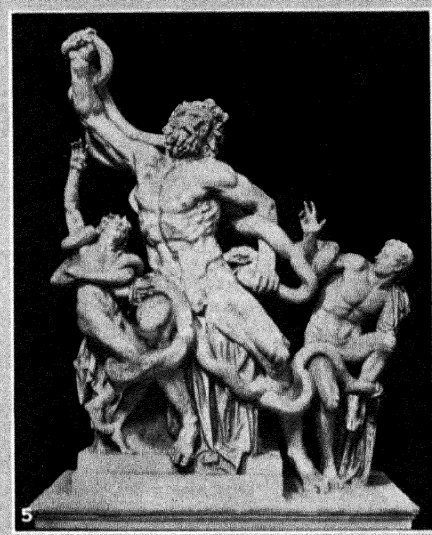
others These works, which are noted for their softness and charm, make understandable the saying of ancient critics that Praxiteles and Scopas were noted for the pathos of their works, as Pheidias and Polyclitus for the ethical quality of those they produced. But the pathos of Praxiteles is of a soft and dreamy character, there is no action, or next to none, and the emotions which he rouses are sentimental rather than passionate Scopas was of another mood The discovery of the Hermes naturally set archaeologists searching in the museums of Europe for other works, which may from their likeness to it in various respects be

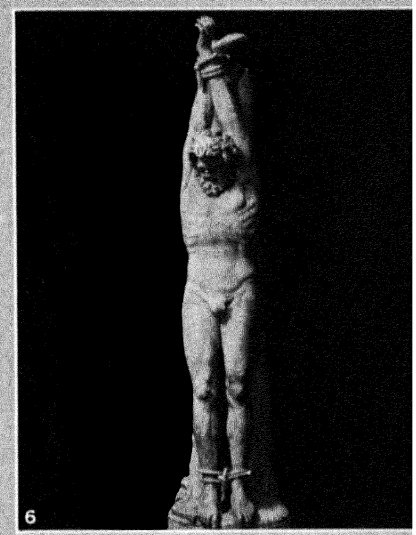


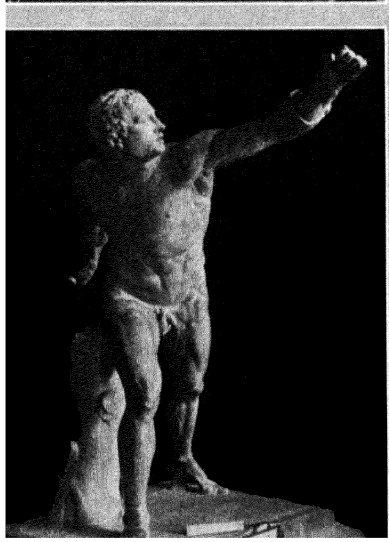


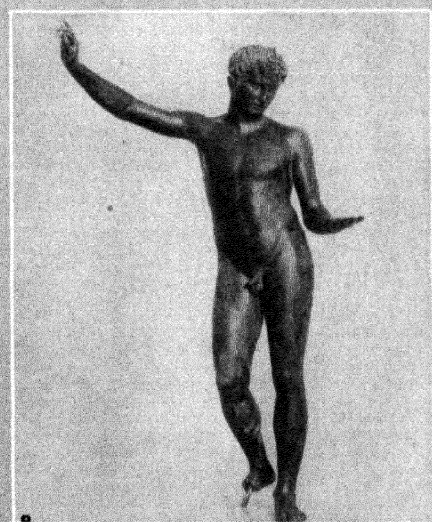


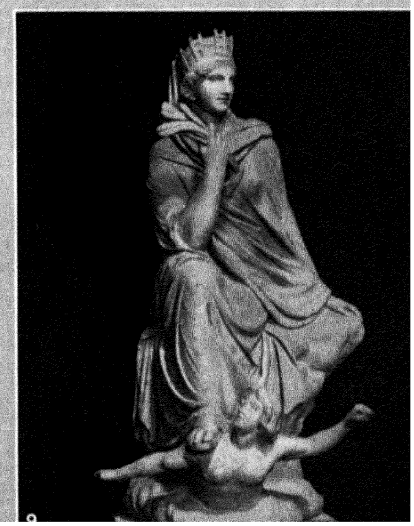












BY COURTESY OF (8) THE METROPOLITAN MUSEUM OF ART, NEW YORK; PHOTOGRAPHS, (1, 5, 6, 9) ALINARI, (2, 7) GIRAUDON, (3) F. BRUCKMANN, (4) ANDERSON

GREEK SCULPTURE

1. Niobe and her youngest daughter, 4th–3rd c. B.C.; copies. Uffizi Gallery, Florence. 2. Winged Victory of Samothrace; original, 4th c. B.C. Louvre. 3. Niobid, probably an original of the 5th c. B.C. Terme Museum, Rome. 4. Seated boxer, bronze, late Hellenistic. Terme Museum, Rome. 5. Laocoon group, first c. B.C. Vatican. 6. Flaying of Marsyas, Rhodian school. Villa Albani, Rome. 7. Fighter, of Agasias. Louvre. 8. "Marathon boy." Found in the bay of Marathon; 4th c. B.C. 9. Symbolic figure of the city of Antioch, seated above the river Orontes; 3rd c. B.C. Vatican

victory won at Salamis in Cyprus in 306 B.C. over the fleet of Ptolemy, king of Egypt

Nor can two works be passed over without notice so celebrated as the Apollo of the Belvedere in the Vatican (Pl. VI, fig. 7), and the Artemis of Versailles The Apollo is now by most archaeologists regarded as probably a copy of a work of Leochares, to whose Ganymede it bears a superficial resemblance. The Artemis is regarded as possibly due to some artist of the same age But it is by no means clear that either of these figures can be removed from among the statues of the Hellenistic age The old theory of Preller, which saw in them copies from a trophy set up to commemorate the repulse of the Gauls at Delphi in 278 B C, has not lost its plausibility

Sarcophagi of Sidon.—This may be the most appropriate place for mentioning the remarkable find made at Sidon in 1886 of a number of sarcophagi, which once doubtless contained the remains of kings of Sidon They are now in the museum of Constantinople, and are admirably published by Hamdy Bey and T. Reinach (*Une Nécropole royale à Sidon,* 1892–96). The sarcophagi in date cover a considerable period The earlier are made on Egyptian models, the covers shaped roughly in the form of a human body or mummy The later, however, are Greek in form, and are clearly the work of skilled Greek sculptors, who seem to have been employed by the grandees of Phoenicia in the adornment of their last resting-places Four of these sarcophagi in particular claim attention, and in fact present examples of Greek art of the 5th and 4th centuries in several of its aspects To the 5th century belong the tomb of the Satrap, the reliefs of which bring to light the activities and glories of some unknown king, and the Lycian sarcophagus, so called from its form, which resembles that of tombs found in Lycia, and which is also adorned with reliefs which have reference to the past deeds of the hero buried in the tomb, though these deeds are represented, not in the Oriental manner directly, but in the Greek manner, clad in



FROM HAMDY AND REINACH, "NÉCROPOLE À SIDON"

FIG 24.—TOMB OF MOURNING WOMEN AT SIDON, 4TH CENTURY B C

mythological forms To the 4th century belong two other sarcophagi. One of these is called the Tomb of Mourning Women On all sides of it alike are ranged a series of beautiful female figures, separated by Ionic pillars, each in a somewhat different attitude, though all attitudes denote grief (fig 24) The pediments at the ends of the cover are also closely connected with the mourning for the loss of a friend and protector, which is the theme of the whole decoration of the sarcophagus Depicted in them are the telling of the news of the death, with the results in the mournful attitude of the two seated figures The mourning women must be taken, not as the representation of any persons in particular, but generally as the expression of the feeling of a city. Such figures are familiar to us in the art of the second Attic school; there are parallels to the sarcophagus among the 4th century sepulchral reliefs of Athens The attribution of the workmanship of this beautiful sarcophagus to some sculptor trained in the school of Praxiteles cannot be mistaken And it is a conjecture full of probability that it once contained the body of Strato, king of Sidon, who ruled about 380 B.C, and who was *proxenos* or public friend of the Athenians.

More celebrated is the astonishing tomb called that of Alexander, though there can be no doubt that, although it commemorates the victories and exploits of Alexander, it was made not to hold his remains, but those of some ruler of Sidon who was high in his favour. Among all the monuments of antiquity which have come down to us, none is more admirable than this, and none more characteristic of the Greek genius The illustration shows, in two lines, the composition which adorned one of the sides of this sarcophagus It represents a victory of Alexander, probably that of the Granicus (fig. 25) On the left can be seen the Macedonian king charging the Persian horse, on the right his general Parmenio, and in the midst a younger officer, perhaps Cleitus Mingled with the chiefs are foot-soldiers, Greek and Macedonian, with whom the Persians are mingled in unequal fray What most strikes the modern eye is the remarkable freshness and force of the action and the attitudes Those, however, who have seen the originals have been specially impressed with the colouring, whereof, of course, our reproduction gives no hint, but which is applied to the whole surface of the relief with equal skill and delicacy There are other features in the relief on which a Greek eye would have dwelt with special pleasure—the exceedingly careful symmetry of the whole, the balancing of figure against figure, the skill with which the result of the battle is hinted rather than depicted The composition is one in which the most careful planning and the most precise calculation are mingled with freedom of hand and expressiveness in detail The faces in particular show more expression than would be expected in art of the previous century. Authorities are unable as yet to assign an author or even a school to the sculptor of this sarcophagus, it comes to us as a new and striking phenomenon in the history of ancient art The reliefs which adorn the other sides of the sarcophagus are almost equally interesting On one side is Alexander again, in the company of a Persian noble, hunting a lion The short sides also show scenes of fighting and hunting In fact it can scarcely be doubted that if there was but a clue to the interpretation of the reliefs, they would be found to embody historic events of the end of the 4th century There are only a few other works of art, such as the Bayeux tapestry and the Column of Trajan, which bring contemporary history so vividly before our eyes The battles with the Persians represented in some of the sculpture of the Parthenon and the temple of Nike at Athens are treated conventionally and with no attempt at realism, but here the ideal and the actual are blended into a work of consummate art, which is at the same time, to those who can read the language of Greek art, a historic record The portraits of Alexander the Great which appear on this sarcophagus are almost contemporary, and the most authentic likenesses of him The great Macedonian exercised so strong an influence on contemporary art that a multitude of heads of the age, both of gods and men, and even the portraits of his successors, show traces of his type

There are yet to be mentioned what are among the most charming and the most characteristic products of the Greek chisel, the beautiful tombs, adorned with seated or standing portraits or with reliefs, which were erected in great numbers on all the main roads of Greece A great number of these from the Dipylon cemetery are preserved in the Central museum at Athens, and impress all visitors by the gentle sentiment and the charm of grouping which they display.

PERIOD IV. 300–50 B.C.

There can be no question but that the period which followed the death of Alexander, commonly called the age of Hellenism,



FROM HAMDY AND REINACH, "NÉCROPOLE À SIDON"

FIG 25 —PAINTED RELIEF ADORNING ONE SIDE OF A SARCOPHAGUS CALLED THE TOMB OF ALEXANDER, PROBABLY REPRESENTING THE VICTORY AT GRANICUS, SIDON 4TH CENTURY B C

was one of great activity and expansion in architecture. The number of cities founded by himself and his immediate successors in Asia and Egypt was enormous The remains of these cities have in a few cases (Ephesus, Pergamum, Assus, Priene, Alexandria) been partially excavated But the adaptation of Greek architecture to the needs of the semi-Greek peoples included in the dominions of the kings of Egypt, Syria and Pergamum is too vast a subject to be entered upon here

Painting during this age ceased to be religious It was no longer for temples and public stoae that artists worked, but for private persons, especially they made frescoes for the decoration of the walls of houses, and panel pictures for galleries set up by rich patrons The names of very few painters of the Hellenistic age have come down to us There can be no doubt that the character of the art declined, and there were no longer produced great works to be the pride of cities, or to form an embodiment for all future time of the qualities of a deity or the circumstances of scenes mythical or historic But at the same time the mural paintings of Pompeii and other works of the Roman age, which are usually more or less nearly derived from Hellenistic models, prove that in technical matters painting continued to progress Colouring became more varied, groups more elaborate, perspective was worked out with greater accuracy, and imagination shook itself free from many of the conventions of early art Pompeian painting, however, must be treated of under Roman, not under Greek art There is shown a single example, to depict the elaboration of painting at Alexandria and elsewhere, the wonderful Pompeian mosaic (fig 28), which represents the victory of Alexander at Issus. This work being in stone has preserved its colouring; and it stands at a far higher level of art than ordinary Pompeian paintings This, on the contrary, is certainly copied from the work of a great master It is instructive to compare it with the sarcophagus illustrated in fig 25, which it excels in perspective and in the freedom of individual figures, though the composition is much less careful and precise Alexander charges from the left (his portrait being the least successful part of the picture), and bears down a young Persian, Darius in his chariot flees towards the right, in the foreground a young knight is trying to manage a restive horse It will be observed how very simple is the indication of locality. a few stones and a broken tree stand for rocks and woods

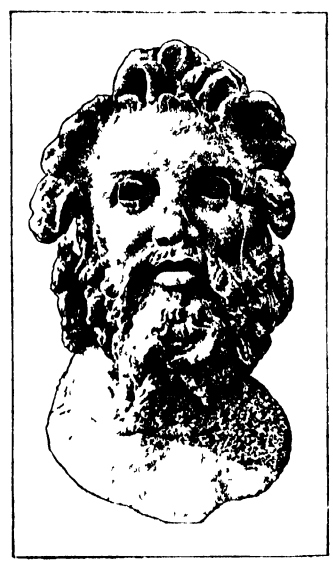


FIG 26 —THE HEAD OF THE TITAN ANYTUS, ONE OF THE COLOSSAL HEADS FOUND AT LYCOSURA

Among the original sculptural creations of the early Hellenistic age, a prominent place is claimed by the statue of Fortune, typifying the city of Antioch (Plate VII, fig 9), a work of Eutychides, a pupil of Lysippus Of this we possess a small copy, which is sufficient to show how worthy of admiration was the original We have a beautiful embodiment of the personality of the city, seated on a rock, holding ears of corn, while the river Orontes, embodied in a young male figure, springs forth at her feet

Almost the only remaining work of the early 3rd century which shows imagination is the above-mentioned statue typifying

the city of Antioch by Eutychides, a pupil of Lysippus Sculptors often worked on a colossal scale, producing such monsters as the colossal Apollo at Rhodes, the work of Chares of Lindus, which was more than 100ft. in height; but they did not show freshness or invention, and for the most part contented themselves with varying the types produced in the great schools of the 4th century. The wealthy kings of Syria, Egypt and Asia Minor formed art galleries, and were lavish in their payments; but it has often been proved in the history of art that originality cannot be produced by mere expenditure.

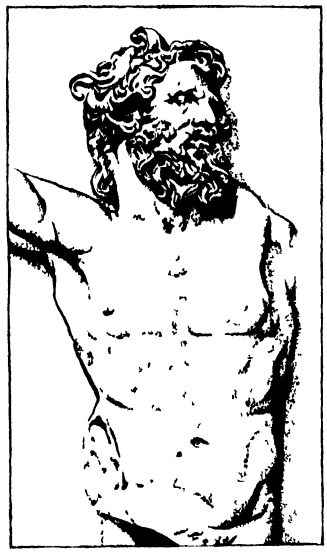


FIG 27.—GIANT FROM THE GREAT ALTAR OF PERGAMUM, SHAGGY HAIR, FIERCE EXPRESSION, AND HUGE MUSCLES PROBABLY DERIVED FROM THE GALATIANS

A great artist, whose date has been disputed, but who is now assigned to the Hellenistic age, Damophon of Messene, is known from his actual works. He set up in the shrine of the *Mistress* (Despoena) at Lycosura in Arcadia a great group of figures consisting of Despoena, Demeter, Artemis and the Titan Anytus Three colossal heads found on the spot probably belong to the three last-mentioned deities The illustration is of the head of Anytus, with wild disordered hair and turbulent expression (fig 26) Dr Dorpfeld argued, on architectural grounds, that shrine and images alike must be given to a later time than the 4th century; and this judgment is now confirmed by inscriptional and other evidence

In one important direction sculpture certainly made progress Hitherto Greek sculptors had contented themselves with studying the human body whether in rest or motion, from outside The dissection of the human body, with a consequent increase in knowledge of anatomy, became usual at Alexandria in the medical school which flourished under the Ptolemies This improved anatomical knowledge soon reacted upon the art of sculpture Works such as the Fighter of Agasias in the Louvre (Pl VII, fig 7), and in a less degree the Apoxyomenus (Pl VI, fig 2), display a remarkable internal knowledge of the human frame, such as could only come from the habit of dissection Whether this was really productive of improvement in sculpture may be doubted But it is impossible to withhold one's admiration from works which show an astonishing knowledge of the body of man down to its bony framework, and a power and mastery of execution which have never since been surpassed

With accuracy in the portrayal of men's bodies goes of necessity a more naturalistic tendency in portraiture. The art of portraiture was at a high ideal level in the Pheidian age, and even in the age of Alexander the Great, notable men were rendered rather according to the idea than the fact To a base and mechanical naturalism Greek art never at any time descended But from 300 B C onwards there is a marvellous series of portraits which may be termed rather characteristic than ideal, which are very minute in their execution, and delight in laying emphasis on the havoc wrought by time and life on the faces of noteworthy men Such are the portraits of Demosthenes, of Antisthenes, of Zeno and others, which exist in our galleries And it was no long step from these actual portraits to the invention of characteristic types to represent the great men of a past generation, such as Homer and Lycurgus, or to form generic images to represent weather-beaten fishermen or toothless old women

Altar of Pergamum.—The knowledge of the art of the later Hellenistic age is greatly indebted to the German Archaeological institute, the systematic labours of which since 1875 have resulted in recovering the remains of Pergamum, the fortress-city which was the capital of the dynasty of the Philetaeri Among the ancient buildings of Pergamum none was more ambitious in scale and striking in execution than the great altar used for sacrifices to Zeus, a monument supposed to be referred to in the phrase of the Apocalypse "where Satan's throne is." This altar, like many great sacrificial altars of later Greece, was a vast erection to which one mounted by many steps, and its outside was adorned with a frieze which represented on a gigantic scale, in the style of the 2nd century B C, the battle between the gods and the giants. This enormous frieze (*see* PERGAMUM) is now one of the treasures of Berlin, and it cannot fail to impress visitors by the size of the figures, the energy of the action, and the strong vein of sentiment which pervades the whole, giving it a certain air of modernity, though the subject is strange to the Christian world In early Greek art the giants where they oppose the gods are represented as men armed in full panoply, "in shining armour, holding long spears in their hands," to use the phrase in which Hesiod describes them But in the Pergamene frieze the giants are strange compounds, having the heads and bodies of wild and fierce barbarians, sometimes also human legs, but sometimes in the place of legs two long serpents, the heads of which take with the giants themselves a share in the battle. Sometimes also they are winged The gods appear in the forms which had been gradually made for them in the course of Greek history, but they are usually accompanied by the animals sacred to them in *cultus,* between which and the serpent-feet of the giants a weird combat goes on We can conjecture the source whence the Pergamene artist derived the shaggy hair, the fierce expressions, the huge muscles of his giants (fig 27), probably these features came originally from the Galatians, who at the time had settled in Asia Minor, and were spreading the terror of their name and the report of their savage devastations through all Asia Minor. The victory over the giants clearly stands for the victory of Greek civilization over Gallic barbarism; and this meaning is made more emphatic because the gods are obviously inferior in physical force to their opponents, indeed, a large proportion of the divine combatants are goddesses Yet everywhere the giants are overthrown, writhing in pain on the ground, or transfixed by the weapons of their opponents, everywhere the gods are victorious, yet in the victory retain much of their divine calm

The piecing together of the frieze at Berlin has been a labour of many years, it is now complete, and there is a special museum devoted to it Some of the groups have become familiar to students from photographs, especially the group which represents Zeus slaying his enemies with thunderbolts, and the group wherein Athena seizes by the hair an overthrown opponent, who is winged, while Victory runs to crown her, and beneath is seen Gaia, the earth-goddess who is the mother of the giants, rising out of the ground, and mourning over her vanquished and tortured children

Another and smaller frieze which also decorated the altar-place gives us scenes from the history of Telephus, who opposed the landing of the army of Agamemnon in Asia Minor and was overthrown by Achilles; it is quite fragmentary, but was pieced together by Dr Schneider in the *Jahrbuch* of the German Archaeological institute for 1900

Since the Renaissance Rome has produced a continual crop of works of Greek art of all periods, partly originals brought from Greece by conquering generals, partly copies, such as the group at Rome formerly known as Paetus and Arria, and the overthrown giants and barbarians which came from the elaborate trophy set up by Attalus at Athens, of which copies exist in many museums A noted work of kindred school is the group of Laocoon and his sons (Pl VII, fig 5), signed by Rhodian sculptors of the 1st century B C, which has been perhaps more discussed than any work of the Greek chisel, and served as a peg for the aesthetic theories of Lessing and Goethe. In our days the histrionic and strained character of the group is regarded as greatly diminishing its interest, in spite of the astounding skill and knowledge of the human body shown by the artists To the same school belong the late representations of Marsyas being flayed by the victorious Apollo, a somewhat repulsive subject, chosen by the artists of this age as a means for displaying their accurate knowledge of anatomy.

On what a scale some of the artists of Asia Minor would work

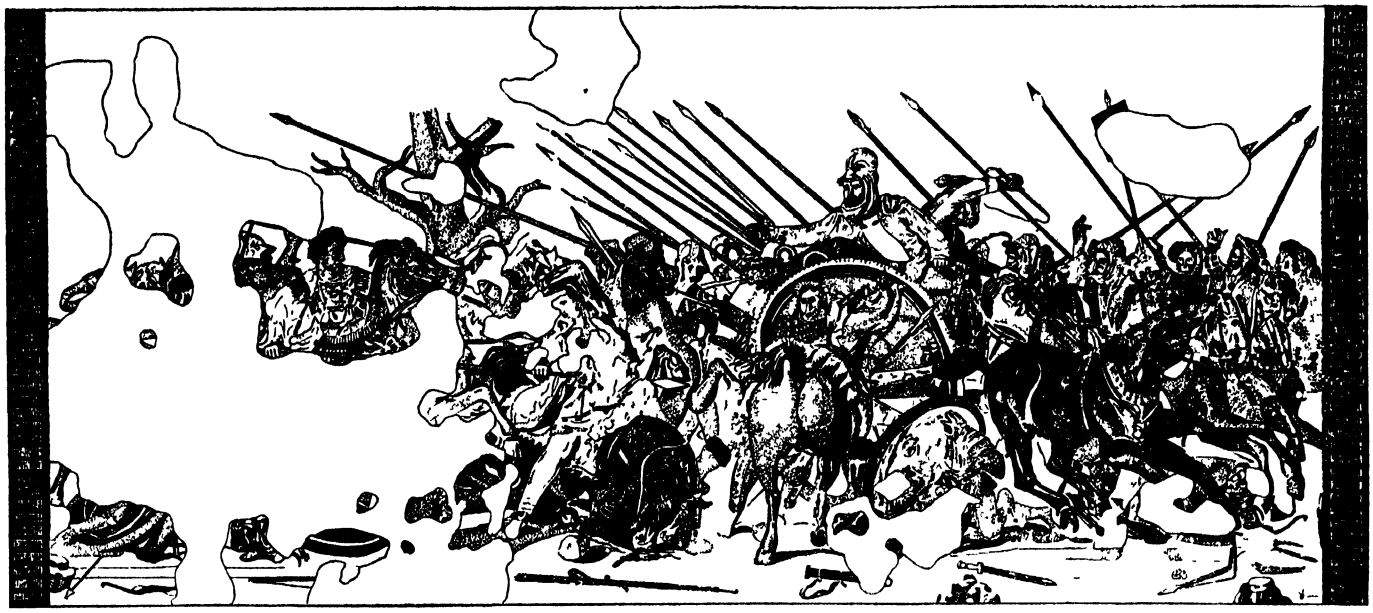


FIG 28 —BATTLE OF ISSUS AFTER THE MOSAIC IN THE NAPLES MUSEUM

is shown us by the enormous group, by Apollonius and Tauriscus of Tralles, which is called the Farnese Bull, and which represents how Dirce was tied to a wild bull by her stepsons Zethus and Amphion.

Rome.—The extensive excavations and alterations which have taken place at Rome in recent years have been very fruitful, the results may be found partly in the palace of the Conservatori on the Capitol, partly in the Museo delle Terme Among statues found in our own days none excel in interest some bronzes of large size dating from the Hellenistic age In the figure of a seated boxer (Pl VII, fig 4), in scale somewhat exceeding life, attitude and gesture are expressive Evidently the boxer has fought already, and is awaiting a further conflict His face is cut and swollen, on his hands are the terrible caestus, here made of leather, and not loaded with iron, like the caestus described by Virgil The figure is of astounding force, but though the face is brutal and the expression savage, in the sweep of the limbs there is nobility, even ideal beauty To the last the Greek artist could not set aside his admiration for physical perfection Another bronze figure of more than life-size is that of a king of the Hellenistic age standing leaning on a spear He is absolutely nude, like the athletes of Polyclitus Another large bronze presents us with a Hellenistic type of Dionysus

Beside the bronzes found in Rome we may set those retrieved from the sea on the coast of Cythera, the contents of a ship lost on the way from Greece to Rome The date of these statues has been disputed, but, even if executed in the Roman age, they go back to originals of the 5th and 4th centuries The most noteworthy among them is a beautiful athlete (Pl VI, fig 9), standing with hand upraised, which reflects the style of the Attic school of the 4th century

After 146 B C when Corinth was destroyed and Greece became one of the Roman provinces, Greek art, though by no means extinct, worked mainly in the employ of the Roman conquerors (*see* ROMAN ART)

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GREEK FIRE, the name applied to inflammable and destructive compositions used in warfare during the middle ages and particularly by the Byzantine Greeks at the sieges of Constantinople. The employment of liquid fire is represented on Assyrian bas-reliefs. At the siege of Plataea (429 BC) the Spartans attempted to burn the town by piling up against the walls wood saturated with pitch and sulphur and setting it on fire (Thuc ii 77), and at the siege of Delium (424 BC) a cauldron containing pitch, sulphur and burning charcoal, was placed against the walls and urged into flame by the aid of a bellows, the blast from which was conveyed through a hollow tree-trunk (Thuc. iv. 100). Aeneas Tacticus in the following century mentions a mixture of sulphur, pitch, charcoal, incense and tow, which was packed in wooden vessels and thrown lighted upon the decks of the enemy's ships Later, as in receipts given by Vegetius (*c* AD 350), naphtha or petroleum is added, and some nine centuries afterwards the same substances are found forming part of mixtures described in the later receipts (which probably date from the beginning of the 13th century) of the collection known as the *Liber ignium* of Marcus Graecus In subsequent receipts saltpetre and turpentine make their appearance, and the modern "carcass composition," containing sulphur, tallow, rosin, turpentine, saltpetre and crude antimony, is a representative of the same class of mixtures, which became known to the Crusaders as Greek fire but were more usually called wildfire Greek fire, properly so-called, was, however, of a somewhat different character It is said that in the reign of Constantine Pogonatus (648–685) an architect named Callinicus, who had fled from Heliopolis in Syria to Constantinople, prepared a wet fire which was thrown out from siphons (*τὸ διὰ τῶν σιφώνων ἐκφερόμενον πῦρ ὑγρόν*), and that by its aid the ships of the Saracens were set on fire at Cyzicus and their defeat assured. The art of compounding this mixture, which is also referred to as *πῦρ θαλάσσιον*, or sea fire, was jealously guarded at Constantinople, and the possession of the secret on several occasions proved of great advantage to the city The nature of the compound is somewhat obscure It has been supposed that the novelty introduced by Callinicus was saltpetre, but this view involves the difficulty that that substance was apparently not known till the 13th century, even if it were capable of accounting for the properties attributed to the wet fire Lieut.-Col. H W L Hime, after a close examination of the available evidence, concludes that what distinguished Greek fire from the other incendiaries of the period was the presence of quicklime, which was well known to give rise to a large development of heat when brought into contact with water. The mixture, then, was composed of such materials as sulphur and naphtha with quicklime, and took fire spontaneously when wetted—whence the name of wet fire or sea fire, and portions of it were "projected and at the same time ignited by applying the hose of a water engine to the breech" of the siphon, which was a wooden tube, cased with bronze A revival of the idea, if transformed in character by modern chemistry, was seen in the flame-throwers (*q v*) of the World War

See H. W. L Hime, *Gunpowder and Ammunition, their Origin and Progress* (London, 1904)

GREEK INDEPENDENCE, WAR OF, the name given to the great rising of the Greek subjects of the sultan against the Ottoman domination, which began in 1821 and ended in 1833 with the establishment of the independent kingdom of Greece The circumstances that led to the insurrection and the general diplomatic situation by which its fortunes were from time to time affected are described elsewhere (*see* GREECE. *History*, TURKEY. *History*) If we exclude the abortive invasion of the Danubian principalities by Prince Alexander Ypsilanti (March 1821), which collapsed ignominiously as soon as it was disavowed by the tsar, the theatre of the war was confined to continental Greece, the Morea and the adjacent narrow seas. Its history may, broadly speaking, be divided into three periods: the first (1821–24), during which the Greeks, aided by numerous volunteers from Europe, were successfully pitted against the sultan's forces alone; the second, from 1824, when the disciplined troops of Mehemet Ali, pasha of Egypt, turned the tide against the insurgents; the third, from the intervention of the European Powers in the autumn of 1827 to the end

When, on April 2, 1821, Archbishop Germanos, head of the *Hetaeria* in the Morea, raised the standard of the cross at Kalavryta as the signal for a general rising of the Christian population, the circumstances were highly favourable. In the Morea itself, in spite of plentiful warning, the Turks were wholly unprepared; while the bulk of the Ottoman army, under Kurshid Pasha, was engaged in the long task of reducing the intrepid Ali, pasha of Iannina (*see* ALI, Pasha of Iannina). Another factor, and that the determining one, soon came to the aid of the Greeks In warfare carried on in such a country as Greece, sea-girt and with a coast deeply indented, inland without roads and intersected with rugged mountains, victory—as Wellington was quick to observe—must rest with the side that has command of the sea This was assured to the insurgents at the outset by the revolt of the maritime communities of the Greek archipelago The Greeks of the islands had been accustomed from time immemorial to seafaring; their ships were well armed, to guard against the Barbary pirates and rovers of their own kin, lastly, they had furnished the bulk of the sailors to the Ottoman navy which, now that this recruiting ground was closed, had to be manned hastily with impressed crews of dock-labourers and peasants The Turkish fleet, "adrift in the Archipelago"—as the British seamen put it—though greatly superior in tonnage and weight of metal, could never be a match for the Greek brigs, manned as these were by trained, if not disciplined, crews

Outbreak of the Insurrection.—The war was begun by the Greeks without definite plan and without any generally recognized leadership. The force with which Germanos marched from Kalavryta against Patras was composed of peasants armed with scythes, clubs and slings, among whom the "primates" exercised a somewhat honorary authority The town itself was destroyed, but the citadel remained in the hands of the Turks till 1828. Meanwhile, in the south, leaders of another stamp had appeared. Petros, bey of the Maina (*q v*) chief of the Mavromichales, who at the head of his clan attacked Kalamata and put the Mussulman inhabitants to the sword, and Kolokotrones, a notable brigand once in the service of the Ionian government, who—fortified by a vision of the Virgin—captured Karytaena and slaughtered its infidel population Encouraged by these successes the revolt spread rapidly; within three weeks there was not a Mussulman left in the open country The flames of revolt now spread across the Isthmus of Corinth. early in April the Christians of Dervenokhoria rose, and the whole of Boeotia and Attica quickly followed suit, at the beginning of May the Mussulman inhabitants of Athens were blockaded in the Acropolis In the Morea, meanwhile, a few Mussulman fortresses still held out One by one they fell, and everywhere were repeated the same scenes of butchery The horrors culminated in the capture of Tripolitsa, the capital of the vilayet In September this was taken by storm, Kolokotrones rode in triumph to the citadel over streets carpeted with the dead, and the crowning triumph of the Cross was celebrated by a cold-blooded massacre of 2,000 prisoners of all ages and both sexes. This completed the success of the insurrection in the Morea, where only Patras, Nauplia, and one or two lesser fortresses remained to the Turks

Meanwhile, north of the Isthmus, the fortunes of war had been less one-sided In the west Khurshid's lieutenant, Omar Vrioni (a Mussulman Greek of the race of the Palaeologi), had inflicted a series of defeats on the insurgents, and relieved the Acropolis; but the rout of Mohammed Pasha, who was coming to his aid in the defile of Mount Oeta, forced him to retreat and the campaign of 1821 ended with the retirement of the Turks into Thessaly. The month of April had witnessed the revolt of the principal Greek islands, Spetsae, Psara, Hydra and Samos. Their fleets were divided into squadrons, of which one, under Tombazes, was deputed to watch for the entrance of the Ottomans into the archipelago, while the other under Andreas Miaoulis sailed to blockade Patras and watch the coasts of Epirus. At sea, as on land, the Greeks opened the campaign with hideous atrocities.

General Character of the War.—These inauspicious begin-

nings, indeed, set the whole tone of the war, which was frankly one of mutual extermination. On both sides the combatants were barbarians, without discipline or competent organization. At sea the Greeks rapidly developed into mere pirates, and even Miaoulis, for all his high character and courage, was often unable to prevent his captains from sailing home at critical moments, when pay or booty failed. On land the presence of a few educated Phanariots, such as Demetrios Ypsilanti or Alexander Mavrocordato, was powerless to inspire the rude hordes with any sense of order or of humanity in warfare; while every lull in the fighting was the signal for internecine conflicts due to the rivalry of the leaders Their cause, indeed, was helped more by the impolitic reprisals of the Turks than by the heroism of the insurgents All Europe stood aghast at the news of the execution of the Patriarch Gregorios of Constantinople (April 22, 1821) and the wholesale massacres that followed The cause of Greece was now that of Christendom, of the Catholic and Protestant West, as of the Orthodox East European Liberalism, too, gagged and fettered under Metternich's "system," recognized in the Greeks the champions of its own cause; while even conservative statesmen, schooled in the memories of ancient Hellas, saw in the struggle a fight of civilization against barbarism This latter belief, which was, moreover, flattering to their vanity, the Greek leaders were astute enough to foster; the propaganda of Adamantios Coraes (*q v*) had done its work; and wily brigands, like Odysseus of Ithaka, assuming the style and trappings of antiquity, posed as the champions of classic culture against the barbarian All Europe, then, hailed with joy the exploit of Constantine Kanaris, who on the night of June 18–19 succeeding in steering a fireship among the Turkish squadron off Scio, and burned its flagship

Expedition of Dramali, 1822.—Meanwhile Sultan Mahmud, now wide awake to the danger, had been preparing for a systematic effort to suppress the rising The threatened breach with Russia had been avoided by Metternich's influence on the tsar Alexander, the death of Ali of Iannina had set free the army of Khurshid Pasha, who was charged with the task of reducing the Morea In the spring of 1822 two Turkish armies advanced southwards one, under Omar Vrioni, along the coast of western Hellas, the other, under Ali, pasha of Drama (Dramali), through Boeotia and Attica Omar was held in check by the mud ramparts of Missolonghi; but Dramali crossed the Isthmus and with the over-confidence of a conquering barbarian advanced to the relief of the hard-pressed garrison of Nauplia He crossed the perilous defile of Dervenaki unopposed, and at the news of his approach most of the members of the Greek Government assembled at Argos fled in panic terror Demetrios Ypsilanti, however, with a few hundred men joined the Mainote Karayanni in the castle of Larissa, which crowns the acropolis of ancient Argos This held Dramali in check, and gave Kolokotrones time to collect an army The Turks, in the absence of the fleet which was to have brought them supplies, were forced to retreat (Aug 6); the Greeks, inspired with new courage, awaited them in the pass of Dervenaki, where the undisciplined Ottoman host, thrown into confusion by an avalanche of boulders hurled upon them, was annihilated In western Greece Omar Vrioni stoutly opposed and was forced to abandon the siege of Missolonghi and retire northwards

Civil War Among the Greeks.—The victorious outcome of the year's fighting had a disastrous effect upon the Greeks Their victories had been due mainly to the guerilla leaders; Mavrocordato, whose character and antecedents had marked him out as the natural head of the new Greek state, in spite of his successful defence of Missolonghi, had been discredited by failures elsewhere, and the Greeks thus learned to despise their civilized advisers and to underrate the importance of discipline The temporary removal of the common peril let loose all the sectional and personal jealousies and the year 1823 witnessed the first civil war between the Greek parties These internecine feuds might easily have proved fatal to the cause of Greece All semblance of discipline and cohesion had vanished from the Greek fleet Had Khosrev, the new Ottoman admiral, been a man of enterprise, he might have regained the command of the sea and, with it, that of the whole situation But the fate of his predecessor had filled him with a lively terror of Kanaris and his fireships; he contented himself with a cruise round the coasts of Greece. On land the Turks gained some initial successes, but in the end the harassing tactics of the guerilla bands forced them back northwards At the end of the year the Greeks were once more free to renew their internecine feuds. Just when these feuds were at their height, in the autumn of 1823, the most famous of the Philhellenes who sacrificed themselves for the cause of Greece, Lord Byron, arrived in Greece The year 1824 was destined to be a fateful one for the Greek cause The large loans raised in Europe, while providing the Greeks with the sinews of war, provided them also with fresh material for strife To the struggle for power was added a struggle for a share of this booty, and a second civil war broke out, Kolokotrones leading the attack on the forces of the Government Early in 1825 the Government was victorious and Kolokotrones was in prison

Intervention of Mehemet Ali.—A new and more terrible danger now threatened Greece Sultan Mahmud, despairing of suppressing the insurrection by his own power, had reluctantly summoned to his aid Mehemet Ali, pasha of Egypt, whose well equipped fleet and disciplined army were now thrown into the scale against the Greeks Crete, subdued a year previously, now became the base of operations against the Greeks On June 19, the Egyptian fleet, under Ibrahim Pasha, sailed from Alexandria Khosrev, too, emboldened by this new sense of support, ventured to sea, and although his attack on Samos was frustrated by Miaoulis's fireships, he succeeded in joining Ibrahim off Budrun, two indecisive engagements followed with the united Greek fleet on Aug 5 and 10 The object of Ibrahim was to reach Suda Bay with his transports, which the Greeks should at all costs have prevented A first attempt was defeated by Miaoulis on November 16, but the Greek admiral was unable to keep his fleet together, thus leaving the sea unguarded Ibrahim again set sail, and reached Suda without striking a blow Here he completed his preparations and, on February 24, 1825, landed at Modon in the Morea with a force of 4,000 regular infantry and 500 cavalry The rest followed, without the Greeks making any effort to intercept them The conditions of the war were now completely changed The Greeks, who had been squandering the money provided by the loans, affected to despise the Egyptian invaders, but they were soon undeceived Ibrahim had laid siege to Navarino, and after some delay a Greek force of some 7,000 very mixed men was sent to its relief On April 19 they were met by Ibrahim at Krommydi with 2,000 regular infantry, 400 cavalry and four guns The Greek entrenchments were stormed at the point of the bayonet by Ibrahim's fellahin at the first onset and the defenders broke and fled The news of this disaster, and of the fall of Pylos and Navarino that followed, struck terror into the Greek Government, and in answer to popular clamour Kolokotrones was taken from prison and placed at the head of the army But his guerrilla tactics were powerless against Ibrahim, who marched northward, seized Tripolitsa and made this the base from which his columns marched to devastate the country far and wide

Reshid "Kutahia" Besieges Missolonghi.—Meanwhile from the north the Ottomans were making another supreme effort The command of the army that was to operate in west Hellas had been given to Reshid "Kutahia," pasha of Iannina, an able general and a man of determined character On April 6, after bribing the Albanian clansmen to neutrality, he passed the defile of Makrynoros, which the Greeks had left undefended, and May 7 opened the second siege of Missolonghi For twelve months the population held out, repulsing the attacks of the enemy, refusing every offer of honourable capitulation This resistance was rendered possible by the Greek command of the sea, Miaoulis from time to time entering the lagoons with supplies, it came to an end when this command was lost In Sept 1825 Ibrahim, at the order of the sultan, had joined Reshid before the town, piecemeal the outlying forts and defences now fell, until the garrison staked all on a final sortie This took place on the night of April 22, 1826; but a mistaken order threw the ranks of the Greeks into disorder The Turks entered the town pell-mell with the retreating crowd

Karaiskakis.—The fall of Missolonghi, followed as this was by the submission of many of the more notable chiefs, left Reshid free to turn his attention to east Hellas, where Gouras had been ruling as a practically independent chief and in the spirit of a brigand The peasants of the open country welcomed the Turks as deliverers and Reshid's conciliatory policy facilitated his march to Athens, which fell at the first assault on Aug. 25, siege being at once laid to the Acropolis, where Gouras and his troops had taken refuge Round this the war now centered; for all recognized that its fall would involve that of the cause of Greece In these straits the Greek Government entrusted the supreme command of the troops to Karaiskakis, an old retainer of Ali of Iannina, a master of the art of guerilla war, and, above all, a man of dauntless courage and devoted patriotism A first attempt to relieve the Acropolis, with the assistance of some disciplined troops under the French Col Fabvier, was defeated at Chaidari by the Turks The garrison of the Acropolis was hard pressed and the death of Gouras (October 13) would have ended all, had not his heroic wife taken over the command and inspired the defenders with new courage For months the siege dragged on, while Karaiskakis fought with varying success in the mountains, a final victory at Distomo (February 1827) over Omar Vrioni securing the restoration to the Greek cause of all continental Greece, except the towns which were actually held by the Turks

Cochrane and Church.—It was at this juncture that the Greek Government, reinforced by a fresh loan from Europe, handed over the chief command at sea to Lord Cochrane (earl of Dundonald) and that of the land forces to General Church, both Miaoulis and Karaiskakis consenting to serve under them Cochrane and Church at once concentrated their energies on the task of relieving the Acropolis Already, on February 5, Gen Gordon had landed and entrenched himself on the hill of Munychia, near the ancient Piraeus When Church and Cochrane arrived, a general assault on the Ottoman camp was decided on This was preceded, on April 25, by an attack, headed by Cochrane, on the Turkish troops established near the monastery of St Spiridion, the result of which was to establish communication between the Greeks at Munychia and Phalerum The monastery held out for two days longer, when the Albanian garrison surrendered on terms, but were massacred by the Greeks as they were marching away under escort For this miserable crime Church has, by some historians, been held responsible by default, it is clear, however, from his own account that no blame rests upon him (*see* his MS *Narrative,* vol 1 chap 11 p 34) The assault on the Turkish main camp was fixed for May 4, but, unfortunately, a chance skirmish brought on an engagement the day before, in the course of which Karaiskakis was killed, an irreparable loss in view of his prestige with the wild *armatoli* The assault on the following day was a disastrous failure The Greeks, advancing prematurely over broken ground and in no sort of order, were fallen upon in flank by Reshid's horsemen and fled in panic Church held Munychia till the 27th, when he sent instructions for the garrison of the Acropolis to surrender On June 5 the remnant of the defenders marched out with the honours of war, and continental Greece was once more in the power of the Turks Had Reshid at once advanced over the Isthmus, the Morea also must have been subdued, but he was jealous of Ibrahim and preferred to return to Iannina to consolidate his conquests

Renewed Anarchy.—The fate of Greece was now in the hands of the Powers, who after years of diplomatic wrangling had at last realized that intervention was necessary if Greece was to be saved for European civilization The worst enemy of the Greeks was their own incurable spirit of faction, and a third civil war had only been prevented by the arrival of Cochrane and Church Under their influence a new National Assembly met at Troezene in March 1827 and elected as president Count Capo d' Istria (*q v*), formerly Russian minister for foreign affairs; at the same time a new constitution was promulgated which, when the very life of the insurrection seemed on the point of flickering out, set forth the full ideal of Pan-Hellenic dreams Anarchy followed, war of Rumeliotes against Moreotes, of chief against chief; rival factions bombarded each other from the two forts at Nauplia over the stricken town, and in derision of the impotent government. Finally, after months of inaction, Ibrahim began once more his systematic devastation of the country. To put a stop to this the Powers decided to intervene by means of a joint demonstration of their fleets, in order to enforce an armistice and compel Ibrahim to evacuate the Morea (Treaty of London, July 6, 1827) The refusal of Ibrahim to obey, without special instruction from the sultan, led to the entrance of the allied British, French and Russian fleet into the harbour of Navarino and the battle of October 20, 1827 (*see* NAVARINO) This, and the two campaigns of the Russo-Turkish War of 1828–29, decided the issue

BIBLIOGRAPHY —There is no trustworthy history of the war, based on all the material now available, and all the existing works must be read with caution, especially those by eye-witnesses, who were too often prejudiced or the dupes of the Greek factions The best-known works are G Finlay, *Hist of the Greek Revolution* (2 vols, London, 1861), T. Gordon, *Hist. of the Greek Revolution* (London, 1833); C. W P Mendelssohn-Bartholdy, *Geschichte Griechenlands,* etc. (*Staatengeschichte der neuesten Zeit*) (2 vols, Leipzig, 1870–74), F. C H L Pouqueville, *Histoire de la régénération de la Grèce,* etc. (4 vols, Paris, 1824),—the author was French resident at the court of Ali of Iannina and afterwards consul at Patras, Count A Prokesch-Osten, *Geschichte des Abfalls der Griechen vom turkischen Reich,* etc (6 vols, Vienna, 1867), the last four volumes consisting of *pièces justificatives* of much value *See* also W Alison Phillips, *The War of Greek Independence* (London and New York, 1897), a sketch compiled mainly from the above-mentioned works Of great value also are the 29 volumes of Correspondence and Papers of Sir Richard Church, now in the British Museum (Add mss 36,543–36,571) For further references *see* the bibliography appended to W Alison Phillips's chapter on "Greece and the Balkan Peninsula" in the *Cambridge Modern History,* x 803 (W A P)

GREEK LANGUAGE. This term is commonly applied to the tongues of both ancient and modern Greece These, however, differ so much that it is necessary to deal with them in separate sections

Of both the alphabet is as follows

Name	Sign	Conventional equivalent	Name	Sign	Conventional equivalent
Alpha	Α α	A	Nu	Ν ν	N
Beta	Β β	B	Xi	Ξ ξ	X
Gamma	Γ γ	G	Omicron	Ο ο	short O
Delta	Δ δ	D	Pi	Π π	P
Epsilon	Ε ε	Short E	Rho	Ρ ρ	R
Zēta	Ζ ζ	Z (DZ)	Sigma	Σ(C) σς	S
Ēta	Η η	long E	Tau	Τ τ	T
Thēta	Θ θ	TH	Upsilon	Υ υ	U
Iōta	Ι ι	I	Phi	Φ φ	PH
Kappa	Κ κ	K	Chi	Χ χ	CH
Lambda	Λ λ	L	Psi	Ψ ψ	PS
Mu	Μ μ	M	Oměga	Ω ω	long O

ANCIENT

Greek, one of the Indo-European languages, was spoken in one or other of its forms (dialects) in the Balkan peninsula, on the west coast of Asia Minor, in south Italy and Sicily, and in the islands of the Ionian and Aegean seas By the fourth century B C the political supremacy of Athens and the greatness of Attic literature had caused the Attic dialect to become the basis of a *lingua franca* for all Greeks, which in the long run superseded the other dialects The conquests of Alexander the Great caused Greek (in the form of this *lingua franca* or *κοινη* to become the speech of the whole Near East (Asia Minor, Syria, Mesopotamia, Egypt). Under the Romans these regions continued to use Greek, and at the present day Russians and Serbians use a modified form of the Greek alphabet.

Authenticity of Our Texts.—Documents written in Greek have reached us, some in the originals, others in copies The *originals* are. (a) inscriptions, decrees, treaties, temple inventories, dedications, etc , engraved on stone and found in Greece and all over the Near East, the earliest may date from the eighth century B C and they become numerous in the fifth and later

centuries; (b) documents (letters, contracts, petitions, accounts, etc) written on papyrus between the late fourth century B.C. and the eighth century A.D , and preserved by the dry sands of Egypt, from which the excavations, mainly of the end of the 19th and beginning of the 20th century, have brought them to light in large numbers (*see* PAPYROLOGY). Papyri have not been recovered from other parts of the Greek-speaking world (except at Herculaneum, where they were buried by the eruption of Vesuvius in A D 79), but legal documents written on vellum in the second and first centuries B C have been found at Sâlihîyeh (the ancient Dura-Europos, in Mesopotamia), and at Avroman (Parthia)

The *copies*, on which we rely for our knowledge of almost all Greek literary works, are written at first on papyrus, and later on vellum or paper For long the oldest known Greek mss were those containing the Greek Bible, written on vellum and dating from the 4th and 5th centuries A D , and the texts of other Greek works rested on vellum (later paper) mss which were (in general) not older than the 9th and 10th centuries A D These remain the broadest basis of our knowledge, but recent excavations have brought to light papyrus mss , some mere scraps, others very substantial rolls or books, of Homer and other classical texts, a few of them written in the 3rd, 2nd and 1st centuries B C , and many of them in the earliest centuries of the Christian era In a number of cases we have recovered papyrus copies of works which had perished, no copies having reached us in mediaeval mss (*see* GREEK LITERATURE)

Important accessions to our knowledge of the language, its pronunciation, spelling and vocabulary, have resulted from the recovery of so many well-authenticated texts So long as the mediaeval copies were the only source of our knowledge it was impossible to have much confidence in the spelling which they offered, and certain variations which they exhibited, *e g* the variation between ει and ι (τειμή-τιμή, ἀποτεῖσαι-ἀποτῖσαι, etc) presented a little understood problem Moreover, the grammatical treatises of Herodian (2nd century A D), Choeroboscus (6th century A D) and others, show that these problems presented themselves already in the early centuries of the Christian era, these grammarians drew up lists of words recommending particular spellings in doubtful cases It remained doubtful, however, how far the grammarians could be regarded as knowing the truth or as providing a trustworthy criterion for the correction of the mss

The inscriptions and papyri often provide evidence which settles once and for all a disputed question of spelling They often carry us back to a time when speech-sounds which later became identical were still distinct from one another For instance, the inscriptions and papyri of any date earlier than about 150 B C are almost wholly free from the hesitation between ει and ι They have ει without exception in certain words (*e g* ἀποτεῖσαι "to pay") and ι without exception in certain others (*e g* , τιμή) Before 150 B C (approximately) the two spellings represented distinct sounds, after 150 B C the sounds were identical, and the spellings ει and ι were interchangeable Again the Greek of the 3rd century B C possessed the long diphthongs αι ηι ωι (the spelling ᾳ ῃ ῳ is not older than the 12th century A D) From the end of the 2nd century B C they are written α η ω without the iota The uniformity with which this happens, and the appearance of the iota in the wrong place (spellings like ἄνωι for ἄνω are frequent) shows that the iota, which must have been pronounced in the 3rd century B C , had ceased to be pronounced in the 1st century B C , and was sometimes added in writing by persons who thought (rightly or wrongly) that they knew the older spelling. At least one erroneous restoration of iota has been perpetuated. Where our mediaeval mss. (even the most accurate of them) and late inscriptions give us ῥαιθυμεῖν, the papyri of the 3rd century B C have ῥαθυμεῖν (without iota), which must be the original and only correct spelling Unlike ῥᾴδιος, the word can never have been pronounced with an iota Many of the inscriptions and still more of the papyri are written by persons of little education, whose spelling tends to be phonetic, their very errors throw light on the pronunciation One instance must suffice: the word ἑαυτοῦ in inscriptions and papyri of the 1st century B C. is often written ἑατοῦ, whereas αὐτοῦ is not written ἀτοῦ. The reason is that ἑαυτοῦ was pronounced at first ἑᾱυτοῦ (being derived by contraction from ἑ͡ο αὐτοῦ like the Ionic ἑ͡ωυτοῦ which has a different type of contraction) later ἑᾱτοῦ By the study of such spelling-variations the chief changes in the pronunciation of Greek can be dated with considerable accuracy. Many of the changes which mark the passage from ancient to modern Greek took place in the three or four centuries preceding and the three or four centuries following the Christian era. The language of the period (2nd century A D) in which Herodian spoke and wrote was already so different from Attic that his spelling-rules must be assumed to be based not on observation of contemporary pronunciation (it was in fact the divergence between this and the traditional spelling which made spelling-rules a necessity) but on antiquarian research, and in this field the modern investigator has the advantage over him

Nature of the Tradition of the Accents.—Greek texts, whether on stone, papyrus, vellum or paper, are usually written without spaces between the words, and the continuous use of breathings and accents is found only in mediaeval mss from the 9th century onwards Inscriptions (with rare exceptions) and non-literary papyri are entirely without breathings and accents The same is often true of literary papyri, but these are sometimes more or less sporadically marked with breathings and accents, especially if epic, dramatic or lyric texts The accentuated literary papyri are in the main not older than the opening centuries of our era On the other hand, the features of pronunciation of which breathings and accents are the written signs are more ancient than the use of the signs From numerous references in Greek authors, and especially from Apollonius Dyscolus and his son Herodian, who wrote in the 2nd century A D , we learn many details of the accentuation of Greek, which was a variation of pitch, the syllable marked with the acute accent was high-pitched, the others, those which in the printed books are marked with the grave accent or with no mark at all, were spoken on the low pitch, while circumflexed syllables, were spoken on a descending pitch, the first part of the syllable being higher than the second Such is the most probable inference from the statements of grammarians and certain other evidence (*e g* the marks found in accented papyri, and the scanty remains of Greek music), though several points are still disputed

The general accuracy, and at the same time the great antiquity, of the traditional accentuation of Greek in modern printed editions may be proved by means of a comparison between it and the accentuation of Vedic Sanskrit, the two exhibit a number of striking coincidences which point to an unbroken oral tradition in both cases from the hypothetical parent "Indo-European" In 1876 Karl Verner demonstrated that certain consonant changes in Germanic could be explained if the position of the accent thus observed in Greek and Sanskrit were admitted to have existed at one time in Germanic also The antiquity of the distinction between the acute and the circumflex has been demonstrated by a comparison with the accentuation of modern Lithuanian, in which a corresponding distinction has been observed

The breathings and accentual marks found in our text of a classical author, such as Plato, cannot have been copied, even at many removes, from his autograph Plato cannot have written more than the bare series of letters forming the words It is, however, clear that he pronounced an *h* or a high pitch even when he did not put it down in writing, and that those who, in transmitting his text to us, inserted the breathings and accentual marks (in the main Byzantine scholars of the 9th century) were guided by contemporary living speech (the position of the accent is in general still the same in Modern Greek), and by antiquarian knowledge to a very large measure of success

Varieties of Early Greek.—The language of the inscriptions from the 7th to the 4th century B C presents varieties of two kinds, varieties of alphabet and spelling, and varieties of dialect

(1) Varieties of alphabet and spelling The Greek alphabet is an adaptation of the Semitic alphabet, and differs according

to locality and date One of these differences throws much light on the language, viz., the varying mode of representing ε sounds and ο sounds.

The contraction of ε+ε (ĕ+ĕ) must obviously have resulted, to begin with, in a long ē, and similarly the contraction of ο+ο must have given ō. Hence ει in the 4th century Attic (and later Greek) form ἑπεστάτει (from ἑπεστάτε-ε) must have been pronounced from the beginning not as a diphthong, but as a long ē, and similarly the ου of μισθοῦμεν (from μισθόομεν) must have been from the first pronounced ō, not as a diphthong ου. In the oldest inscriptions these sounds are in fact written ε and ο (*επεστατε, μισθομεν*) When ει and ου are thus demonstrably monophthongs, they are called "spurious diphthongs."

In the local Attic and many other alphabets there was no vowel-symbol η (H), and no ω (Ω) In such alphabets E had to represent three sounds, viz , ε (as in *φέρω*), ē (as in ἑπεστατε) and the other kind of ē which was written η when that letter was introduced (*ανεθεκε*, later *ανεθηκε*) Similarly ο had to represent ο (in *φερομεν*), ō (in *μισθομεν*) and the other ō which was later written ω (*δορον* later *δῶρον*).

But ει and ου are not always spurious diphthongs In *εἶμι* ("I shall go") the ει is, in origin at least, a diphthong (Lith. *einù*, "I go," Lat *eo* from *ei-o* through *e[y]-o, i-tur* from *ei-tur;* Gr. *ἴμεν* shows the *ι*-element bereft of the *e*) In *εἰλήλουθα* the υ is the same as in *ἦλυθον*, so that ου is here in origin a genuine diphthong In early inscriptions, ει and ου are in certain words fixed and not capable of alternating with ε and ο Thus *εἶπε, δοκεῖ* (from *δοκέ-ει*), *πρεσβεία, πειθομένοις, ἔπει* (Dat. of *ἔπος*), *ἐπεί* ("when"), *εἰ, ἀτέλεια, οὐκ, οὐδένος*, are constant spellings, of course without accents even in an inscription (Dittenberger, *Sylloge*[3] 64) which has only ε and ο in place of the later "spurious diphthongs" (*ἔναι, τρῆς, τῶ δέμο, τῶ Διός, τῶ 'Ολυμπίο, οἰκῶντες*, etc.). Thus the early inscriptions sometimes yield information attainable in no other way, *e g* they tell us that *οὐκ, οὗτος, εἶπε* and *φέρεις φέρει* have genuine diphthongs

The spurious diphthongs sometimes owe their origin to what is known as "compensatory lengthening" Just as the long ā in *πᾶς* arises from a lengthening of the ă in *πάνς (from *παντ-s cf.* Genitive *παντ-ός*) to compensate for the loss of the *ν*, so the nominative **τιθέντ-s* became **τιθέης* and then *τιθῆς*, which is written *τιθες* on the older inscriptions, *τιθεῖς* in later Attic, and *τιθῆς* in some other dialects

At the end of the 5th century B C the local Ionic alphabet, which possessed the vowel signs η and ω in addition to ε and ο, began to supersede the other Greek alphabets. It was officially adopted at Athens in place of the Attic alphabet in 403 B.C , and by the end of the 4th century it was in general use throughout Greece.

The ē and ō which resulted from contraction and compensatory lengthening were not everywhere written in the same way in the 4th century B C. In some dialects we find not *τελεῖτε, τιθεῖς, διδούς*, but *τελῆτε, τιθῆς, διδῶς*. Within the Doric area both spellings are found (*e g.* in some places *ἦμεν*, in others *εἶμεν*, from *es-men*, infinitive of the verb "to be"). The difference is perhaps one not of pronunciation, but only of spelling

The distinction between genuine and spurious diphthongs shows itself even after general adoption of the Ionic alphabet in the case of contractions with a preceding vowel, *e g δράεις δράει*, which have the genuine ει, become *δρᾶις δρᾶι* (*δρᾷς δρᾷ* in mediaeval mss.), but *δράειν*, which has the spurious ει, becomes *δρᾶν*. Similarly in *οὐκέθ' ὁμῶς τιμῆς ἔσεαι* (Il 9, 605), *τιμῆς* is the contracted form of *τιμήεις*, which has the spurious ει (*τιμη-[ϝ]εις* from *-ϝεντ-s cf.* gen. *-εντ-ος*, Sanskrit *-vant-*) In Il 3, 13, where the mss. have *κονίσαλος ὤρνυτ' ἀελλὴς*, Buttmann's conjecture, that the last word is a contraction of *ἀελλήεις* "eddying," involves only a change of accent (to *ἀελλῆς*): it would be a mistake to write, as he proposed, *ἀελλῆς*.

The study of the ancient Greek language is based on written documents and the textual critic seeks to restore and interpret the actual letters of the autograph, in cases where this autograph has not reached us.

The mediaeval mss offer texts written in the Ionic alphabet, and in a spelling which, at its most accurate, is that of the 3rd century B.C., but more often shows signs of the passing of the centuries between that date and the 9th and 10th centuries A.D. The spelling of the 3rd century B.C. is clearly not appropriate to authors who wrote in the 5th century B.C (especially the beginning of it), or earlier, in the case of Homer the composition of the poems was earlier than the knowledge of writing in Greece.

Many of the great Athenians (Sophocles, Euripides, Aristophanes, Thucydides) wrote in the second half of the 5th century. They may well have used the Ionic alphabet, which inscriptions prove to have been used at Athens some decades before 403 B.C. Aeschylus, who wrote in the first half of the 5th century, is more likely to have used the Attic alphabet, employed in fragments of the earlier lyrics which are painted on Attic vases of the 6th and 5th centuries The old spellings may well have survived longest in the case of the oldest books (Homer, Hesiod, Theognis, Alcman, etc.).

The study of the Homeric poems from this point of view has led to tangible results In the older alphabets of Greece, ε and ο, as already mentioned, can stand for ē and ō ("spurious" ει and ου), and a single consonant is written where the later practice is to write it double (*ἀλογλωσος* = *ἀλλογλώσσους*). Both features are to be seen in *τειχιοσης* (= *Τειχιούσσης*) in a Milesian inscription of the 6th century B C. In the line *καιροσέων δ'ὀθονέων ἀπολείβεται ὑγρὸν ἔλαιον* (Od 7 107) *καιροσέων* is the archaic spelling of *καιρουσσέων*, a word which was so rare that the rhapsodes of the 6th century did not understand what they found in their written texts of Homer In this way the spelling escaped modernization. The word *ἀνηρείψαντο* which is given by our mss. of Il 20, 234 is a mistake for *ἀνηρέψαντο* as we now know from the forms *ἀ[να]ρέψατο* in a Paean of Pindar and *ἀναρεψαμένη* in mss of Hesiod (Theog 990) In Il 7, 434 *ἔγρετο* means "gathered, assembled," and is the archaic spelling of the aor. of *ἀγείρω* (later written *ἤγρετο*). It was mistaken for the aor of *ἐγείρω* (*ἔγρετο* "arose") and to this mistake it owes its preservation In Il 5, 293: *αἰχμὴ δ' ἐξελύθη* ("came out") *παρὰ νείατον ἀνθερεῶνα* the poet clearly meant *ἐξέλυθε*, the unaugmented form corresponding to the augmented *ἐξήλυθε*, because it resembled the aorist passive of *ἐκλύω* and because the metre demanded a long vowel in the last place, it became *ἐξελύθη*

The two instances just given (*ἔγρετο, ἐξελύθη*) show us a Homer written in an alphabet which possessed no H, but used E instead

Certain other indications point to a time when the poems existed only in oral transmission and had not yet been written down Bentley showed that many irregularities in the metre vanished when once it was admitted that at the time of the composition of the poems the language possessed the sound *w* (written *ϝ* in dialect-inscriptions, but nowhere written in our mss of Homer).

The traces of this sound consist of lengthenings of a preceding vowel (*e g.*, *κᾱλός* is really *καλϝός*—this form occurs in a Boeotian inscription of the 7th century B.C.), and of cases of hiatus (*e g.*, *ὅπα ἀρνῶν* Il 4, 435—the dialect inscriptions have *ϝαρήν, ϝαρνός*).

Bentley's observations were true, but more recently it has been recognized that some lines in the poems may have been composed when the *w*-sound was already lost from the language It is probable that the composing of the poems extended over a long period, within which the *w* ceased to be pronounced

In Il. 24, 154 *ὃς ἄξει* is defective both metrically and in point of sense, the parallel *ὅς σ' ἄξει* (line 183) shows that the poet meant in 154 *ὅς ϝἑ' ἄξει*, where *ϝἑ* is the older form of the Attic *ἑ* (Doric *ϝε* and Pamphylian *ϝἑ* are found in inscriptions). Such cases (there are several of them) bring out clearly the reality of the sound *w* in Homer. In a number of other respects the spelling which we find in our mss. of Homer can be shown to be unoriginal. The first person plur. subj of *ἔστην* is written *στείομεν* (Il. 15, 297), instead of *στήομεν* as the analysis requires (the root is *στᾱ, cf.* Lat. *stāre*, which gives Ionic *στη-*, and the sign of the subjunctive in unthematic verbs is a short *-o-* or *-ε-*). The later Ionic form *στέωμεν* (which arose by a regular

change of -ηο- to -εω- *cf.* βασιλῆος: βασιλέως) occurs in Il. 11 348. The reciters found στεομεν in their written texts of Il. 15. 297, and lengthened the ε to ε̄ (which they wrote ει, as we have seen), because, as the living form was στέωμεν, it did not occur to them that στεομεν was the old way of writing στήομεν. The group -ηο- thus came to be written -ειο- in many other words as well.

The word εἰνάτερες was believed by Herodian to be the plural of εἰνάτηρ. Inscriptions have proved however that the nominative sing was ἐνάτηρ, and εἰνάτερες is the poet's arbitrary way of modifying the word ἐνάτερες in order to fit it into a hexameter. Here again, the lengthening of ε is expressed by the spurious diphthong, the introduction of which into the text can hardly be much older than the 4th century B C Other examples of ει and ου resulting from metrical lengthening are εἰν ἀγορῇ, Πειρίθοος, δουλιχόδειρος (for δολυχόδερϝος) οὐλόμενος, Οὐλύμποιο, and many others. The numerous forms of which ὁρόωντες, ὁράασθαι are specimens, in which the older ᾰ̈ο, ᾰ̈ε seem to have become οω and αᾱ, have no parallel in dialect inscriptions. The poets (whether in writing or in oral composition) must have used the forms ὁράοντες, ὁράεσθαι. In the course of the transmission the later contracted forms ὁρῶντες, ὁρᾶσθαι tended to be substituted, but the metre compelled the reciters to "pull out" the contracted forms into ὁρόωντες and ὁράασθαι, by prefixing in each case to the long vowel (which resulted from the contraction) its short form (ο, α). Forms, such as ναιετάει, which did not survive (there was no ναιετᾷ in later Greek), were not exposed to this modernizing tendency, and were left untouched.

Distinct from differences of alphabet and spelling are differences between the spoken forms of the language in different places, *i e.*, differences of dialect Our knowledge of the dialects is derived mainly from inscriptions of the 6th, 5th, 4th and 3rd centuries B C.; from the time of the Athenian supremacy the Attic dialect begins to supersede the others, so that many documents show a mixture of non-Attic and Attic elements. In later centuries there were revivals of the use of dialects in inscriptions, but their artificial character is proved by the presence in them of forms which earlier inscriptions show to have been long obsolete, *e g* ῥαψάϝυδος (=ῥαψῳδός) in a late Boeotian inscription, whereas earlier Boeotian inscriptions indicate that ϝ between vowels had long been lost The literary documents written in dialect are often of larger compass than the inscriptions, and therefore in some ways more instructive, especially for the vocabulary, but the variations in the manuscript tradition (*e g*, of Hippocrates and Herodotus) constitute a difficulty which only the inscriptions can help us to overcome The inscriptions have in fact enabled us to pick our way with greater certainty among the variants, and to detect (for instance) the fact that the consistent absence of the so-called ν ἐφελκυστικόν from our mss of Herodotus is not a feature of the Ionic dialect, but is the result of unintelligent editing by some unknown ancient critic, the Ionic inscriptions have this ν in even greater profusion than the Attic (Ion. ἐποίειν where Att has ἐποίει)

The main dialect divisions are. (1) Ionic, of which Attic is a sub-dialect, (2) Aeolic, (3) Arcadian and Cyprian, (4) Doric In the 6th and 5th centuries B C the local distribution was as follows: Ionic was spoken in the central part of the coast of Asia Minor, in many of the Aegean islands, in Euboea and the Chalcidian peninsula, and (in its Attic form) in Attica Aeolic is the collective name of the dialects spoken in the northern part of the Asiatic coast (Aeolis) including Lesbos, and (with a Doric admixture) in Thessaly and Boeotia Arcadian and Cyprian are named from the places in which they were spoken, the recognition of their close resemblance in spite of the great distance between them was one of the surprises which resulted from the discovery of Arcadian and Cyprian inscriptions and of the deciphering of the Cyprian syllabary in the '70s and '80s of the 19th century. Lastly Doric in many varieties was spoken in the Peloponnese (except Arcadia) in north-west Greece (Locris, Phocis, Epirus) in the more southerly Aegean islands, especially Thera, Crete, Cos, Rhodes, and on the neighbouring part of the Asiatic coast

Colonists took with them the dialect of the mother-city; we find Ionic spoken in several Milesian settlements on the Black sea coast, and Doric in Syracuse and other Doric foundations in Sicily and south Italy.

Such, in outline, is the geographical distribution of the Greek dialects at the period when they become known to us For an earlier period we have to rely mainly on the evidence of Greek historians (especially Herodotus and Thucydides) From them we learn that there was in early times a migration from Epirus into the Aeolic land of Thessaly, which drove before it another migration from Thessaly into Boeotia At the time of the Trojan War, according to Thucydides, the later Boeotians were not yet in Boeotia. From Herodotus, Strabo and Pausanias, we learn of the former presence of Ionians in Cynuria, and on the shores of the Saronic gulf The resemblance between the land-enclosed Arcadian dialect and the distant Cyprian is less surprising when we find that Arcadian was at one time spoken as far south as the promontory of Taenarum This is proved by the name of the festival to Poseidon which was celebrated there, viz, Ποϝοιδαια. The dialect of Taenarum in historical times was Laconian (Doric), in which σ between vowels had become *h*. Accordingly Ποϝοιδαια is the Laconized form of Ποσοιδαια, and an Arcadian inscription proves that Ποσοιδαν was the Arcadian name of the god It may be inferred that Arcadian was once spoken throughout the Peloponnese and perhaps over a still wider area, before it was overwhelmed and shut in by the Dorian migration.

Greek and the Other Indo-European Languages.—The dialects show considerable differences from one another in respect of sounds, inflexions, syntax and vocabulary, and the comparison of the dialects with one another often throws light on the past, enabling us to reconstruct an earlier condition of the Greek language In this reconstruction use is made at the same time of a comparison with the other Indo-European languages In what follows an attempt will be made to indicate briefly some of the more important sound-changes to which Greek owes its differences from the other languages

Of the consonants which the parent speech had, Greek has lost inter-vocalic *y* and *s*, Sanskrit *tráyas* "three" and Greek (Cretan) τρέες are both descended from Indo-Eur *trĕyĕs;* Sanskrit *tras-ati* "trembles" and Greek τρέ-ω come from *tres-* At the beginning of a word both *y* and *s* became *h:* ὅς (rel. pron) corresponds to Sanskrit *yas* (Indo-Eur *yos*), and the article ὁ to Sanskrit *sa* (Indo-Eur *so*) Sometimes *y* became ζ (Sanskrit *yugâm*, Gr ζυγόν) The earliest records of many dialects show a complete loss of the sound *w* (*e g*, ὄις [*oĭs*] from Indo-Eur *owis*, *cf.* Lat *ovis*) but other dialects retain this sound (which is written ϝ [digamma]), *e g*, ὄϝις (accus. plur) is found in an Argive inscription of the 5th century B C.

The loss of these three sounds often left two vowels standing next one another in a word, this was at first tolerated, but later led to contraction into a single vowel These contractions occurred in the main after the composition of the Homeric poems, and the method of contraction differs in different dialects Hence forms like ναιετάει in Homer, and the contrast between (*e g*) Att τιμῶ, τιμᾷ and Dor. τιμῶ, τιμῇ or between Att. φιλῶ and Ion. φιλέω

In combination with liquids and nasals *y*, *s* and *w* often caused a lengthening of the preceding vowel before disappearing, ἔτεινα (pronounce ἔτ-ε̄να) arose from ἐ-τεν-s-α, τείνω (pron τῆνω) from τεν-γω, Ion. ξεῖνος (pron ξῆνος) from ξένϝος (πρόξενϝος occurs in an inscription) Here too, the dialects diverge, the details are too complex to be enumerated here

A *y* following a guttural, dental or labial stop combined with it into a single sound: φυλακ-γω became φυλάσσω, μεθ-yος (*cf* Lat *medius*, Sanskrit *madhyas*) became μέσσος and then μέσος, μεγ-γων became μέζων (Ion.), χαλεπ-γω became χαλέπτω.

A nasal before σ (which generally arose, as in μέσος, from a dental +*y*, sometimes from a dental +*s*) disappeared in most dialects (*e.g*, Att. πᾶσα from πάνσα, τιθεῖσα from τιθένσα) leaving behind it a lengthened vowel Some dialects, however,

retained the *-νσ-* combination (Arc. *πάνσα*).

When the numerous long vowels which arose from contraction and from compensatory lengthening are left out of account, the remainder of the Greek vowels are found to be, in the main, survivals from the parent speech: *e.g.*, *μάτηρ* (Dor etc.), Lat. *māter*, *δῶρον*, Lat. *dō-num*, *(ϝ)ἰς*, Lat. *vīs*; *μῦς*, Lat. *mūs*; *πλῆ-το*, Lat *plē-nus*; *ἄγω*, Lat *ago*; *ὄ(ϝ)ις*, Lat. *ovis*; *φέρω*, Lat *fero*; sometimes when most of the languages agree in *ă* (*πατήρ*, *pater*, etc.) Sanskrit has *ĭ* (*pitar-*); in such cases the parent-form is believed to have had an indistinct vowel like the first *o* in *potato*.

Indo-Eur. *t*, *p*, *d*, *b* have survived unchanged in Greek (some instances will be found among the words already quoted). Sanskrit has the sounds *dh*, *bh*; these go back to Indo-Eur *dh*, *bh*, which have yielded Greek *θ*, *φ* (pronounced like *t*, *p*, in the Irish pronunciation of English), *e.g.*, Sanskrit *bhar-*, Lat *fero*, Greek *φέρω*, Sanskrit *dadhāmi*, Lith *dē-ti* (infin. "to lay"), Greek *τίθημι*.

The Indo-Eur. gutturals are of two kinds, technically called palatals and labio-velars.

The palatals appear in Greek as *κ*, *γ*, *χ*, in Latin as *c*, *g*, *h*, and as gutturals in Celtic and Germanic: *e.g.*, *κύων*, Lat *canis*, *ἄγω*, Lat *ago*; *χιών*, Lat. *hiems*. In the Eastern group of Indo-Eur. languages (Indo-Iranian, Armenian, Slavonic and Baltic) they appear as sibilants, *e.g.*, Sanskrit *śvā* (stem *śun*) "dog," *ajati* "he drives," *himás* "frost, snow," Lith *šun-* "dog," *žiemà* and Slav. *zima* "winter."

The labio-velars were sounds of the *qu* or *kʷ* type. They survive more or less clearly in Latin *quis*, *ni-n-guit*. In some languages they drop the *u* or *w* element, and become *k*, *g* and *gh* (so in Sanskrit). Sometimes they appear as *p*, *b*; *e.g.*, Oscan *pis* corresponding to Latin *quis*, Old Irish *ben* "woman" corresponding to English *queen*. In the Greek dialects they tend to appear before *a* and *o* vowels as labials (*π*, *β*, *φ*) *e.g.*, *ποινή*, Avestan *kaēna* "punishment," Lith *kaina* "price" (all from Indo-Eur *kʷoinā*), *-βόρος*, Lat *-vorus*, Sankr. *-garás* "swallowing"; *φόνος*, Sanskrit *ghanás* (from Indo-Eur *gʷhonos*). Before *e* and *i* vowels they tend to appear as dentals, *e.g.*, *τίνω*, *τεῖσαι* (from *kʷĭ-*, *kʷei-*, forms of the same root as in *ποινή*), *τις*, Lat *quis*, *θείνω*, Sanskrit *hanti* "he kills," Hittite *kuenzi* "he kills" (Indo-Eur *gʷhen-ti*, from the same root as *φόνος*, *ἔπεφνε*, *πέφαται*). In Aeolic the labials appear even before *e*-vowels, *e.g.*, *πήλοι* "far," Att *τῆλε*, Boeot *πέτταρες*, Att *τέτταρες*, Dor *τέτορες* (*cf.* Lat *quatuor*). Occasionally a labio-velar develops into a Greek guttural, often owing to the neighbourhood of *u*, e.g., *βου-κόλος* with the same ending as *αἰ(γ)-πόλος*, *cf.* Lat. *colo*, *in-quil-inus*; *κύκλος*, Lith *kāklas* "neck," Eng *wheel*; *γυνή*, Boeot *βανά*, Eng *queen*. The pronoun *τις* appears in Thessalian as *κις*, for *πότερος*, *πῶς* Herodotus has *κότερος*, *κῶς*.

The Greek *πατράσι* (dat. pl. of *πατήρ*) corresponds very closely (even in respect of the accent) to the Sanskrit Locative *pitṛ́ṣu*. In this, as in many Sanskrit words, *r* functions as a vowel. This "sonant" *r* as it is called, is descended from the same sound in the parent-speech. In the other langages the result is *r* preceded or followed by a short vowel: Greek *ρᾰ* or *ἄρ*, Lat *or*, Lith *ir*, Ger *ur*, etc. The variation in the quality of the vowel is a sign that it has been separately developed in each language. The same phenomenon is observed in the case of *l*, *m* and *n*. Sonant *m*, for example, is observed in the word for 100, Indo-Eur *ḱm̥tom*, Lat *centum*, Lith. *šimtas*, Ger *hund*, Greek *ἑ-κατόν* and Sanskrit *śatám* indicate that sonant *m* became *a* in these languages. The same *ă* from *m̥* or *n* (to use the technical notation of these sounds) is found in *πόδ-α* from *ποδ-m* (which has the same ending as the *o*-stem *ἔργο-ν* [from *-o-m*], Lat *illu-m*), and in *γεγράφαται* (from *γεγράφντται*) which has the same ending as *λέλυ-νται*.

The Aeolic dialect has *ρο* and not *ρα* in place of the sonant, *e.g.* *στρότος* and not *στρατός* from *strtos*.

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MODERN

Apart from numerous differences in dialect, there are two broad types of language used in modern Greece, viz., the "pure," or *καθαρεύουσα* and the "popular," or *δημοτική*, to use the most dignified of the terms employed to distinguish them. The former is a conscious and artificial return to Ancient Greek, and is taught in schools, and used for official purposes and generally by newspapers, the latter is the natural language of the people, and embodies a good many foreign words which have crept into the language in the course of later Greek history. The "popular" is primarily a spoken language, that of the Greek songs and ballads, and as such has not a fixed orthography, but it possesses the force of a living language, and is largely employed by modern writers of poetry and fiction. Tendencies towards compromise may be observed between the "purist" and "popular" schools.

Phonetics.—One broad distinction between Ancient Greek and the modern language is that the ancient accent was a "pitch" or "musical" accent, the modern is a "stress" accent, so that if a line of ancient Greek poetry, say of Homer, is read aloud with the modern stress value assigned to the accented syllables, the rhythm is destroyed, and the modern Greek can only regain its effect by arbitrarily shifting the stress accent in such a way that the values of the ancient quantities are approximately reproduced.

This change in the effect, though not in the position, of the accent in Modern Greek has resulted in a levelling out of vowel values, although the ancient vowel forms are retained in writing, *α* is pronounced, continental fashion, as *ah* (*father*); *ε* as *eh* (*led*); *η*, *ι*, *υ* have all the same value *-ee* (*see*); *ο* and *ω* *oh* (*cope*). Of the diphthongs, *αι* is pronounced as *ε*; *ει*, *οι*, *υι* as *η*, etc.; *ου* as *oo* (*brood*); *αυ* as *ahv*, except before the hard consonants (*κ*, *π*, *τ*, *χ*, *φ*, *θ*, *σ*), when it is pronounced *ahf*. Similarly *ευ* is pronounced as *ev* and *ef* respectively, *ηυ* as *eev* and *eef*. The consonants approximate to the sounds of the corresponding English consonants, with these exceptions: *β* is pronounced as *v*; *γ* as hard

gh, except before ε, η, ι, υ, αι, ευ, οι, υι, when it has the value of *y*; when doubled or before κ, it has the value of *ng*; δ is sounded as *th* (*the*), φ as *f*; χ as *ch* in Scotch *loch*, but before the vowels and diphthongs mentioned under γ it is soft, as in German *ich*; ψ has the value of *ps*. To express the equivalents of English *b*, *d* and hard *g*, Modern Greek uses μπ, ντ and γκ respectively. In the middle of words, π after μ has a *b* sound, *e g*, ἔμπορος = émboros; τ after ν a *d* sound, *e g*, ἐντροπή = endropée. The final ν of the article and the initial π or τ of the following word also undergo a change of sound. Thus τὸν πατέρα *tom batĕra*, τὴν τέχνην *teem dĕchneen*. The above are the main rules for pronunciation, though some refinements of minor importance for the English student are omitted. The accented syllable is strongly stressed, so much so that the beginner seems only to catch the accented syllable. The distinction between acute, grave and circumflex is immaterial for speaking, but is generally retained in writing after the manner of Ancient Greek There is no aspirate in pronunciation, though the signs for rough and smooth breathing are retained in writing.

Grammar.—The "popular" language diverges from Ancient Greek far more than the "purist," both as regards forms and the shifting of accent Full information can be obtained from some of the works mentioned in the *Bibliography*

Declension.—Modern Greek has lost the dual Except in the very "purist" style and in a few stereotyped phrases, it has also lost the dative case; in place of this, εἰς or πρός with the accusative, the accusative alone, or the genitive is substituted. For the genitive, ἀπό with the accusative is often used, or the simple accusative As regards substantives in general, though the "purist" language practically follows the classical, the following features of the "popular" should be noted: words of the first declension ending in -α, -η, -ας or -ης, have plural in -ες. In the second declension there is a tendency to favour neuters, *e.g.*, τὸ χερί for ἡ χείρ In the third, Popular Greek adopts accusative singular of feminine nouns as nominative, *e.g.* μητέρα, τρίχα, etc, and the accusative plural of masculine nouns, *e g*, πατέρας, γέροντας, etc Often masculine forms in this declension are shifted to the second, *e g*, γέρων to γέρος, γόνυ to γόνατον, etc. Note also that the plural of nouns of the third declension are often augmented by a syllable, *e g.* παπᾶς, *priest*, plural παπάδες, παπουτζῆς, *shoemaker*, plural, παπουτζῆδες

Adjectives —"Popular" usage retains -η in the feminine after ρ and in words compounded with α- negative, *e g*, ἄσπρη, ἄμορφη, and prefers uncontracted adjectives, *e g*, χρυσός for χρυσοῦς In forming comparatives πλέον is much used with the positive form To express "than" after comparatives the following are used: genitive case, ἤ or παρά with nominative, or ἀπό with accusative. To express superlatives, the definite article is used with the comparative form, *e.g*, ὁ καλύτερος.

Pronouns —In case of ἐγώ and σύ note accusative singular ἐμένα, ἐσένα and genitive plural μᾶς, σᾶς, in αὐτός genitive singular τοῦ, τῆς and genitive plural τῶ(ν), τούς. The curious indeclinable expression τοῦ λόγου μου, σου, του, της for *myself*, etc. is worth remarking, in possessive pronouns ἰδικός, *e g.* ὁ ἰδικός μου υἱός *my own son*, in relative pronouns, ὁ ὁποῖος and ὁποῦ (indeclinable) = *who*; in indefinite pronouns, κάτι, *something; τίποτε anything, nothing*, κανείς *anyone, no one*, καθείς, *any, every*, and expressions like κάθε ἄνθρωπος, *everyman*, κάποιος, *a certain*, κάμποσος, *several*. Of interrogatives, note τί invariable, *e g*, τί ὥρα εἶνε, *what's the time?* τί λογῆς, *of what sort?*

Numerals.—The general usage follows the classical, but "popular" Greek has many divergent forms, such as ἑξε (6), τριάντα (30), σαράντα (40), πενῆντα (50), ἑξῆντα (60), etc. The following miscellaneous expressions may be noted: ἑκατομμύριον (*million*), δωδεκάς (*dozen*), δύο φοραίς (*twice*), τρία τέταρτα ($\frac{3}{4}$), δύο ἀπὸ τὰ πέντε ($\frac{2}{5}$), δύο στὸ πέντε ($\frac{5}{2}$), ἑξε τοῖς ἑκατόν (6%), μισὴ ὥρα (*half-hour*), εἰς τὰς πέντε (*5 o'clock*), τρεῖς καὶ τέταρτο (3 15), ἑξε παρὰ εἴκοσι (5 40), εἴκοσι Φεβρουαρίου εἰς τὰ χίλια ἐννακόσια εἰκοσιοκτώ (20th Feb, 1928).

Conjugation.—The Modern Greek verb has no dual, optative or infinitive. The optative is expressed by εἴθε νά *e g.*, εἴθε νὰ ἦτο *would that it had been*, the infinitive by νά followed by the subjunctive, *e.g*, θέλω νὰ γράφω, *I want to write*. There is a tendency to substitute the -ω ending for μι, *e.g.*, δεικνύω, and to abandon contracted verbs, *e.g.*, χρυσόνω takes the place of χρυσόω. The auxiliary verbs ἔχω and θέλω have largely taken the place of the old tense forms; θέλω is generally used in its abbreviated form θά thus θὰ εἶμαι, *I shall be*; ἔχω λάβει, *I have received*; θὰ εἶχον λάβει, *I should have received*. In these examples λάβει is an invariable form, corresponding (according to some) to an Infinitive without ν, according to others, to the 3rd singular aorist subjunctive and as such sometimes written λάβῃ. The corresponding passive form is ληφθῆ—ἔχω ληφθῆ, *I have been received*. For the imperative, ἄς with the subjunctive is largely used, *e g.*, ἄς γράφῃ, *let him write*. It should be observed that for the forms described as subjunctive, the corresponding indicative forms, γράφει, etc, are freely used. The invariable present participle form ending in -οντας should be noted, *e g*, ὄντας, *being*, γράφοντας, *writing* As to the principles of the Modern Greek verb with regard to time, the most important distinction is between the continuous (present) and the momentary (aorist), *e g*, θὰ γράφω *I shall be writing*, and θὰ γράψω, *I shall write*. In conditionals, classical refinements have been largely obliterated: ἐάν or ἄν is commonly used with the indicative, *e g*, ἐάν εἶχε γράψει, ἤθελον μάθει, *If he had written, I should have learned;* thus θέλω has ousted ancient ἄν in the apodosis

Vocabulary.—The "purists" go to Ancient Greek for their vocabulary, and are anxious to oust all foreign words. To meet modern conditions, they introduce many neologisms, coined on analogy with the ancient language, *e g*, ἀσύρματος τηλεγραφία, *wireless telegraphy*, ῥαδιοτηλεγράφημα, *wireless telegram*, δακτυλογραφία, *typewriting*, συνάλλαγμα, *bill of exchange;* ὑπάλληλος, *employee*, καρβουνότουβλα, *briquettes;* ταχυδρομεῖον, *post-office*, ἀμαξοστοιχία, *railway train;* ἀτμόπλοιον, *steamer*, ὑποβρύχιον, *submarine*, θωρηκτόν, *warship;* ἔνελπις, *cadet*, σύνταγματάρχης, *colonel;* ἀεροπλάνον, *aeroplane;* πολυβόλον, *machine-gun;* περίστροφον, *revolver*, etc.

The foreign words still surviving in "popular" language mirror the vicissitudes of post-classical Greece; they are naturally far more common in the literature of mediaeval Greece than they are to-day. The principal languages from which such words are drawn are Latin, Italian and Romance languages (reminiscent of the settlements of the crusading Latins in Greece), Slav, Wallachian, Albanian, and above all Turkish (in which may be included some earlier Arabic survivals) Examples:

Latin.—ἀκκουμβῶ, *lean*, ἄρματα, *arms*, βάρκα, *boat;* βέργα, *rod;* βοῦλλα, *seal;* κάμπος, *field*, κουρσεύω, *be pirate*, παλάτιον, *palace;* πλουμίζω, *adorn;* σπίτι, *house;* στράτα, *street*, ταβέρνα, *tavern.*

Italian and Romance.—ἀρμάδα, *fleet*, βελοῦδο, *velvet;* γάτα, *cat*, κάλτσα, *stocking*, καπέλλο, *hat*, καπετάνιος, *captain*, κουμπάρος, *best-man;* λεβάντες, *E. Wind*, λίστα, *list*, μοῦτσος, *cabin-boy;* ντάμα, *lady;* πέννα, *pen;* πονέντες, *W Wind*, πόρτον, *harbour*, ῥιμάρω, *rhyme*, σαλόνι, *saloon;* τιμόνι, *tiller*, φορτούνα, *storm* It is sometimes difficult to distinguish between borrowings from Latin and Italian and Romance languages.

Slav.—βάλτος, *marsh*, γοῦνα, *fur*, κουνέλι, *rabbit*, ῥοῦχα, *clothes*

Wallachian.—βλάχος, *rustic;* κατσίβελος, *gypsy*

Albanian.—κοπέλα, *girl*, λουλούδι, *flower.*

Turkish and Arabic.—ἀμπᾶς, *serge*, γάιδαρος, *ass*, δραγουμάνος, *interpreter*, ζαγάρι, *hunting-dog*, (Ar), καδῆς, *judge*, καζάνι, *cauldron;* καΐκι, *boat*, καλαφατίζω, *caulk* (Ar), κέφι, *good humour*, κιόσκι, *kiosk;* λουφές, *pay;* μαιμοῦ, *monkey*, μουσαφίρης, *guest*, μπαρούτι, *gunpowder;* ντουλάπι, *cupboard*, ὀντᾶς, *room*, παζάρι, *bazaar;* παπούτσι, *shoe*, παράδες, *money;* ῥακί, *spirits*, ῥαχάτι, *ease;* σαράγι, *palace*, σαράφης, *money-changer* (Ar), σεφέρι, *war*, τζάμι, *glass*, τζαμί, *mosque*, τεμπέλης, *lazy*, τουμπεκί, *tobacco*, φλιτζάνι, *cup*, χαμπάρι, *news*, χάνι, *inn*, χαράτσι, *tribute*, χαρτζιλίκι, *pocket-money*, χατίρι, *favour.*

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GREEK LAW. The basis for the development of Greek law was laid by the rise in Greece of city-states (*poleis*). Primitively all Greeks were tribal; or, to use their own term, ethnic But between 1200 and 800 B C. among those of them who had entered the area of the Aegean civilization tribes were replaced by city-states. Of Greek tribal law little need be said Its source was twofold For the most part it issued from kindred-groups—families and brotherhoods (*phratries*)—by which also in this event it was enforced But it likewise sprang from the tribal government—kings, elders and assemblies; and tribal, and even intertribal, pressure operated to produce or maintain a general sameness in the rules and regulations of the lesser groups. Tribal law, and the law of the early city-states as well, consisted of customary rules preserved by popular memory So long as they were thus intangible they could be changed only unconsciously by the slow processes of social growth Thus, they seemed unchangeable. Nor did the gods withhold their hands after they had laid down the fundamental ordinances. From Zeus there came to every king, so Homer tells us, the dooms (*themistes*) according to which he settled disputes (*Il* ix 99).

Tribal justice had as its mainspring self-help. Its course may be illustrated in cases of homicide Fear of vengeance at the hands of the kindred of the slain man drove his slayer, whether guilty or innocent, to seek exile, sanctuary or the protection of his blood-brothers But to avoid the feuds, to which acts of violence and reprisals gave rise, recourse was had to commutation, and if this proved inefficacious, to arbitration The oldest Greek trial of which we have record was one arising out of a dispute between a slayer and avenger as to the receipt or non-receipt of blood-money. The hearing was held publicly, in the place of assembly, and was attended by partisans of both contestants, who were restrained by public officers (heralds). The "daysman" (ἴστωρ) was supported by the elders They sat on "polished stones in the sacred circle," and in their midst lay two pieces of gold to be awarded either to the disputant who made good his contention or to the elder who declared most righteously the rule of law (δίκη) governing the case (*Il.* xviii 497–508).

The scope of self-help was wider than the scope of kinsmen-help. The adulterer, no less than the homicide, could be dealt with directly by the party aggrieved, but since unmitigated self-help was socially suicidal, even if he were caught *in flagrante delicto* he might be ransomed if a bondsman went surety for him (*Od.* viii. 344–599). Where death or violence were not its normal accompaniments the practice of affirming rights solely by self-help lasted longer Until a late date a creditor might seize the person of his debtor for nonfulfillment of contract. Long after the rights of talio and "distress" had been subordinated to state law they continued to be legitimate remedies of international law

The *Iliad* and *Odyssey* of Homer are the sole contemporary source for early Greek law They reflect its condition in the period of transition from the tribe to the city-state. Between Homer and the 7th century revolutionary changes in constitutional law occurred. They affected comparatively little the rules applicable within the family sphere; but the autonomy of the kinsmen-groups in pursuing private vengeance was radically affected by the coming to prevalence of an attitude toward homicide that lifted murder out of the category of ordinary acts of violence; the slayer was thought to pollute the entire community. So the state could no longer remain neutral

The defects of unwritten laws were not so much their vagueness as their failure to cover new situations. They might coerce facts and outlaw novelties, like those of the ancient Spartans and the modern Albanians But where new situations developed in spite of them, a frontier region of uncertainty arose in which the magistrates were unguided and unrestrained. Such was the characteristic aspect of justice in the "iron age" in which Hesiod wrote (700 B C.). An obvious remedy was to separate the determining of law from the passing on facts and to leave one function only to magistrates The function Rome left them was the one Athens took from them. In *c.* 683 B C it created a body of six "determiners of customs" (*thesmothetai; cf* the Persian *databara*), to whom, it may be assumed, the chief magistrates (archon, *q v* polemarch, king) were bound to refer for an authoritative definition of the "law" that bore on disputes brought before them

In the 7th century the Greek city-states began putting their laws into writing The method used was to entrust the task of determining all the laws and issuing them in the form of a code to a single individual described as a "law-determiner" (*nomothetes*). The early codes have all perished except for a few isolated passages; so that our direct knowledge of them is slight. But we may say that laws were, on the one hand, instructions issued for the guidance of boards and officials in the performance of their public duties, and, on the other hand, rules of general application containing prohibitions with their attendant penalties, and specifications as to what should be done in certain contemplated acts or situations Since the rules were linked up for enforcement with definite organs of government, the entire code was arranged under the heads of the competent public authorities

Greek law-codes were accordingly a blend of public law, including the forms to be observed by priests in public worship, and private law A pre-condition for their publication was the spread of literacy. Since they were demanded because of the inadequacy of traditions, they naturally appeared first in the colonies and in progressive states The earliest *nomothetes* is said to have been Zaleucus of Locri in Magna Graecia Charondas of Catana was perhaps a younger contemporary Other famous law-givers were Dracon of Athens (*c* 621 B C), Pittacus of Mitylene and Philolaus of Corinth. The historical reality of Lycurgus of Sparta, Theseus of Attica, and even Minos of Cnossus has been sustained by some recent writers, and the divinity of Zaleucus, Charondas, and even Draco has been affirmed by others; unwisely in both instances.

Since each city-state had its own law it is apparent that strictly there was no such thing as Greek law, but only hundreds of local codes And indeed in the sense in which England developed a common law and France "received" another, there was no possibility for a common law to arise in Greece, unless it be in the area of the short-lived Athenian empire (477–405 B C). The common law which Greece possessed was simply the law that was common to all its numerous codes This need not have been inconsiderable The law given by Zaleucus to Locri was adopted by Sybaris; that given by Charondas to Catana was shared by the other Chalcidian cities in Sicily and Italy, and what is even more remarkable, it was not only drawn on by Thurii, but also used in Mazaca in Cappadocia. None the less cases of migratory codes were exceptional. The unity of Greek law, such as it was, depended rather upon the possession by all Greeks of a common stock of legal principles This was partly an inheritance from a distant past. The rules governing marriage, right of succession (*anchisteia*), the disposition of heiresses, adoption—family life in general—were everywhere similar because they were derived from ancient Hellenic ideas. But it was also the outcome of

reciprocal borrowing. Commerce in Greece was at all times international in part and largely in the hands of metics The ideas of commercial right and wrong were established in the international ports and on the high seas by a kind of mental and moral barter. They were brought to greater precision by the negotiation of commercial treaties (*σύμβολα*); and finally they became so consolidated that Demosthenes (xxxv. 45) could affirm that the laws governing commercial cases "were everywhere identical"

Between the 7th and 4th centuries codes tended to converge The movement of law had to conform to the general movement in Greece, which was towards greater and greater uniformity But there was an inevitable relation between laws and the character of states; and since for a long time noble or class-states, which had existed generally at the time laws were first codified, persisted in certain parts of Greece, the convergence was at first on two types of law rather than on one—an aristocratic type and a democratic type The former is well illustrated in the laws of Gortyn in Crete

As these have reached us, they consist of earlier and later portions, the latter a supplement made at *c* 450 B C In this collection, especially in its earlier portions, the rules of a class-state predominated A magistrate, unassisted by jurors, judged cases, and there was a special judge for the privileged class The right to make a will was not recognized Women inherited as well as men The penalties for offences varied with personal status For private seizure of an alleged wrong-doer in advance of trial a fine of 10 staters was imposed if he was a freeman, one of 5 if he was a slave Rape of a free man or woman was penalized by 100 staters, rape of an *apetairos* by 10, and of a serf by 5, but if the violator was a slave the penalty was doubled The number of witnesses required to prove an allegation varied similarly, five, for example, to convict a free man, three to convict an *apetairos*, one to convict a serf In the event of conflict the law defined which witnesses "were nearer," that is, should prevail

The other type of code emphasized by contrast what the Greeks called *isonomia* This meant, in terms of public law, the admission of all free-born native adult males to equal share in the assemblies in which sovereign action was taken, and, in terms of private law, the cancelling of all class distinctions Athens is the classic example of this type, and the influence, power and policy of Athens helped greatly to spread throughout Greece the principles of law for which it itself stood Historically there was a connection between political and legal equality, and in Athens both were realized finally on a basis of self-government in 507 B C, after the expulsion of the Peisistratids But they were not inseparable In Boeotia, for example, a way was found to reserve participation on equal terms in the sovereign assemblies to citizens of the middle and upper classes without giving them any rights under private law which all free-born native adults did not also have Those owning a certain amount of property simply became "councillors", and councillors alone were organized for the transaction of public business For a brief time after the fall of the Four Hundred in 411 B C Athens itself adopted this form of *isonomia* There the experiment failed politically and was not repeated

Growth of Law in Athens.—In the centre of Greek law, as we know it, stands the law of Athens It was first codified by Dracon The thought then uppermost in the minds of the Athenians was to fix once for all existing customs Stability, presumed for the law while it was unwritten, was naturally presumed for the written law also But, owing, as it seemed, to the rapacity of the rich and the extravagant hopes of the poor, the situation became so acute within a generation that Solon, archon for the year 594 B C, on being given the full power of the state to reconcile the warring factions, took the extreme step of issuing a new code of laws The only part of Dracon's code which he retained unchanged was the law of homicide The constitutional provisions, including those regulating judicial procedure, were profoundly altered, notably by a rule, pregnant with history, authorizing appeal from judicial decisions of magistrates to a popular assembly organized as a court (*heliaia*) All free-born adult males native in Attica were given the public-law rights of *isonomia*—membership on equal terms in Assembly and *heliaia*. For classes based on birth Solon substituted classes based on property These new classes were recognized in the distribution of public offices and services Were they also recognized in the assessment of legal penalties? There is no conclusive evidence on the point The spirit of the Solonian constitution was hostile to their maintenance It struck at the roots of privilege by including wrongs done to citizens individually in the category of wrongs done to the state In all cases (excepting homicide), which involved more than business settlements, Solon established the right of any citizen whatsoever to appear as public prosecutor.

Solon regarded law-making as an abnormal function of government and he bound the Athenians by oath not to resort to it again for 100 years This attitude toward it persisted under the Peisistratids, who preserved Solon's laws while administering them to serve their own ends Cleisthenes, too, was an extra-constitutional law-maker But at some point, not precisely determinable, between the time of Cleisthenes and the downfall of the Four Hundred in 411 B C, the method of legislating through suspension of the constitution in favour of an autocratic *nomothetes* was abandoned for the more democratic method of vesting the law-giving power in a board of *nomothetai*, and it was according to the more modern method that the *régime* of the Five Thousand was inaugurated in August 411 B C and the democratic laws re-enacted on the overthrow of the Thirty and the Ten in 403 B C On the latter occasion it proved necessary both to make a general revision of the laws and to issue a new code The legislative work was entrusted to a corps of 1,000 representatives taken from the demes, half by lot and half by popular vote (the *nomothetai*) This body issued the laws, old and new, in the form of drafts (*συγγραφαί*) and put them in the hands of a commission of "publishers" (*anagrapheis*) for editing This body had them cut on stone slabs in the King's Porch, where also the old code had been inscribed

Thus far legislation was an occasional and not a regular function of government But this view of it was now abandoned Athens had henceforth a process by which the laws might be changed annually It was initiated at the first meeting each year of the Assembly Votes were then taken on the laws, section by section, to determine whether or not they seemed adequate, first on the laws concerning the Councils, secondly, on those classified as general (*κοινοί*), thirdly, on those relating to the nine archons, and finally on those relating to the other magistrates For the defence of laws judged inadequate five attorneys were elected, and during the succeeding three weeks anyone who chose might bring forward substitutes for laws under indictment and have them posted on the state bulletin boards Then, at its third meeting the Assembly ordered *nomothetai* to be chosen The *nomothetai*—on one occasion 1,001 in number (Dem xxiv 27)—were selected from the jurors (dicasts) empanelled for the year In this particular they resembled a court Their proceedings, too, were in the form of a trial with pleas by the proponents of changes and counter-pleas by the attorneys for the defendant laws But since their presiding officers consisted of the identical type of presidency used in the Assembly, they also resembled the sovereign political body Their decisions, too, were reached as in an Assembly and not in a court—by open vote Unlike a decree a law could be enacted only after due notice had been given and the public interests had been defended by counsel It emanated from a body carefully selected to ensure the representation of every section of the population, not, like a decree, from the group of citizens who chanced to be present at a particular meeting of the Assembly The *nomothetai* were dicasts, but they rendered a political not a judicial verdict Hence unlike the action of a court, it was subject to suspension, like the action of the Assembly, if indicted for illegality, and became definitely binding only when reaffirmed by a regular tribunal

The code was a thing of many complex interrelations An alteration at one point might produce unsuspected trouble at others The officials who had most to do with law-enforcement were the *thesmothetai* It was therefore made incumbent upon them to examine the code carefully in the course of their

administration, and, if they found in it obsolete articles not so designated, or articles which contradicted or duplicated one another, to put on the bulletin boards the editorial revisions they deemed necessary. For the validation of these clerical corrections an ordinary meeting of the Assembly was competent, but it was held constructively to have been a session of *nomothetai.* A much less innocuous participation of the Assembly in legislation is demonstrated by documents for the period following *c* 360 B C. Impeded in action it wished to take by lack of legal authority, the Assembly passed votes requiring the chairmen and president who should preside at the first session of *nomothetai* to present for consideration the additions to the laws it desired This may have led to an over-weakening of constitutional law (Dem. xx 89 *sqq*), but so long as this was fused with private law there was no alternative The magistrates' courts, being incompetent to render judicial decisions except in trifles, were incapable of developing a *ius honorarium* Neither could law in Athens be court-made, since every verdict of the dicasts was independent of every other verdict.

Until the age of Pericles, the Athenians entrusted the function of acting as "guardian of the laws" to the Aréopagus Then they did away with it as being derogatory to popular sovereignty Yet the laws had to be safeguarded, not perhaps against the *demos* itself—for like the king the *demos* could do no wrong—but against individuals in Council and Assembly who should mislead it The remedy applied was to hold all makers of motions at meetings of these bodies liable to public actions for illegality (*γραφαὶ παρανόμων*), thus placing the protection of the laws in the large category of public interests for the vindication of which each and every citizen in good standing might assume the rôle of state prosecutor The test of illegality was that the motion should seek to accomplish something prohibited by the laws There was, however, nothing illegal in persuading the Assembly to use decrees (*psephismata*) to fill gaps in the laws; and in the 5th century, when legislation was still a quasi-revolutionary activity, this course was frequently followed It was by means of decrees primarily that law was built up for the empire The constitution of the council itself was extended by decree. New magistracies were created in this way Decrees were therefore often indistinguishable from laws in subject matter, and since the courts were required to take account of them both, they might have precisely the same force as laws. Yet there was a fundamental difference between the two A decree could be abrogated by a new decree without ceremony, whereas a law stood until annulled by further legislation The revisions of 411–10 and 403 B C must have conferred the superior status of laws on many rules which theretofore had rested on decrees alone, and thenceforth the Athenians lessened the need for decrees to trespass on the province of laws by providing for annual legislation Naturally they made the proposers of new laws liable to the same form of public action as the proposers of new decrees And indeed they went even farther than this; they made them liable to public prosecution if the laws originated by them were found within a year to be inexpedient After the twelve months had expired, laws, like decrees, alone were indictable, not their authors.

Official transcripts of the laws were ordered to be made on stone tablets in 410–04 B C ; and to this measure we owe the preservation, though in a very fragmentary condition, of Dracon's law on involuntary homicide (I G I. 115), Cleisthenes' law on the Council of the Five Hundred (I G. I 114), and a law of uncertain date governing grants of maintenance in the *prutaneion* (I G I 77) On the occasion of the revision made in 403 B C a new text was issued in the Ionic alphabet then officially adopted The new laws passed during the following 80 years were attached to the code in the form of the minutes of the sessions of *nomothetai* in which they originated, and like the laws of Rome they were regularly cited by the names of their proposers. A small number of these *novellae* has come into our possession textually, three in inscriptions (I G. II. 140, 333, 244). Most of the laws that have reached us, whether in whole or in part or in paraphrase, were entered by ancient grammarians at points where they seemed to be called for in the speeches of the Attic orators. These and others, culled from lexicographers and scholiasts and elsewhere, are collected in Telfy's *Corpus Juris Attici* (Pest and Leipzig, 1868). The descriptive portion of Aristotle's *Constitution of the Athenians* (§§42–70), composed between 327 and 323 B C. was based directly on the code of that epoch. Though it is confined to an exposition of public law and has reached us without its final portions, it is by far the most extensive abstract of the Athenian laws that we possess

So far as we can judge from the specimens preserved, the laws of Athens were drafted in simple language Some ancient phrases survived in their older portions In style they resembled the laws of the Twelve Tables rather than the matured legislation of republican Rome No attempt was made in them completely, to define parties or objects concerned by the use of synonymous terms and to adhere rigorously thereafter to the definitions once made—a defect that opened the way to subterfuge in litigation (Lysias, x 15), but was less troublesome in the equitable processes of the dicastic courts than it would have been in courts guided by strict law The laws dealt with concrete situations that had arisen in actual experience. Hence they were adequate through being numerous and detailed rather than through embodying principles that were capable of wide application The distinctions between the hundred and more actions open to suitors were drawn with acuteness, if not with over-subtlety The rules of procedure were "at times casual and incomplete (set practice being taken for granted), at times minutely specific " Penalties for "criminal" offences were remarkable for their severity—a reflex doubtless of the passion and intensity of their political life, they included death (with circumstances of atrocious cruelty in the case of common malefactors), fines that were often confiscatory; total or partial disfranchisement; and detention, but not imprisonment. The code was thought not to measure up to the standards of contemporary jurisprudence; but when it was refashioned by Demetrius of Phalerum to give effect to the Peripatetic theory of society (317 B C), the Athenians would have none of it. On the expulsion of the unpopular *nomothetes*—his office was an anachronism, no less than many of his laws—they revived the "laws of Solon," revised them to suit the altered circumstances and republished them (307–304 B C)

The task of abstracting the law of Athens (or of Greece) from the instructions of magistrates, and setting it out under appropriate headings for comparison with Roman and other systems of law, has been undertaken by modern scholars, notably lawyers But from the nature of the materials, which also precludes any attempt to summarize the laws under their original headings, we must content ourselves here with citing the works by Beauchet, Partsch, Mitteis, Vinogradoff and Weiss mentioned in the bibliography

Judicial System of Athens in the 4th Century.—Except for (1) a special group of public actions, itself divisible into subgroups, suits fell into two general categories (2) *dikai,* or private suits, and (3) *graphai,* or public suits.

1. The special actions may be thought of as a residuum of the means in use before Solon for dealing with crimes against the state The small fines (*ἐπιβολαί*) imposable by administrative officials upon citizens who disputed their authority represented another such residuum Their common characteristic is that the council and assembly or the magistrates were competent to punish, if they chose, without observing the regular forms of judicial procedure The most striking example of executive justice is *apagoge* (with its variants *endeixis* and *hyphegesis*), the arrest and detention of malefactors (*κακοῦργοι, e.g* , thieves) caught in the act or of persons (exiles, state debtors and the like) caught exercising rights of which they had been legally deprived. If the prisoners admitted their guilt the "eleven" were authorized to inflict summarily the penalties prescribed, ordinarily death; otherwise, they, or exceptionally the *thesmothetai,* had to conduct the case as a public action.

By far the most important of these special forms was impeachment (*εἰσαγγελία*). Typically it may be described as the process designed to cover acts that may be loosely defined as treason The offences were at first left indeterminate, but eventually a law

was elaborated including among them, specifically, treason and conspiracy to commit treason; betrayal of a city, ship, army or fleet; unauthorized traffic with an enemy, residence in his country or service in his army; the acceptance by a public man of bribes as a consideration for misleading the *demos*. From actions of this type many *causes célèbres* arose, notably the trial of the eight generals who commanded in the battle of Arginusae. The denunciation might be presented to either the council or the assembly and accepted or rejected by them If accepted, the defendant was arrested and if the matter was grave he was kept in prison pending trial The council drew up the definite proposal for action, in the one instance on its own initiative, in the other at the request of the assembly. If the penalty deemed sufficient was a fine of 500 drachmae or less, the council was fully competent to impose it. Otherwise it transmitted its proposal, through the agency of the *thesmothetai*, to the Assembly, which had thereupon to decide either to try the case itself, which it did by the process used in enacting a decree, or, as was more usual, to hand it over to a dicastery The penalty was ordinarily death with confiscation of property The dead bodies of traitors were cast beyond the boundaries of Attica "Presentment" (προβολή) was somewhat similar to impeachment Actions regarding contraband (φάσις) and wrongful possession of public property (ἀπογραφή) were also special in that those who prosecuted them paid court fees, as in civil suits, but received half or three-fourths of the penalty This was the prime source of sycophancy (the trade of informing)

2 **Dikai**—The characteristic feature of *dikai* was that the right to bring them rested upon the possession by the plaintiff of a private interest But they fall into two altogether different classes. (*a*) actions for homicide, and (*b*) civil suits

(*a*) Because of its antiquity the law of homicide contained a relic of the primitive practice of self-help It placed the obligation of seeking redress for homicide upon the kinsmen of the slain man—upon his father, brothers and sons as prosecutors, and upon his cousins, sons of cousins, male relatives by marriage and blood-brothers (*phratores*) as co-prosecutors A man belonging to the inner group alone had the right to bring action, or, more probably, his was the prior right, since in cases where it was permissible to arrange a settlement (ἀίδεσις), even the blood-brothers were competent to act if none of the nearer relatives existed Draco had recognized the essential difference that exists between wilful murder and other kinds of homicide, but it was a distinction that did not permit any discrimination in the religious ritual of the occasion, the king-archon presided and voted at all trials, the courts sat in holy places in the open air, and pending trial the accused was excluded from the agora and all shrines and religious ceremonies, but not imprisoned When the offence charged was wilful murder, or wounding or poisoning or arson with intent to kill, and the victim was an Athenian, the Areopagus as a whole formed the court, it sat on Ares' Hill, and the penalty, when life was taken, was death, otherwise exile Other kinds of homicide were regarded as of lesser seriousness, and a board of judges called *Ephetai*—originally a commission, perhaps, of 51 Areopagites, later a panel of dicasts—constituted the tribunal The place in which the trial was held varied with the nature of the defence To the Palladium belonged cases of involuntary homicide and instigation thereto, the penalty being temporary exile, also suits for killing non-citizens—slaves, metics, and foreigners To the Delphinium belonged cases of justifiable killing, and to the Phreatto, accusations against citizens already in exile The defendant pleaded from a boat anchored off the shore so as not to pollute the country by setting foot on it. In the Prytaneum the king-archon had the *phulobasileis*, instead of the Areopagus or the *Ephetai*, associated with him as judges, and to it belonged trials which were purely ceremonial in character—where the "doer" was unknown or an animal or, as in the obsolete English law of "deodands," something inanimate. The objects found guilty were cast beyond the frontiers.

(*b*) Civil suits could be brought only by the parties interested or their legal representatives Their entry was governed by the general principle of Athenian law that magistrates should accept cases arising in the sphere of their own administration, but the principle was inapplicable to magistrates whose duties were mainly or wholly judicial. Of these the *thesmothetai* were comparatively unimportant in civil suits. The other two—the Introducers and the Forty—received civil suits only The competence of the Introducers was limited to suits which by reason of their special urgency had to be brought to trial within a month of the filing of the complaint (δικαὶ ἔμμηνοι); but not all such suits came to them Those that they received were actions arising from non-restitution of dowry, from loans that were in the nature of an accommodation—where the rate of interest was low (12% or less) or the security poor—from transactions with business associates, partners, or bankers, and from trierarchies Also actions for assault For each pair of *phulae* there was one Introducer

Of the Forty, four acted for each *phule*. If the object of litigation was worth 10 drachmae or less they settled it with full authority. Otherwise they referred it to a public arbitrator (διαιτητής), whose business was first of all to reconcile the parties Failing in this he heard the case If his decision was accepted by both parties it was final. But if the loser chose to appeal from it, the arbitrator sealed up in caskets all the papers submitted at the hearing, those of each litigant separately, and referred the case back to the section of the Forty whence it came This had then to take it to a public court, where the usual course was followed

It was characteristic of civil-suits that the winner had himself to obtain the rights awarded; but if he encountered resistance he could bring a suit of ejectment The feature of this class of actions that calls for special notice was the provision for compulsory arbitration It applied to all civil suits that came before the Forty either directly, or indirectly from other magistrates Excepting the monthly suits, which would not brook delay, most disputes about property, sales, leases, contracts, debts, etc, implicating either citizens (office-holders and non-office-holders alike) or metics and other privileged aliens had to be submitted to arbitration. The task of arbitrating was reserved exclusively to the last class of citizens on the roll of those liable for military service, in other words, the Athenians in their 60th year The appointment of the arbitrator for each case was made by lot and the arbitrator on whom the lot fell could not decline to serve, unless he were holding office or absent from the country, without incurring the penalty of disfranchisement, to which he was also liable, on complaint to the whole body of arbitrators, if he abused his position The state had more confidence in the average capacity of its sexagenarians than it had in their public spirit and integrity But what of the litigants? That they would respect the findings of an obviously incompetent arbitrator, however unbiassed he might be, was not to be expected The essence of the system was "that in a large number of disputes the constitution did not compel two quiet citizens to face the ordeal of a trial in court, but provided a cheap and simple and reasonable means of getting justice" (Wyse)

3 **Graphai.**—The judicial vindication of a public interest was the object of these suits They could be entered by any citizen in good standing He might be himself the aggrieved party, but in that event, even if the award was pecuniary, it fell to the state, which in all cases exacted the penalty As in private suits, so in public, the magistrates were confined to a passive rôle before taking action they had to wait till private individuals filed complaints with them The principle that executive competence determined judicial competence also prevailed

Accordingly the generals and the other army officers were alone competent to receive suits for infractions of military duty To the archon and the polemarch came suits (private or public as the case demanded) concerning matters of family—the rights of widows, orphans, minors and heiresses, the management and division of family property, the appointment of guardians or patrons, etc —to the archon, if they involved citizens, to the polemarch, if they involved metics and other privileged aliens The king-archon received suits concerning religious matters—impiety, hereditary priesthoods, the share of *genê* and priests in sacrificial offerings and the like. Since over 100 species of suits are known, divided about equally between *dikai* and *graphai*, it is impossible here to give a complete classification of suits and magistrates But

the rôle of the *thesmothetai* calls for special comment. The six men constituting this board had duties to perform in connection both with making and administering the law which make it almost unintelligible that they should have been elected by lot (after 487 B.C.) and changed every year. They acted as intermediaries of the Council and the Assembly in cases which went to the courts from either of these bodies, and they were alone competent to receive indictments of decrees and laws and their authors, as well as of officials who presided at sessions of the deliberative and legislative assemblies. They also received actions against the generals. Besides offences against the state many offences against society were within their competence—theft, adultery, bribery and corruption of officials, councillors, and dicasts; usurpation of rights of citizenship, sycophancy, falsification or suppression of records, etc. Their civil suits were incidental.

The correct entry of suits required no small acquaintance with law on the part of average citizens, but so did the entire judicial system. The magistrates who accepted entries, with unimportant exceptions, were always new to their office and possessed neither more nor less legal training than litigants. All litigants had to be their own attorneys. The state depended wholly upon private initiative to set the judicial processes in motion. What was everybody's business proved to be the business of a low rather than a high type of citizen; so that the community was harassed by blackmailing and sycophants. Suits were as thick in Athens as leaves in Vallombrosa. Instead of employing fisticuffs or duelling or lawyers the Athenians went to law. It has been said that they were a nation of lawyers; but it has been also said that they were a nation without lawyers. And both statements are true.

The duty of assessing the evidence and rendering the verdict devolved upon tribunals on which sat jurors (Areopagites, *ephetai*, dicasts) ranging in number from 201 to 2,500 and exceptionally to 6,000. The Areopagus was a fixed body of about 220 members made up of ex-archons, and cases of wilful murder came to it automatically. Seeing that the archons were elected by lot with regard to local distribution, the Areopagites were simply typical Athenians, but they entered the tribunal fresh from an exceptional experience with the whole judicial system, and as the years passed they acquired a close knowledge of the law and physiognomy of murder. Hence their judgments enjoyed in marked degree general respect.

The king-archon was the only magistrate for whom the tribunal was fixed in advance. The rest had to apply to the *thesmothetai*, who assigned panels of dicasts to them by lot, 201 or 401 for ordinary civil cases, 501 or 1,001 for ordinary public cases. The *thesmothetai* determined on which one of the days fixed by them for sessions each magistrate should have his case tried and in which court-house the trial should be held. The selection of the panel of dicasts for each court-house was made on the day of the trial by a most intricate process of lot (Aristotle, *Constitution of the Athenians*, §63 *sqq.*). Its objects were fivefold; to ensure (1) that each individual in each of the ten sections into which the *heliaea* was divided should have a like chance to serve; (2) that every panel, containing, as it must, a like number of dicasts from each *phule*, should reproduce in miniature the whole people for which constructively it was to act; (3) that no one whatsoever should know in advance of the entrance of the dicasts into the court-house who was to judge any particular case, (4) that no one should impersonate the dicasts selected; (5) that dicasts who failed to turn up in the court-house should not receive their daily stipend of 3 obols. There was no mistaking the intention of the Athenians. they desired every panel to speak with the voice of all Athens, uninfluenced by bribery, intimidation, or collusion. And they got their wish.

The sorting of the evidence was made at a preliminary hearing (*anakrisis*). There the elements of the proof and disproof were assembled—the statements under oath of the parties, the depositions of witnesses, laws, decrees, contracts, and the like. The testimony of slaves was admissible only when elicited by torture; that of women and minors was admissible only in murder cases, and that of the parties to the suit was not admissible at all. Hearsay evidence was excluded. The cross-examination of witnesses was not permitted. Till 403 B.C. the pleadings were oral, but written pleadings, found necessary in cases appealed under the system of public arbitration, were adopted generally early in the 4th century. There were permissible ways of barring suits by contesting their admissibility. A civil suit might be dropped at any time. The prosecutor, however, must proceed with a public suit once it was instituted or pay a fine of 1,000 drachmae and forfeit the right to bring further actions, and he incurred the same penalty if he failed to secure one-fifth of the dicasts' votes. Court fees were collected in civil suits. Public suits more than paid for themselves by fines and confiscations. There were careful rules to govern default.

The presidency of the tribunal belonged either to the *thesmothetai* or ordinarily, to the magistrate who was connected with the suit in its earlier stages. The president had to see that the trial followed the course laid down by law, and, since his legal training was no greater than that of the litigants and dicasts, he had no claim or right to intervene further. Precedents having no legal standing, no one was needed to assess their bearing. The dicasts were in fact under oath to disregard them and to make decisions solely on the evidence and arguments presented, giving effect to laws and decrees where these sufficed, otherwise to their own sense of right. The proceedings in court consisted essentially of arguments addressed to the dicasts by the plaintiff and the defendant personally and by friends (not paid professional advocates) who appeared to support either party with their reputation and court experience. At the proper places the statements and depositions contained in the *dossier* of the preliminary hearing were read by the clerk of the court and acknowledged under oath by the litigants and the witnesses. The law authorized actions to compel the appearance of witnesses and the production by third parties of relevant documents, which, too, were read from the *dossier* by the clerk. A time, greater in public than in private suits, was set for the entire argument. Half of it was given to each party, and the water-clock (*klepsudra*), by which it was apportioned, was stopped during the reading. An inarticulate litigant would normally leave the burden of the argument to his supporters, and the practice was general for the main speeches to be prepared by professional speech-writers (*logographoi*), whose art consisted in no small degree in concealing their handiwork. If we except the disreputable tribe of sycophants, from whom speakers took special pains to distinguish themselves, this was the only professional class produced by the administration of law in Athens. They were accomplished pleaders, versed in the intricacies and pitfalls of the law, adepts in appealing to the prejudices of the dicasts, and since some of them were active in instituting public suits, they might come very near to being lawyers.

Once the arguments were concluded the dicasts voted, without discussion, either to acquit or to condemn. The utmost care was taken to preserve secrecy and honesty in the balloting. If the vote was against the defendant, but the bare decision did not suffice to dispose of the case, an argument upon the penalty ensued, at the end of which the dicasts balloted to decide whose estimate, the winner's or the loser's, should be accepted. The court was powerless to substitute an estimate of its own, but a compromise could be reached if the litigants chose to meet each other half way in their estimates. An appeal from the verdict was possible only in cases of non-culpable default; or on the ground of perjury, and then only if notice to contest the verdict on this score were given before the dicasts voted.

We do not possess the *dossier* of a single trial. The opposing arguments have seldom reached us. The speeches of the Attic orators were published as masterpieces of eloquence. They do not form a case-book of Athenian law. What they reveal is the sort of argument to which the dicasts were thought to be responsive. In public cases appeals were made to their ignorance, prejudices and cupidity, which, if successful, must have made their verdicts travesties of justice; and we know that in times of great political excitement they succeeded all too frequently. But the courts were a political as well as a judicial body. They were there to give the *coup de grâce* to discredited politicians; they were the heirs of ostracism. In private cases the speeches were often

such as might be addressed to modern juries; and we have little reason to impugn the verdicts. The vicious tendencies of the judicial system are obvious; the contamination of justice by politics; the weakening of responsibility through its diffusion among so many jurors; the rendering of unlike decisions in like cases. But the correctives were also present; the unexampled familiarity of common man with law and legal practice; and their unique experience in taking collective action in large bodies History contains no other instance of justice so thoroughly organized to accord with the principles of radical democracy The Athenians were so situated that they did not feel the need either of delegating their government to picked representatives or of entrusting their justice to experts specialized in law The Romans enshrined their justice in their great system and profession of the law, and, thus safeguarded in their private rights, left their government to autocrats

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GREEK LITERATURE. The literature of Greece is doubly unique among those of Europe In the first place, it developed, up to quite modern times, mainly from within, foreign influences being almost if not entirely absent, all other European nations have been influenced, more or less profoundly, from without In the second, it and it alone has a continuous history, extending from the second millennium B C to the present day It is convenient to divide it into three periods, Ancient, Mediaeval, and Modern, whereof the first may be again subdivided into (1) Early, to about the end of the Persian Wars (first quarter of the fifth century B C); (2) Attic, to about 300 B C; (3) Hellenistic, to the beginning of the Mediaeval period, conventionally fixed at the beginning of Justinian's reign (529 A D)

1. EARLY PERIOD

(*a*) **Epic and Pre-epic Literature.** When the *Achaioi* (to use Homer's commonest name for them) entered Greece about the middle of the second millennium B C, it appears that they spoke a common language which was already showing distinct traces of dialectical differences They possessed some rudiments of literature already, as hymns, harvest-songs, war-songs, dirges and the like, probably of more or less fixed form as to content and metre These were probably oral, and we know them mostly from mentions in Homer, although a few surviving fragments of popular songs give us an idea of what they may have been like Heroic ballads, celebrating notable men past and present, must also have been in vogue, and from the ballad-mongers developed in time a school of epic poetry, which for us is represented by its greatest master, Homer (*q v*), an extraordinary genius who, probably about 950 B C., composed the *Iliad* and *Odyssey*, utilizing his vast knowledge of the current sagas and myths, and undoubtedly including, after the manner of all great masters of literature, many reminiscences of the style and matter of earlier pieces His work was in all probability reduced to writing by himself, the metre was the hexameter[1] (*q v*), a form so complicated that it must have had a long history before he used it, his language is most reasonably explained as an artificial literary speech, generally intelligible, but not identical with any one local dialect; the place of composition was undoubtedly somewhere in Asia Minor, hence the language, although by no means identical with, has a considerable affinity to that form of Greek afterwards known as Ionic.

[1] ἔπος, the "verse" *par excellence*, hence the name epic (ἐπική, properly "written in hexameters," *sc.* "poetry")

Many modern authorities unhesitatingly and uncompromisingly reject, in all its forms, the theory of the multiple authorship of the Homeric poems, commenced in antiquity by the so-called *chorizontes* or separators (*sc.*, of the author of the *Odyssey* from the poet of the *Iliad*) and revived in modern times, first by Wolf, his predecessors and successors, then by the authors of the various theories, such as that of Grote, which suppose one or both of the poems to have grown from a considerable, but still comparatively short, nucleus. The details of this controversy must be left to the article Homer, but a statement of the position taken up with regard to it is necessary to make intelligible the chronology of much of this sketch The separatist theory is ultimately due to that habit of mind which finds it difficult to assume the existence of a transcendent genius. Every argument on which it rests has again and again been refuted

The Homeric poems, then, existed in substantially their present form by about the beginning of the last millenium B C They were published, if that term can be used, chiefly by the recitations of a gild of professional poets and reciters, (rhapsodes, ῥαψῳδοί lit "song-sewers") the so-called *Homeridai* (clan of Homer, a common form of gild-name) They were thus exposed to the numerous small changes in detail which naturally attend oral transmission, such as the substitution of current for obsolete words and forms, the addition or omission of single lines, groups of lines, possibly here and there even short episodes, and so forth But, although aberrant texts were thus produced, it seems probable that there existed from early times more authentic copies, going back ultimately to the poet's own ms Hence when the Alexandrian critics, and perhaps before them Peisistratus of Athens (sixth century B C), attempted to produce an authentic and reliable text, they were not left to mere conjecture or weighing of probabilities, but had at their disposal a certain number of mss which contained genuinely old tradition, not unrecognizably deformed

With this simultaneous preservation and deformation of the text went imitation and supplementing, not by additions to the *Iliad* and *Odyssey*, but by the composition of new poems, which told those parts of the heroic legends which Homer had not touched upon The authors of these works were Ionians, as were the *Homeridai*, to whom indeed it is highly likely that at least the earlier poets of this group belonged

The grammarian Proclus (A D 140) has preserved the names and subjects of some of these; but the fragments are very scanty The *Nostoi* or *Homeward Voyages*, by Agias (or Hagias) of Troezen, filled up the gap of ten years between the *Iliad* and the *Odyssey;* the *Lay of Telegonus*, by Eugammon of Cyrene, continued the story of the *Odyssey* to the death of Odysseus by the hand of Telegonus, the son whom Circe bore to him Similarly the *Cyprian Lays* by Stasinus of Cyprus, ascribed by others to Hegesias (or Hegesinus) of Salamis or Halicarnassus, was introductory to the *Iliad;* the *Aethiopis* and the *Sack of Troy*, by Arctinus of Miletus, and the *Little Iliad*, by Lesches of Mytilene, were supplementary to it These and many other names of lost epics—some taken also from the Theban myths (*Thebais, Epigoni, Oedipodea*)—serve to show how prolific were the followers of Homer (*see* Cycle)

The epic poetry of Ionia celebrated the great deeds of heroes in the old wars. But in Greece proper there arose another school of epic, which busied itself with religious lore and ethical precepts, especially in relation to the rural life of Boeotia This school is represented by the name of Hesiod The legend spoke of him as vanquishing Homer in a poetical contest of Chalcis in Euboea; and it expresses the fact that, to the old Greek mind, these two names stood for two contrasted epic types He is conjecturally placed about 850–800 B C, but some would refer him to the early part of the 7th century B C His home was at Ascra, a village in a valley under Helicon, whither his father had migrated from Cyme in Aeolis on the coast of Asia Minor. In Hesiod's *Works and Days* we have the earliest example of a didactic poem The seasons and the labours of the Boeotian farmer's year are followed by a list of the days which are lucky

or unlucky for work The *Theogony*, or "Origin of the Gods," describes first how the visible order of nature arose out of chaos; next, how the gods were born. Though it never possessed the character of a sacred book, it remained a standard authority on the genealogies of the gods. So far as a corrupt and confused text warrants a judgment, the poet was piecing together—not always intelligently—the fragments of a very old cosmogonic system, using for this purpose both the hymns preserved in the temples and the myths which lived in folklore A school of Hesiodic poets grew up, whose works included several long narrative poems, such as the 'Ηοῖαι, including the *Wooers of Helen* (whereof a fragment has been recovered from Egypt) and others The *Shield of Heracles* is, at least in form, an episode of the 'Ηοῖαι; it is 480 lines long and much influenced by *Iliad* xviii (the Arms of Achilles) A religious purpose was essentially characteristic of the Hesiodic school Its poets treated the old legends as relics of a sacred history, and not merely, in the Ionian manner, as subjects of idealizing art Such titles as the *Maxims of Cheiron* and the *Lay of Melampus, the seer*—lost poems of the Hesiodic school—illustrate its ethical and its mystic tendencies

The *Homeric Hymns* are a collection of pieces, some of them very short, in hexameter verse Their traditional title is—*Hymns* or *Preludes of Homer* and the *Homeridai* The second of the alternative designations is the true one The pieces are not "hymns" used in formal worship, but "preludes" or prefatory addresses (προοίμια) with which the rhapsodists ushered in their recitations of epic poetry The "prelude" might be addressed to the presiding god of the festival, or to any local deity whom the reciter wished to honour The pieces (of which there are 33) range in date perhaps from 750 to 500 B C (though some authorities assign dates as late as the 3rd and 4th centuries A D ; *see* ed by Sikes and Allen, *e g* p 228), and it is probable that the collection was formed in Attica, for the use of rhapsodists The style is an imitation of Homer's, in a much more recent form of Greek, but there are also several traces of the Hesiodic or Boeotian school The principal "hymns" are (1) to Apollo (generally treated as two or more hymns combined in one), (2) to Hermes, (3) to Aphrodite, and (4) to Demeter The hymn to Apollo, quoted by Thucydides (iii 104) as Homer's, is of peculiar interest on account of the lines describing the Ionian festival at Delos Two celebrated pieces of a sportive kind passed under Homer's name The lost *Margites*—a comic poem on one "who knew many things but knew them all badly"—is regarded by Aristotle as the earliest germ of comedy, and was possibly as old as 700 B C Only a few lines remain The *Batracho(myo)machia*, or *Battle of the Frogs and Mice* is of highly uncertain date[1]

(*b*) **Elegiac poetry.** Homer and his Ionian successors had used the hexameter as a vehicle for elevated narrative of adventure; the Hesiodic school had found another use for it, namely serious didactic works, such as in a later age were generally set forth in prose, a medium not then recognized as a literary form But all this while a political change had been operating Greece had passed from the empire of Agamemnon which Homer described to independent kingdoms and baronies; these in turn gave place to oligarchies, and by the seventh century this system in turn was showing clear signs of decay Hence the individual, the private citizen, was assuming daily greater relative importance Yet it seems to have been felt that so noble a measure as Homeric or even Hesiodic verse was hardly suitable for the expression of his sentiments, a lighter form, the elegiac couplet (*q v*) was invented, and rapidly became the medium for all manner of compositions, including dirges, love-songs, recruiting-songs, and what we should call essays suitable for prose The new medium became very popular and spread far beyond the Ionian race, as witness the Megarian Theognis (sixth century), who used it for a long series of reflections on personal, ethical and political matters, still extant, the Athenian Solon (somewhat earlier, about 639–559), and Tyrtaeus (seventh century), a man of uncertain nationality, who became the interpreter of contemporary Spartan aspirations. The name *elegos* is of uncertain origin, but certainly the first elegists were Ionians (Callinus of Ephesus, first half of the seventh century, is the earliest known). It never quite died out, and after being rather less in favour during the next period of literature, it revived in the Alexandrian epoch An important offshoot is the epigram, for which it is the favourite, although never the only, metre (*cf* ALEXANDRIAN SCHOOL).

(*c*) **Iambic poetry.** Another Ionian invention, destined to become an exceedingly important medium, was the iambic This form (*q v*), literally the "shooting" or "darting" metre (from *ἰάπτειν cf* the jesting handmaid Iambe in the legend of Demeter, *q v*) had nothing whatever to do with the hexameter, or with epic tradition, being closely akin to the rhythm of ordinary speech (Aristotle, *Rhet* iii 1408b 33), and therefore very well suited to realistic compositions In fact, the most famous masters of it (Archilochus of Paros, about 650, Hipponax of Ephesus, about a hundred years later) were celebrated as lampooners. For this purpose, the form known as the *skazon* or limping iambus was especially adapted But other subjects, notably fable, were handled, and Semonides (not Simonides) of Amorgus, a writer of uncertain, but fairly early date, has left us an amusing iambic poem on women, which explains how they were created from various beasts (mares, sows, and so on), the few good ones being made out of bees To this same period belongs, traditionally, the Phrygian Aesop (*Aisopos*), to whom later ages attributed a great number of beast-fables These, or some of them, were current from the time of Archilochus on, those which we now have are one and all late, whether in prose or in verse (*see* A Chambry, *Aesopi fabulae*, Paris 1925, and Halliday, *Greek and Roman Folklore*, New York 1927, p 101) In the fifth century, Athenian writers used iambics for the dialogue of both tragedy and comedy

(*d*) **Personal lyric.** Hitherto the centre had been Ionia, but the neighbouring Aeolians had meanwhile developed a quite different form of composition, the lyric, which may be described briefly as short songs, on personal topics, or at least treating their topic in an intensely personal manner As indicated by the name, they were meant to be sung to the lyre, the traditional accompaniment of the elegy was the oboe (*αὐλός see* AULOS) Traditionally, the lyre had originally but four strings, giving the tetrachord (*see* MUSIC, *Greek Music*), but an improvement attributed to Terpander of Lesbos (670) gave it seven strings, thus producing the octave Lesbos, in the 7th century B C , had attained some naval and commercial importance But the strife of oligarchy and democracy was active, the Lesbian nobles were often driven by revolution to exchange their luxurious home-life for the hardships of exile It is such a life of contrasts and excitements, working on a sensuous and fiery temperament, that is reflected in the fragments of Alcaeus, to which, in recent years, some small additions have been made from Egyptian papyri The other great representative of the Aeolian lyric is Sappho, the only woman of Greek race who is known to have possessed poetical genius of the first order Her fragments, which also have been supplemented by Egyptian discoveries, show together with extraordinary powers of expression, a very wide range of subject, from *badinage* to the most intense passion Anacreon of Teos, in Ionia, may be classed with the Aeolian lyrists in so far as the matter and form of his work resembled theirs, though the dialect in which he wrote was mainly the Ionian A few fragments remain from his hymns to the gods, from love-poems and festive songs The collection of short pieces, often very pretty, which passes current under his name date only from the 10th century The poems which it comprises are of various age and authorship, probably ranging in date from *c* 200 B C to A D 400 or 500

(*e*) **Choral lyric.** The last comers to Greece, the Dorians, had so far contributed nothing of their own But about the time of Sappho, a new school of poetry arose in Sparta, under the guidance of a Sardian, one Alcmaeon, or, as the Dorians called him, *Alkman*, and it spread rapidly among Doric-speaking peoples. This was choral lyric, voicing, not individual sentiments,

[1]Some attribute it, as well as the *Margites*, to Pigres of Halicarnassus, the supposed brother of the Carian queen Artemisia, who fought on the side of Xerxes at the battle of Salamis

but those of a community or part of a community. The chief fragment which survives of his work is a *parthenion*, or song intended for a chorus of girls, and it is still decidedly individual in tone, the members of the choir addressing all manner of remarks to each other. In Sicily a greater writer, so far as we can judge, rose up in the person of Stesichorus, who lived for the most part in Himera, and wrote, not of course in the Laconian dialect used by Alkman, but still in Doric, which was the speech of most Sicilian Greeks He seems to have written choral pieces on a grand scale, dealing with epic themes. Arion (*q v*) of Methymna in Lesbos is said to have given the dithyramb a literary form and Ibycus of Rhegium apparently wrote poems partaking of both Dorian and Aeolic character But the Boeotians again entered the field, as they had done in the days of epic poetry, the considerable fragments of their poetess Corinna, who lived in the fifth century, show that their dialect was used for choral lyric and therefore that the tradition of long poems, partly narrative in character, was established there also Meanwhile, the new fashion was reflected upon some parts of Ionia

In the fifth century we find three great lyric poets, all professional, writing to order and for pay, all using a dialect more or less Doric, and all writing poems to be sung by choirs, in elaborate metres, arranged generally on the principle of strophe, antistrophe, and epode (*see* STROPHE); yet none of them a Dorian by nationality Simonides of Ceos was an Ionian, and lived part of his life at Athens, his nephew was Bacchylides, of whose pretty and neat writings Egypt has provided us with a fairly large sample, and the greatest of them all was Pindar (*Pindaros*) of Thebes, who claimed Dorian descent, but was a thorough Boeotian The fragments which alone remain of the first (556–468) show that he lacked neither power, sweetness, nor variety; he did not confine himself to lyric, for several of the finest epigrams in all Greek are of his writing Pindar (518–*c.* 442) is represented for us by his *epinikian* odes, *i e*, choral songs in celebration of victories at the various great games, and by large fragments of other forms of ode, as *parthenia*, hymns, dirges and dithyrambs All, especially the first, are marked by an extraordinary richness of expression, made extremely difficult for us by the use not only of a somewhat artificial dialect but of a highly conventional style, full of bold and striking metaphors, often very strange to our taste Compared with him, Bacchylides gives the impression of writing more by rule than by inspiration, and of already presenting traces of degeneration; that lyric poetry did decline markedly is clear from what we have left of Timotheus of Miletus (died 357), whose *Persae* is a model of designed obscurity, forced would-be elevation of style, and general bad taste

(*f*) **Prose.** It remains only to say that the first use of prose as a literary medium is found among the *logographi* (*q v*) and philosophers of Ionia, and that their influence was sufficient to make Ionic continue as the recognized medium for historical composition and for some kinds of scientific treatise (notably medical, it is the language of the whole Hippocratic corpus) for a considerable time

2. ATTIC LITERATURE

(*a*) **Tragedy.** It had thus become the established convention that works of a conversational tone should be in Ionic, and in iambics, and that choral odes should be in Doric A form of literature arose which, with modifications, combined these traditions and made a new means of expression This was Tragedy, the first great contribution of Athens to literature Arising out of the worship of Dionysus, although the details are very obscure, it developed, traditionally under Thespis in the sixth century, into a series of narrative odes relating to the history of that god, or of other divine and heroic figures, interspersed with episodes, as they were called, in which an actor represented some adventure by means of narrative or of dialogue with the chorus After becoming somewhat more of a regular drama under Phrynichus, Pratinas, and Choerilus, it passed into the hands of Aeschylus (524–456), who became the real founder of tragedy by introducing a second actor, and thus rendering the dialogue independent of the chorus At the same time the choral song—hitherto the principal part of the performance—became subordinate to the dialogue; and drama was mature Aeschylus is also said to have made various improvements of detail in costume and the like; the system of the "trilogy" and the "tetralogy" is further ascribed to him,—the "trilogy" being properly a series of three tragedies connected in subject, such as the *Agamemnon, Choephori, Eumenides*, which together form the *Orestcia*, or Story of Orestes The "tetralogy" is such a triad with a "satyric drama" added—that is, a drama in which satyrs (*q v*) formed the chorus The fragmentary *Ichneutae* of Sophocles and the *Cyclops* of Euripides are the only extant specimens of a satyric drama In the seven tragedies which alone remain of the 70 which Aeschylus is said to have composed, besides the grandeur, at times rugged and obscure, of the whole, there is a strain of speculative thought markedly theological in tone. Sophocles, who was born some 30 years after Aeschylus, is the most perfect artist of the ancient drama No one before or after him gave to Greek tragedy so high a degree of ideal beauty, or appreciated so finely the possibilities and the limitations of its sphere He excels especially in drawing character, his *Antigone*, his *Ajax*, his *Oedipus*—indeed, all the chief persons of his dramas—are typical studies in the great primary emotions of human nature He gave a freer scope to tragic dialogue by adding a third actor, and in one of his later plays, the *Oedipus at Colonus*, a fourth actor is required From the time when he won the tragic prize against Aeschylus in 468 to his death in 405 B C he was the favourite dramatist of Athens Euripides was but some 15 years younger than Sophocles, but when he entered on his poetical career, the old inspirations of tragedy were already failing Euripides marks a period of transition in the drama, and is, in fact, a mediator between the classical and the romantic He was imbued with the new intellectual scepticism of the day, and the speculative views which were conflicting in his own mind are reflected in his plays He had much picturesque and pathetic power, he was a master of expression, and he shows ingenuity in devising fresh resources for tragedy—especially in the development of a type of plot alien to that of New Comedy (*see* below), exemplified in his *Ion*, which turns on the recognition of a long-lost son under exciting and romantic circumstances This, and his fondness for characters drawn from everyday life, were noted by ancient critics as well as by moderns, the latter is a commonplace in Aristophanes, the former insisted upon in the recently discovered *Life of Euripides* by Satyrus (3rd century B C) All the great tragic poets of Attica were remarkably prolific Aeschylus was the reputed author of 70 tragedies, Sophocles of 113, Euripides of 92; and there were others whose productiveness was equally great.

(*b*) **Comedy.** Comedy also arose out of the worship of Dionysus (its name is derived from κῶμος, *see* DRAMA), though again the details are obscure. The Dorians perhaps, first added dialogue to the comic chorus Susarion, a Dorian of Megara, exhibited, about 580 B C, pieces of the kind known as "Megarian farces" Epicharmus of Cos (who settled at Syracuse) gave literary form to the Doric farce, and treated in burlesque style the stories of gods and heroes, and subjects taken from everyday life His Syracusan contemporary Sophron (*c* 450) was a famous writer of mimes, chiefly scenes from low-class life The most artistic form of comedy seems, however, to have been developed in Attica The greatest names before Aristophanes are those of Cratinus and Eupolis, but from about 470 B C there seems to have been a continuous succession of comic dramatists, amongst them Plato Comicus, the author of 28 comedies, political satires and parodies after the style of the Middle Comedy Aristophanes came forward as a comic poet in 427 B C, and retained his popularity for about 40 years He presents a perhaps unique union of bold fancy, exquisite humour, critical acumen and lyrical power His 11 extant comedies may be divided into three groups, according as the licence of political satire becomes more and more restricted In the *Acharnians, Knights, Clouds, Wasps* and *Peace* (425–421) the poet uses unrestrained freedom. In the *Birds, Lysistrata, Thesmophoriazusae* and *Frogs* (414–405) a greater reserve may be perceived.

Lastly, in the *Ecclesiazusae* and the *Plutus* (392–388) personal satire is almost wholly avoided. The same general tendency continued The so-called "Middle Comedy" (390–320) represents the transition from the Old Comedy, or political satire, to satire of a literary or social nature; its chief writers were Antiphanes of Athens and Alexis of Thurii The "New Comedy" (320–250) resembled the modern "comedy of manners."

Its chief representative was Menander (342–291), the author of 105 comedies Fragments have been discovered of seven of these, and in the case of at least three, *Epitrepontes* (The Arbitration), *Perikeiromene* (The Eton Crop) and *Samia* (The Girl from Samos), the plot can be fairly well made out The chief characters are respectable middle-class Athenians, there are no outstandingly heroic figures and no utter villains. The story is of a kind which was then fairly new, but afterwards became exceedingly hackneyed, later comedians and also novelists copying Attic New Comedy *ad nauseam* The *Epitrepontes* will serve as a sample. Two country fellows have got possession of an exposed infant and quarrel as to who shall have the jewelry found with it They refer the dispute to an old gentleman, Smicrines (Mr Smallways), who decides it for them Smicrines has a daughter, Pamphile (Miss Lovely), recently married to a young Athenian, Charisius (Mr. Charming), who, to his horror, discovers that his wife has already borne a child He therefore seeks consolation from a woman of the town, Habrotonon (Love-at-ease) Onesimus (Helpful, Charisius's slave) now finds, in the possession of one of the rustics, a ring belonging to his master, which had been lost in an encounter with an unknown girl at a nocturnal festival After some complications, it turns out that the child is Pamphile's and that Charisius is the father; the missing end of the play no doubt showed a general reconciliation.

The merit of such a piece lies in the just, though slight, drawing of character, and in a certain rather faded elegance of style. Menander was hugely admired in antiquity, but he had neither the joyous exuberance of Aristophanes nor the vigour of his own Latin imitators (*see* LATIN LITERATURE) So far from Terence being *dimidiatus Menander*, it is rather the Athenian who is *dimidiatus Terentius*. Other prominent writers of this class were Diphilus, Philemon, Posidippus and Apollodorus of Carystus. About 330 B C Rhinthon of Tarentum revived the old Doric farce in his *Hilarotragoediae* or travesties of tragic stories These successive periods cannot be sharply or precisely marked off The change which gradually passed over the comic drama was simply the reflection of the change which passed over the political and social life of Athens The Old Comedy, as we see it in the earlier plays of Aristophanes, was probably the most powerful engine of public criticism that has ever existed in any community Unsparing personality was its essence The comic poet used this recognized right on an occasion at once festive and sacred, in a society where every man of any note was known by name and sight to the rest. (*See* DRAMA. *Greek*)

(*c*) **Historical Prose.** It has already been said that prose began in Ionia, hence we find that the first great historical writer, a Dorian by birth and strongly pro-Athenian in sentiment, writes in Ionian Herodotus of Halicarnassus set out to make an "enquiry" (ἱστορίη) into the great wars between Greece and Persia, and incidentally into the events leading up to that struggle, and the men and manners of the countries directly or indirectly involved To this task he brought a marvellous gift of lively narrative, a critical mind, tempered by respect for all forms of religion and relish for a good story (whence two characteristic turns of expression, a refusal to go any further with his narrative lest he trespass on a ἱερὸς λόγος, or legend which should properly be told only to the initiates in some mystery-cult; and the telling in full of a tale which he says he himself does not believe), and an interest in all things human which makes him the father, not only of history, but of anthropology. To this must be added a knowledge of the many theories of history, geography, and the development of religious cult then prevalent The result is a work of inexhaustible interest, generally fully reliable when the author speaks from his own knowledge, and always delightful.

Herodotus was born in 484 B.C ; and his history was probably not completed before the beginning of the Peloponnesian War (431 B.C.) As might be expected, he owes much of his technique and not a little of his subject matter to earlier writers, notably Hecataeus; (*see* LOGOGRAPHI); but when we turn to the larger aspects of his work, Herodotus stands forth as an artist whose conception and whose method were his own. His history has an epic unity Various as are the subordinate parts, the action narrated is one, great and complete; and the unity is due to this, that Herodotus refers all events of human history to the principle of divine Nemesis His weaknesses are lack of insight into political and strategic cause and effect, and a lack of interest in the history of political institutions. Both his strength and his weakness are seen most clearly when he is contrasted with that other historian who was strictly his contemporary and who yet seems divided from him by centuries

Thucydides was only thirteen years younger than Herodotus; but the intellectual space between the men is so great that they seem to belong to different ages. Herodotus is the last great Ionian, Thucydides the first great Attic prose writer Herodotus is the first artist in historical writing, Thucydides is artist and thinker as well Herodotus interweaves two threads of causation —human agency, represented by the good or bad qualities of men, and divine agency, represented by the vigilance of the gods on behalf of justice Thucydides concentrates his attention on the human agency (without, however, denying the other), and strives to trace its exact course Hence, while the older historian may be said to write a prose epic, the younger and greater, without sacrificing an iota of exactness and truth, has all the concentrated interest of a drama. The subject of Thucydides is the Peloponnesian War. In resolving to write its history, he was moved, he says, by these considerations. It was probably the greatest movement which had ever affected Hellas collectively It was possible for him as a contemporary to record it with approximate accuracy And this record was likely to have a general value, over and above its particular interest as a record, seeing that the political future was likely to resemble the political past This is what Thucydides means when he calls his work "a possession for ever." The speeches which he ascribes to the persons of the history are, as regards form, his own essays in rhetoric of the school to which Antiphon belongs. As regards matter, they are always so far dramatic that the thoughts and sentiments are such as he conceived possible for the supposed speaker They thus take the place of the comment which a modern historian would make in his own person, and serve as the chorus to his tragedy Xenophon of Athens (430–*c.* 354) has not the grasp either of the dramatist or of the philosopher His work does not possess the higher unity either of art or of science The true distinction of Xenophon consists in his thorough combination of the practical with the literary character He was an accomplished soldier, who had done and seen much He was also a good writer, who could make a story both clear and lively But the several parts of the story are not grouped around any central idea, such as a divine Nemesis is for Herodotus, or such as Thucydides finds in the nature of political man The seven books of the *Hellenica* form a supplement to the history of Thucydides, beginning in 411 and going down to 362 B C The chief blot on the *Hellenica* is the author's partiality to Sparta, and in particular to Agesilaus Some of the greatest achievements of Epameinondas and Pelopidas are passed over in silence. On the whole, Xenophon is perhaps seen at his best in his narrative of the *Retreat of the Ten Thousand*—a subject which exactly suits him *The Education of Cyrus* is our earliest historical romance, and that is its chief interest. *The Recollections of Socrates* fail lamentably to reveal a character which Xenophon admired but never understood; their historical value has been much exaggerated. In his minor pieces on various subjects Xenophon appears as the earliest essayist. It may be noted that one of the essays erroneously ascribed to him—that *On the Athenian Polity*—is probably the oldest specimen in existence of literary Attic prose

His contemporaries Ctesias of Cnidus and Philistus of Syracuse

wrote histories of Persia and Sicily. In the second half of the 4th century a number of histories were compiled by literary men of little practical knowledge, who had been trained in the rhetorical schools. Such were Ephorus of Cyme and Theopompus of Chios, both pupils of Isocrates; and the writers of *Atthides* (chronicles of Attic history), the chief of whom were Androtion and Philochorus. Timaeus of Tauromenium was the author of a great work on Sicily, and introduced the system of reckoning by Olympiads

(*d*) **Oratory.** The steps by which an Attic prose style was developed, and the principal forms which it assumed, can be traced most clearly in the Attic orators Every Athenian citizen who aspired to take part in the affairs of the city, or even to be qualified for self-defence before a law-court, required to have some degree of skill in public speaking, and an Athenian audience looked upon public debate, whether political or forensic, as a competitive trial of proficiency in a fine art Hence the speaker, no less than the writer, was necessarily a student of finished expression, and oratory had a more direct influence on the general structure of literary prose than has ever perhaps been the case elsewhere A systematic rhetoric took its rise in Sicily, where Corax of Syracuse (466 B C) devised his *Art of Words* to assist those who were pleading before the law-courts; and it was brought to Athens by his disciple Tisias The teaching of the Sophists, again, directed attention to grammar and logic; and Gorgias of Leontini gave an impulse at Athens to the taste for elaborate rhetorical brilliancy

Antiphon represents the earliest, and what has been called the grand, style of Attic prose; its chief characteristics are a grave, dignified movement, a frequent emphasis on verbal contrasts, and a certain austere elevation The interest of Andocides is mainly historical, but he has graphic power Lysias, the representative of the "plain style," breaks through the rigid mannerism of the elder school, and uses the language of daily life with an ease and grace which though the result of study, do not betray their art He is, in his own way, the canon of an Attic style, and his speeches written for others, exhibit also a high degree of dramatic skill Isocrates, whose manner may be regarded as intermediate between that of Antiphon and that of Lysias, wrote for readers rather than for hearers The type of literary prose which he founded is distinguished by ample periods, by studied smoothness and by the temperate use of rhetorical ornament From the middle of the 4th century B C the Isocratic style of prose became general in Greek literature The speeches of Isaeus in will-cases are interesting,—apart from their bearing on Attic life,—because in them we see, as Dionysius says, "the seeds and the beginnings" of that technical mastery in rhetorical argument which Demosthenes carries to perfection Isaeus has also, in a degree, some of the qualities of Lysias Demosthenes excels all other orators not only in power but in variety; his political speeches, his orations in public or private causes, show his consummate and versatile command over all the resources of the language. In him the development of Attic prose is completed, and the best elements in each of its earlier phases are united The modern world can more easily appreciate Demosthenes as a great natural orator than as an elaborate artist. But, in order to apprehend his place in the history of Attic prose, we must remember that the ancients felt him to be both; and that he was even reproached by detractors with excessive study of effect Aeschines is the most theatrical of the Greek orators; he is vehement, and often brilliant, but seldom persuasive Hypereides was, after Demosthenes, probably the most effective, he had much of the grace of Lysias, but also a wit, a fire and a pathos which were his own Portions of six of his speeches, found in Egypt between 1847 and 1890, are extant. The one oration of Lycurgus which remains to us is earnest and stately, reminding us both of Antiphon and of Isocrates Deinarchus was merely a bad imitator of Demosthenes. There seems more reason to regret that Demades is not represented by larger fragments. The decline of Attic oratory may be dated from Demetrius of Phalerum (318 B C.), the pupil of Aristotle. He forms a connecting link between Athens and Alexandria, where he found refuge after his downfall and promoted the foundation of the famous library

(*e*) **Philosophical Prose.** The 5th and 4th centuries saw the abandonment of verse (still used by Parmenides) as a medium for serious philosophic works, and the development, at Athens, of a style and vocabulary suited to philosophy. The greatest name is that of Plato The literary genius shown in his dialogues is many-sided. it includes dramatic power, remarkable skill in parody, a subtle faculty of satire, and, generally, a command over the finer tones of language In passages of continuous exposition, where the argument rises into the higher regions of discussion, Plato's prose takes a more decidedly poetical colouring—never florid or sentimental, however, but lofty and austere In Plato's later works, notably the *Laws,* we can perceive the influence of Isocrates on his style Aristotle's influence on the form of Attic prose literature would probably have been considerable if his *Rhetoric* had been published while Attic oratory had still a vigorous life before it But in this, as in other departments of mental effort, it was Aristotle's lot to set in order what the Greek intellect had done in that creative period which had now come to an end Of his own style, which Cicero praises we can hardly judge, for the surviving works are rather of the nature of lecture notes than of finished literary performances Accurate and showing full mastery of an elaborate technical vocabulary, they are often condensed to the point of obscurity or so free of ornament as to be cold and dry Theophrastus his pupil and his successor in the Lyceum, opens the new age of research and scientific classification with his extant works on botany, but is better known to modern readers by his lively *Characters,* the prototypes of such sketches in English literature as those of Hall, Overbury and Earle

3. HELLENISTIC LITERATURE

The intensely active life of the independent Greek city states was plainly a most important factor in their literature and art Once the individual Greek ceased to be a relatively important unit of a small self-governing community, his inspiration, although not his technical skill, dwindled, and no more works of the very first order were produced after the conquest of Greece by Philip II of Macedon Then came Alexander's conquests; Greek civilization was diffused over Asia and the East by means of Greek colonies in which Asiatic and Greek elements were mingled The life of such settlements, under the monarchies into which Alexander's empire broke up, could not be animated by the spirit of the Greek commonwealths in the old days of political freedom But the externals of Greek life were there—the temples the statues, the theatres, the porticos Ceremonies and festivals were conducted in the Greek manner In private life Greek usages prevailed Greek was the language most used, Greek books were in demand The mixture of races would always in some measure distinguish even the outward life of such a community from that of a pure Greek state; and the facility with which Greek civilization was adopted would vary in different places Syria, for example, was rapidly and completely Hellenized; Judaea resisted the process to the last In Egypt a Greek aristocracy of office, birth and intellect existed side by side with a distinct native life. But, viewed in its broadest aspect, this new civilization may be called Hellenism Hellenism (*q v*) means the adoption of Hellenic ways; and it is properly applied to a civilization, generally Hellenic in external things, pervading people not necessarily or exclusively Hellenic by race What the Hellenic literature was to Hellas, that the Hellenistic literature was to Hellenism The literature of Hellenism has the Hellenic form without the Hellenic soul. A great writer is always something more than an individual; thus Sophocles may be said to embody Periclean Athens, Virgil, Augustan Rome, Shakespeare Elizabethan England But the Hellenistic writers, subjects of empires that were none of their own creation, had no longer a community which they could symbolize

This is not, however, to say that Hellenistic literature has no interest or value. On the contrary, there has perhaps never been a time when so many respectable works of the second class were

produced, both in verse and in prose, and the study of the writers from about 300 B C onwards is full of variety and even fascination There were many who had something to say, and very many who studied how best to say it, a process which gave rise to a considerable amount of good criticism but also to a too exclusive cult of mere outward form

(*a*) **Poetry.** Neglecting the enfeebled survival of the older forms (for personal and choral lyric, dramas of all kinds, epics and elegies all continued to be written), we may take Alexandria as the centre of the new poetical movements Details are given in the article ALEXANDRIAN SCHOOL; for our present purposes it is enough to remark on the highly finished and to a great extent original craftsmanship of Callimachus and his disciples. When it is considered that, apart from many technical improvements in metre, they produced the short story in verse (*epullion*), the purely literary didactic poem, the pastoral, and one might almost add the epigram as a literary *genre*, it is evident that they are not to be neglected in a survey of literature, and their influence, exerted principally through their Roman pupils, has been very great. In general it may be said of their poetry that, lacking breadth and deep inspiration, it succeeded best when it limited itself most, as in the exquisite *Idylls* of Theocritus, which set out to give a somewhat idealized picture of little scenes from country or town life; and that when it failed most lamentably, as in the inordinately dull puzzle-verse of Lycophron, it did so chiefly from lack of that instinctive good taste which is one of the leading characteristics of genuine Hellenic art

(*b*) **Literary prose.** The Hellenistic empires had an imperial speech, the so-called *κοινή* or common dialect, before whose influence all the local dialects rapidly vanished—witness the facts that inscriptions in them become more and more obviously artificial, when they occur at all, and that the modern Greek dialects show hardly a trace of the old ones, being almost all local developments of the *κοινή*. Naturally the question arose how best to use this new speech, which was expressive and varied although it lacked the peculiar virtues of the old national speeches, in the best way. In Asia Minor a new school of expression grew up, known as Asianism, in which one of the greatest names was that of Hegesias of Magnesia (about 250 B C) Its characteristics were an inordinate love of short, balanced, elaborately rhythmical clauses, making full use of every ornament which the earlier rhetoricians from Gorgias on had evolved, and too often sacrificing sense to sound Most of the works of these writers are completely lost, but enough fragments remain to show us that we have their influence at work in several Latin writers, such as the younger Seneca, and that Asianism is one of the forces which went to form the style of St Paul

The extravagances of Asianism brought about a reaction, however, and there grew up a different school of oratory in Rhodes, which claimed to go back to Aeschines, that orator having retired there after his defeat by Demosthenes It combined with the periodic structure of Attic prose much of the Asianic ornament, used in a less excessive fashion That it had real merit is apparent from the fact that in a later age Cicero and Caesar were pupils of a rhetorician of this school, Apollonius Molon (Cicero, *Brutus*, 312, 316, Suetonius, *Divus Iulius*, 4, 1)

(*c*) **Scientific prose.** The scientific and scholarly activity of this period and the next was immense, and there developed a style which, without wholly neglecting literary graces (as for example, the avoidance of hiatus which Isocrates had inculcated) was on the whole plain, workmanlike and unaffected, with a large technical vocabulary appropriate to the critic, mathematician, naturalist, geographer or writer on medicine.

(*d*) **Philosophical prose and verse.** Many philosophers of this age wrote an atrocious style; that of Epicurus (*q.v.*) is particularly bad But there grew up, especially among the Cynics (*q.v.*) a tendency to appeal to the conscience of the ordinary man by means of short lectures or sermons (*διατριβαί*), and these gave rise to compositions in verse having the same end, which we may consider forerunners of Roman satire, particularly that of Horace and Persius. An outstanding name here is that of Cercidas (third century B C), of whose *meliamboi* we have now some specimens, recovered from Egypt; *see* J U. Powell, *Collectanea Alexandrina*, p. 201.

The later, or Graeco-Roman period of Hellenistic literature may be dated from the Roman subjugation of Greece Rome now gradually became the point to which the greatest workers in every kind were drawn. Greek literature had already made a home there before the close of the 2nd century B C Sulla brought a Greek library from Athens to Rome. Such men as Cicero and Atticus were indefatigable collectors and readers of Greek books - The power of speaking and writing the Greek language became an indispensable accomplishment for highly educated Romans, till in the third century A D it nearly drove out Latin as a literary medium Rome became more and more the rival of Alexandria, not only as possessing great libraries, but also as a seat of learning at which Greek men of letters found appreciation and encouragement Greek poetry, especially in its higher forms, rhetoric and literary criticism, history and philosophy, were all cultivated by Greek writers at Rome

The first part of the Graeco-Roman period may be defined as extending from 146 B C to the close of the Roman republic At its commencement stands the name of one who had more real affinity than any of his contemporaries with the great writers of old Athens, and who, at the same time, saw most clearly how the empire of the world was passing to Rome The subject of Polybius (*c* 205–120) was the history of Roman conquest from 264 to 146 B C His style, plain and straightforward, proclaims him a scientist rather than a rhetorician But the distinction of Polybius is that he is the last Greek writer who in some measure retains the spirit of the old citizen-life He chose his subject with a motive akin to that which prompted the history of Thucydides—namely, because, as a Greek citizen, he felt intensely the political importance of those wars which had given Rome the mastery of the world The chief historical work which the following century produced—the *Universal History* of Diodorus Siculus (fl *c* 50 B C)—resembled that of Polybius in recognizing Rome as the political centre of the earth, but Diodorus is a mere compiler, useful because he draws on older works now lost, but often exceedingly dull

Classicism and Atticism. Hellenistic literature always tended to classicize, *i e*, to imitate the great ancient writers instead of striking out new lines of thought or expression About the last century B C there arose a particular form of this, known as Atticism Rightly admiring,—for many of them were good critics,—the style of the great Attic *prosateurs*, most of the literary men of the time set themselves deliberately to write in their language, which had not been spoken for some two hundred years It was as if English writers of to-day were to confine themselves to the style and vocabulary of Addison, but the movement was successful, and coloured all the literary prose of that and succeeding epochs Not one of the Atticizers has real merit, save Lucian, it is to the credit of Plutarch (about 46—after 120 A D) that he Atticizes but little; the scientific writers, such as Strabo the geographer and the physician Galen, generally wrote literary Hellenistic, many of the philosophers, including the Christian apologists and the great Jewish thinker Philon of Alexandria (first century A D), being Platonists, wrote more or less Platonic prose; the earlier Christian writers, notably those of the New Testament, generally did not classicize at all, but were influenced by the Hebraizing Greek of the Septuagint Excessive attention to form gave rise to the phenomenon known as the second sophistic, when a number of writers and orators arose who showed a most extraordinary virtuosity in handling their artificial language, combined with a lack alike of taste and of thought.

In the manifold prose work of this period, four principal departments may be distinguished. (1) *History*, with *Biography*, and *Geography*. History is represented by Dionysius of Halicarnassus—also memorable for his criticisms on the orators and his effort to revive a true standard of Attic prose—by Cassius Dio, Josephus, Arrian, Appian, Herodian, Eusebius and Zosimus In biography, the foremost names are Plutarch, Diogenes Laërtius and Philostratus; in geography, Hipparchus of Nicaea, Strabo,

Ptolemy and Pausanias. (2) *Erudition* and *Science* Under this head may be mentioned such as the lexicon of Julius Pollux, and the lost works drawn upon by Harpocration and Hesychius, Hephaestion's treatise on metre, and Herodian's system of accentuation; the commentaries of Galen on Plato and on Hippocrates; the learned miscellanies of Athenaeus, Aelian and Stobaeus; and the *Stratagems* of Polyaenus. (3) *Rhetoric* and *Belles-Lettres* The most popular writers on the theory of rhetoric were Hermagoras, Hermogenes, Aphthonius and Cassius Longinus—the last the reputed author of the essay *On Sublimity*. Among the most renowned teachers of rhetoric—now distinctively called "Sophists," or rhetoricians—were Dio Chrysostom, Aelius Aristides, Themistius, Himerius, Herodes Atticus and Libanius. Akin to the rhetorical exercises were various forms of ornamental or imaginative prose—dialogues, letters, essays or novels Lucian, in his dialogues, exhibits more of the classical style and of the classical spirit than any writer of the later age, he has also a remarkable affinity with the tone of modern satire, as in Swift or Voltaire. The emperor Julian was the author both of orations and of satirical pieces.

Recent discoveries have thrown more light on the history of the Greek novel, a *genre* which begins about a hundred years before our era with the Milesian Tales of Aristeides, and continues down to early mediaeval times with the works of such writers as Chariton, Achilles Tatius, Longus, Heliodorus, and others In all of these, the plot is much the same, a pair of lovers are separated or for some reason unable to marry, until, after all manner of extraordinary adventures, often suggestive of a cinematograph film, they are made happy New Comedy is one of the principal sources for characters and part at least of the plot, but the influence of Oriental romances may reasonably be inferred Some Christian novels of an edifying type were written; the most famous is the *Recognitions* falsely ascribed to Clement of Rome, which survives in a Latin translation and is a strange mixture of theology, thaumaturgy, and the re-union of long-lost relatives The same age gave birth to large collections of the fictitious letters of famous historical and literary characters, as Phalaris, Themistocles, Hippocrates, Socrates, Euripides and many others, besides letters from persons wholly imaginary, as some of Alciphron's and all those of Aelian New Comedy again, and occasionally pastoral poetry, was drawn upon for incidents and language (4) *Philosophy* is represented chiefly by Epictetus and Marcus Aurelius, in both of whom the Stoic element is the prevailing one; by the Neoplatonists, such as Plotinus, Porphyry, Iamblichus; and by Proclus, of that eclectic school which arose at Athens in the 5th century AD

The Greek poetry of this period presents no work of high merit Babrius versified the Aesopic *Fables;* the two Oppians wrote didactic poems on fishing and hunting, Nonnus and Quintus Smyrnaeus made elaborate essays in epic verse, and Orphism produced some poems and hymns The so-called Sibylline Oracles, in hexameter verse, range in date from about 170 BC to AD 700 By far the most pleasing compositions in verse which have come to us from this age are some of the short poems in the Greek Anthology.

The 4th century may be said to mark the beginning of the last stage in the decay of literary Hellenism From that point the decline was rapid and nearly continuous Christianity had now learned from it all that it was willing to learn, and a large Christian literature existed, estranged from the old ideals In AD 529 Justinian put forth an edict by which the schools of heathen philosophy were formally closed The act had at least a symbolical meaning. It is necessary to guard against the supposition that such assumed landmarks in political or literary history always mark a definite transition from one order of things to another But it is practically convenient to use such landmarks

The above sketch represents our knowledge at the time of writing But the study of Greek literature is continually advancing, partly by new discoveries, partly by re-consideration of the old ones To speak of the former only, within the last generation we have found, among Egyptian rubbish-heaps, besides a large number of fragmentary mss of authors already known, several poems of Bacchylides, of whom previously we knew practically nothing, much of Pindar; the *Constitution of Athens* (*q v*), generally ascribed to Aristotle; the *Ichneutai* of Sophocles, battered, indeed, but in large part intelligible; a great part of the *Hypsipyle* of Euripides; the plays of Menander already mentioned, the Mimes of Herodas; a considerable fragment of a historian, not certainly identified, of the fourth century BC (the "Oxyrhynchus Historian"), and very numerous smaller fragments of many authors from Hesiod down These are the more important literary discoveries, in addition, we have many scraps of popular compositions, songs, farces of the Alexandrian music-halls, and the like, and thousands of non-literary documents, as private letters, official correspondence, records and accounts, both public and private, and the like Herculaneum long ago yielded a number of badly-charred but not wholly illegible rolls, the private library of some one interested in the later Epicurean philosophy, the present excavations (1928) may at any moment produce more books, perhaps containing lost works of great importance Inscriptions, moreover, are constantly being discovered, and have already furnished us with several hymns and paeans, the compendium of Epicureanism known as the Testament of Diogenes of Oenoanda, and much other interesting information, throwing often a welcome light on the development of literature or philosophy. Hence a final history of the subject cannot be written, so long as there is still work of exploration to do, and even supposing that all is accomplished, and the last possible scrap of material found and commented upon, still the productions of so great and fertile a genius as that of Greece would need re-interpretation for each succeeding century.

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BYZANTINE LITERATURE

By "Byzantine literature" is generally meant the literature, written in Greek, of the so-called Byzantine period There is no justification whatever for the inclusion of Latin works of the time of the East Roman empire The close of the Byzantine period is clearly marked by the year 1453, at which date, with the fall of the Eastern empire, the peculiar culture and literary life of the Byzantines came to an end It is only as regards the beginning of the Byzantine period that any doubts exist There are no sufficient grounds for dating it from Justinian, as was formerly often done In surveying the whole development of the political, ecclesiastical and literary life and of the general culture of the Roman empire, and particularly of its eastern portion, we arrive, on the contrary, at the conclusion that the actual date of the beginning of this new era—*i e*, the Christian-Byzantine, in contradistinction to the

Pagan-Greek and Pagan-Roman—falls within the reign of Constantine the Great

The reign of Constantine the Great undoubtedly marks the beginning of a new period in the most important spheres of national life, but it is equally certain that in most of them ancient tradition long continued to exercise an influence Sudden breaches of continuity are less common in the general culture and literary life of the world than in its political or ecclesiastical development This is true of the transition from pagan antiquity to the Christian middle ages Many centuries passed before the final victory of the new religious ideas and the new spirit in public and private intellectual and moral life The last noteworthy remnants of paganism disappeared as late as the 6th and 7th centuries The last great educational establishment which rested upon pagan foundations—the University of Athens—was not abolished till AD 529 The Hellenizing of the seat of empire and of the State, which was essential to the independent development of Byzantine literature proceeds yet more slowly. The first purely *Greek* emperor was Tiberius II (578–582); but the complete Hellenizing of the character of the State had not been accomplished until the 7th century

In order to estimate rightly the character of Byzantine literature and its distinctive peculiarities, in contradistinction to ancient Greek, it is imperative to examine the great difference between the civilizations that produced them The Byzantine did not possess the homogeneous, organically constructed system of the ancient civilization, but was the outcome of an amalgamation of which Hellenism formed the basis For, although the Latin character of the empire was at first completely retained, even after its final division in 395, yet the dominant position of Greek in the Eastern empire gradually led to the Hellenizing of the State

In spite of the dominant position of Greek in the Eastern empire, a linguistic and national uniformity such as formed the foundation of the old Latin *Imperium Romanum* never existed there It might have been expected that the Hellenizing of the political system of the Eastern empire would have likewise entailed the Hellenizing of the non-Greek portions of the empire Such, however, was not the case, for all the conditions precedent to such a development were wanting The Greeks did not possess that enormous political energy and force which enabled the Romans to assimilate foreign races, and moreover they were confronted by sturdy Oriental, mostly Semitic, peoples, who were by no means so easy to subjugate as were the racially related inhabitants of Gaul and Spain

The influence of Greek culture then, was very slight, how little indeed it penetrated into the Oriental mind is shown by the fact that, after the violent Arab invasion in the south-east corner of the Mediterranean, the Copts and Syrians were able to retain their language and their national characteristics, while Greek culture almost completely disappeared The one great instance of assimilation of foreign nationalities by the Greeks is the Hellenizing of the Slavs, who from the 6th century had migrated into central Greece and the Peloponnese All other non-Greek tribes of any importance which came, whether for longer or for shorter periods, within the sphere of the Eastern empire and its civilization—such as the Copts, Syrians, Armenians, Georgians, Rumanians, Serbs, Bulgarians, Albanians—one and all retained their nationality and language The complete Latinizing of the West has accordingly no counterpart in a similar Hellenizing of the East.

Though the character of Byzantine culture is mainly Greek, and Byzantine literature is attached by countless threads to ancient Greek literature, yet the Roman element forms a very essential part of it The whole political character of the Byzantine empire is, despite its Greek form and colouring, genuinely Roman. Legislation and administration, the military and naval traditions, are old Roman work, and as such, apart from immaterial alterations, they continued to exist and operate, even when the State in head and limbs had become Greek. *Rhomaioi* was the most common popular term for Greeks during the Turkish period, and remains so still. The old glorious name "Hellene" was used under the empire and even during the middle ages in a contemptuous sense—"Heathen"—and has only in quite modern times, on the formation of the kingdom of "Hellas," been artificially revived. The vast organization of the Roman political system could not but exercise in various ways a profound influence upon Byzantine civilization, and it often seemed as if Roman political principles had educated and nerved the unpolitical people to great political enterprise The Roman influence has left distinct traces in the Greek language; Greek of the Byzantine and modern period is rich in Latin terms for conceptions connected with the departments of justice, administration and the imperial court

Oriental Influences.—But by far the most momentous and radical change wrought on the old Hellenism was effected by Christianity, and yet the transition was, in fact, by no means so abrupt as one might be led to believe by comparing the Pagan-Hellenic culture of Plato's day with the Christian-Byzantine of the time of Justinian For the path had been most effectually prepared for the new religion by the crumbling away of the ancient belief in the gods, by the humane doctrine of the Stoics, and, finally, by the mystic intellectual tendencies of Neoplatonism. Moreover, in many respects Christianity met paganism halfway by adapting itself to popular usages and ideas and by adopting important parts of the pagan literature The whole educational system especially, even in Christian times, was in a very remarkable manner based almost entirely on the methods and material inherited from paganism Next to the influences of Rome and of Christianity, that of the East was of importance in developing the Byzantine civilization, and in lending Byzantine literature its distinctive character Much that was Oriental in the Eastern empire dates back to ancient times, notably to the period of Alexander the Great and his successors In Egypt, Palestine and Syria, in Asia Minor as far inland as Mesopotamia, Greek and Oriental characteristics were often blended In respect to the wealth and the long duration of its Greek intellectual life, Egypt stands supreme It covers a period of nearly 1,000 years from the foundation of Alexandria down to the conquest of Egypt by the Arabs (AD 643) The soil of Egypt proved itself especially productive of Greek literature under the Cross (Origen, Athanasius, Arius, Synesius), in the same way as the soil of North Africa was productive of Latin literature (Tertullian, Cyprian, Lactantius, Augustine) Monastic life, which is one of the chief characteristic elements of Christian-Byzantine civilization, had its birth in Egypt

Syria and Palestine came under the influence of Greek civilization at a later date than Egypt In these, Greek literature and culture attained their highest development between the 3rd and the 8th centuries of the Christian era Antioch rose to great influence, owing at first to its pagan school of rhetoric and later to its Christian school of exegesis Gaza was renowned for its school of rhetoric, Berytus for its academy of law It is no mere accident that sacred poetry, aesthetically the most valuable class of Byzantine literature, was born in Syria and Palestine In Asia Minor, the cities of Tarsus, Caesarea, Nicaea, Smyrna, Ephesus, Nicopolis, etc , were all influential centres of Greek culture and literature. For instance, the three great fathers of Cappadocia, Basil, Gregory of Nyssa, and Gregory of Nazianzus, all belonged to Asia Minor If all the greater Greek authors of the first eight centuries of the Christian era, *i e*, the period of the complete development of Byzantine culture, be classified according to the countries of their birth, the significant fact becomes evident that nine-tenths come from the African and Asiatic districts, which were for the most part opened up only after Alexander the Great, and only one-tenth from European Greece The whole literature of Egypt, Syria and Asia Minor cannot, despite its international and cosmopolitan character, disavow the influence of the Oriental soil on which it was nourished. Yet the growth of too strong a local colouring in its literature was repressed, partly by the checks imposed by ancient Greek tradition, partly by the spirit of Christianity which reconciled all national distinctions Even more clearly and unmistakably is Oriental influence shown in the province of Byzantine art, as Joseph Strzygowski has conclusively proved.

Language.—The greater portion of the Greek literature from

the close of ancient times down to the threshold of modern history was written in a language identical in its principal features with the common literary language, the so-called *Koinē*, which had its origin in the Alexandrian age. This is the literary form of Greek as a universal language, though a form that scintillates with many facets, from an almost Attic diction down to one that approaches the language of everyday life such as we have, for instance, in the New Testament. From what has been already said, it follows that this stable literary language cannot always have remained a language of ordinary life. For, like every living tongue, the vernacular Greek continually changed in pronunciation and form, as well as in vocabulary and grammar, and thus the living language surely and gradually separated itself from the rigid written language. This progressive tendency might well have led, in the 11th and 12th centuries, to the founding in the Greek vernacular of a new literary language similar to the promising national languages and literature which, at that period, in the Romance countries, developed out of the despised popular idiom. In the case of the Byzantines, unfortunately, such a radical change never took place All attempts in the direction of a popular reform of the literary language, which were occasionally made in the period from the 6th to the 10th centuries, were in turn extinguished by the resuscitation of classical studies, a movement which, begun in the 9th century by Photius and continued in the 11th by Psellus, attained its full development under the Comneni and the Palaeologi Thus the language of the Byzantine writers of the 11th–15th centuries is almost Old Greek in colour; artificially learnt by grammar, lexicon and assiduous reading, it followed Attic models more and more slavishly, to such an extent that, in determining the date of works, the paradoxical principle holds good that the more ancient the language the more recent the author.

Owing to the artificial return to ancient Greek, the contrast that had long existed with the vernacular was now for the first time fully revealed The gulf between the two forms of language could no longer be bridged, and this fact found its expression in literature also While the vulgarizing authors of the 6th–10th centuries, like the Latin-writing Franks (such as Gregory of Tours), still attempted a compromise between the language of the schools and that of conversation, we meet after the 12th century with authors who freely and naturally employed the vernacular in their literary works. They accordingly form the Greek counterpart of the oldest writers in Italian, French and other Romance languages That they could not succeed like their Roman colleagues, and always remained the pariahs of Greek literature, is due to the all-powerful philological-antiquarian tendency which existed under the Comneni and the Palaeologi Yet once more did the vernacular attempt to assert its literary rights, *i.e.*, in Crete and some other islands in the 16th and 17th centuries Though for the time being foiled by the classical reaction of the 19th century, the vernacular seems destined to gain the upper hand at all events in literature of an imaginative character.

The whole Byzantine intellectual life, like that of the Western mediaeval period, is dominated by theological interests Theology accordingly, in literature too, occupies the chief place, in regard to both quantity and quality Next to it comes the writing of history, which the Byzantines cultivated with great conscientiousness until after the fall of the empire All other kinds of prose writing, *e.g.*, in geography, philosophy, rhetoric and the technical sciences, were comparatively neglected, and such works are of value for the most part only in so far as they preserve and interpret old material In poetry, again, theology takes the lead The poetry of the Church produced works of high aesthetic merit and enduring value In secular poetry, the writing of epigrams especially was cultivated with assiduity and often with ability. In popular literature poetry predominates, and many productions worthy of notice, new both in matter and in form, are met with here.

Theology.—The great classical period of Greek theological literature is that of the 4th century. Various factors contributed to this result—some of them positive, particularly the establishment of Christianity as the official religion and the protection accorded to it by the State, others negative, *i.e.*, the heretical movements, especially Arianism, which at this period arose in the east of the empire and threatened the unity of the doctrine and organization of the Church It was chiefly against these that the subtle Athanasius of Alexandria directed his attacks The learned Eusebius founded a new department of literature, church history In Egypt, Antonius (St. Anthony) founded the Greek monastic system, Synesius of Cyrene, like his greater contemporary Augustine in the West, represents both in his life and in his writings the difficult transition from Plato to Christ At the centre, in the forefront of the great intellectual movement of this century, stand the three great Cappadocians, Basil the Great, the subtle dogmatist, his brother Gregory of Nyssa, the philosophically trained defender of the Christian faith, and Gregory of Nazianzus, the distinguished orator and poet Closely allied to them was St Chrysostom, the courageous champion of ecclesiastical liberty and of moral purity. To modern readers the greater part of this literature appears strange and foreign, but, in order to be appreciated rightly, it must be regarded as the outcome of the period in which it was produced, a period stirred to its depths by religious emotions

The glorious bloom of the 4th century was followed by a perceptible decay in theological intellectual activity Independent production was in succeeding centuries almost solely prompted by divergent dogmatical views and heresies, for the refutation of which orthodox authors were impelled to take up the pen. In the 5th and 6th centuries a more copious literature was called into existence by the Monophysites, who maintained that there was but *one* nature in Christ, in the 7th century by the Monothelites, who acknowledged but *one* will in Christ; in the 8th century by the Iconoclasts and by the new teaching of Mohammed One very eminent theologian, whose importance it has been reserved for modern times to estimate aright—Leontius of Byzantium (6th century)—was the first to introduce Aristotelian definitions into theology, and may thus be called the first scholastic In his works he attacked the heretics of his age, particularly the Monophysites, who were also assailed by his contemporary Anastasius of Antioch The last great heresy, which shook the Greek Church to its very foundations, the Iconoclast movement, summoned to the fray the last great Greek theologian, John of Damascus (Johannes Damascenus) Yet his chief merit lies not so much in his polemical speeches against the Iconoclasts, and in his much admired but over-refined poetry, as in his great dogmatic work, *The Fountain of Knowledge*, which contains the first comprehensive exposition of Christian dogma.

Among theologians after John of Damascus must be mentioned the emperor Leo VI, the Wise (886–911), who wrote numerous homilies and church hymns, and Theodorus of Studium (759–826), who in his numerous writings affords us instructive glimpses of monastic life Pre-eminent stands the figure of the patriarch Photius Yet his importance consists less in his writings, which often, to a remarkable extent, lack independence of thought and judgment, than in his activity as a prince of the Church For he it was who carried the differences which had already repeatedly arisen between Rome and Constantinople to a point at which reconciliation was impossible, and was mainly instrumental in preparing the way for the separation of the Greek and Latin Churches accomplished in 1054 under the patriarch Michael Cerularius All literature, including theology, experienced a considerable revival under the Comneni In the reign of Alexius I Comnenus (1081–1118), Euthymius Zigabenus wrote his great dogmatic work, the *Dogmatic Panoply*, which, like *The Fountain of Knowledge* of John of Damascus in earlier times, was partly positive, furnishing an armoury of theology, partly negative and directed against the sects To the writings against ancient heresies were next added a flood of tracts, of all shapes and sizes, "against the Latins," *i.e.*, against the Roman Church, and among their authors must also be enumerated an emperor, the gifted Theodore II Lascaris (1254–58). For the greatest Byzantine "apologia" against Islamism we are indebted to another emperor, Manuel II Palaeologus (1391–1425), who by learned discussions tried to make up for the deficiency in martial prowess shown by the Byzantines in their struggle with the Turks On the whole, theological literature was in the last century of the empire almost completely

occupied with the struggles for and against the union with Rome. Considering the supremacy of the theological party in Byzantium, it was but natural that religious considerations should gain the day over political; and this was the view almost universally held by the Byzantines in the later centuries of the empire; in the words of the chronicler Ducas: "it is better to fall into the hands of the Turks than into those of the Franks."

Hagiography.—Hagiography, *i e*, the literature of the acts of the martyrs and the lives of the saints, forms an independent group and one comparatively unaffected by dogmatic struggles. The main interest centres here round the objects described, the personalities of the martyrs and saints themselves The authors, on the other hand—the *Acts of the Martyrs* are mostly anonymous—keep more in the background than in other branches of literature The man whose name is mainly identified with Greek hagiography, Symeon Metaphrastes, is important not as an original author, but only as an editor. Symeon revised in the 10th century, according to the rhetorical and linguistic principles of his day, numerous old *Acts of the Martyrs,* and incorporated them in a collection consisting of several volumes, which was circulated in innumerable copies, and thus to a great extent superseded the older original texts. These *Acts of the Martyrs,* in point of time, are anterior to our period, but of the *Lives of Saints* the greater portion belong to Byzantine literature. From the popular *Lives of Saints,* which for the reading public of the middle ages formed the chief substitute for modern "belles lettres," it is easy to trace the transition to the religious novel The most famous work of this class is the history of BARLAAM AND JOSAPHAT (*q v*)

Religious Poetry.—The religious poetry of the Greeks primarily suffered from the influence of the ancient Greek form, which was fatal to original development The oldest work of this class is the hymn, composed in anapaestic monometers and dimeters, which was handed down in the manuscripts with the *Paedagogus* of Clement of Alexandria (d about 215), but was probably not his work The next piece of this class is the famous "Maidens' Song" in the *Banquet* of St. Methodius (d. about 311), in which many striking violations of the old rules of quantity are already apparent More faithful to the tradition of the schools was Gregory of Nazianzus But, owing to the fact that he generally employed antiquated versification and very erudite language, his poems failed to reach the people or to find a place in the services of the church It became more and more patent that, with the archaic metre which was out of keeping with the character of the living language, no genuine poetry suited to the age could possibly be produced Fortunately, an entirely new form of poetical art was discovered, which conferred upon the Greek people the blessings of an intelligible religious poetry—the rhythmic poem This no longer depended on difference of quantity in the syllables, which had disappeared from the living language, but on the accent Yet the transition was not affected by the substitution of accent for the old long syllables; the ancient verse form was entirely abandoned, and in its stead new and variously constructed lines and strophes were formed In the history of the rhythmic sacred poetry three periods are clearly marked—the preparatory period, that of the hymns, and that of the *Canones* About the first period we know, unfortunately, comparatively little It appears that in it church music was in the main confined to the insertion of short songs between the Psalms or other portions of Holy Writ and the acclamations of the congregation The oldest rhythmic songs date from Gregory of Nazianzus—his "Maidens' Song" and his "Evening Hymn" Church poetry reached its highest expression in the second period, in the grand development of the hymns, *i e*, lengthy songs comprising from 20 to 30 similarly constructed strophes, each connected with the next in acrostic fashion Hymnology, again, attained its highest perfection in the first half of the 6th century with Romanos, who in the great number and excellence of his hymns dominated this species of poetry, as Homer did the Greek epic. From this period dates, moreover, the most famous song of the Greek Church, the so-called *Acathistus,* an anonymous hymn of praise to the Virgin Mary, which has sometimes, but erroneously, been attributed to the patriarch Sergius.

Church poetry entered upon a new stage, characterized by an increase in artistic finish and a falling off in poetical vigour, with the composition of the *Canones,* songs artfully built up out of eight or nine lyrics, all differently constructed Andreas, archbishop of Crete (*c.* 650–720), is regarded as the inventor of this new class of song. His chief work, "the great Canon," comprises no fewer than 250 strophes The most celebrated writers of *Canones* are John of Damascus and Cosmas of Jerusalem, both of whom flourished in the first half of the 8th century Later, sacred poetry was more particularly cultivated in the monastery of the Studium at Constantinople by the abbot Theodorus and others As regards the rhythmic church poetry, it may now be regarded as certain that its origin was in the East. Old Hebrew and Syrian models mainly stimulated it, and Romanos (*q v*) was especially influenced by the metrical homilies of the great Syrian father Ephraem (d about 373).

History.—In profane literature the writing of history takes the first place, as regards both form and substance In the Byzantine period all historical accounts fall under one of two groups, entirely different, both in form and in matter, (1) historical works, the authors of which described, as did most historians of ancient times, a period of history in which they themselves had lived and moved, or one which only immediately preceded their own times, and (2) chronicles, shortly recapitulating the history of the world This latter class has no exact counterpart in ancient literature The most clearly marked stage in the development of a Christian-Byzantine universal history was the chronicle (unfortunately lost) written by the Hellenized Jew, Justus of Tiberias, at the beginning of the 2nd century of the Christian era; this work began with the story of Moses

Byzantine histories of contemporary events do not differ substantially from ancient historical works, except in their Christian colouring Yet even this is often very faint and blurred owing to close adherence to ancient methods Apart from this, neither a new style nor a new critical method nor any radically new views appreciably altered the main character of Byzantine historiography

The outstripping of the Latin West by the Greek East, which after the close of the 4th century was a self-evident fact, is reflected in historiography also After Constantine the Great, the history of the empire, although its Latin character was maintained until the 6th century, was mostly written by Greeks *e g*, Eunapius (*c* 400), Olympiodorus (*c* 450), Priscus (*c* 450), Malchus (*c* 490), and Zosimus, the last pagan historian (*c* 500), all of whom, with the exception of Zosimus, are unfortunately preserved to us only in fragments Historiography received a great impulse in the 6th century The powerful Procopius and Agathias (*q v*), tinged with poetical rhetoric, described the stirring and eventful times of Justinian, while Theophanes of Byzantium, Menander Protector, Johannes of Epiphaneia and Theophylactus of Simocatta described the second half of the 6th century Towards the close of the 6th century also flourished the last independent ecclesiastical historian, Evagrius, who wrote the history of the church from 431 to 593 There now followed, however, a lamentable falling off in production From the 7th to the 10th century the historical side is represented by a few chronicles, and it was not until the 10th century that, owing to the revival of ancient classical studies, the art of writing history showed some signs of life Several historical works are associated with the name of the emperor Constantine VII Porphyrogenitus To his learned circle belonged also Joseph Genesius, who at the emperor's instance compiled the history of the period from 813 to 886. A little work, interesting from the point of view of historical and ethnographical science, is the account of the taking of Thessalonica by the Cretan Corsairs (A D. 904), which a priest, Johannes Cameniata, an eyewitness of the event, has bequeathed to posterity There is also contained in the excellent work of Leo Diaconus (on the period from 959 to 975) a graphic account of the bloody wars of the Byzantines with the Arabs in Crete and with the Bulgarians A continuation was undertaken by the philosopher Michael Psellus in a work covering the period from

976 to 1077. A valuable supplement to the latter (describing the period from 1034 to 1079) was supplied by the jurist Michael Attaliata The history of the Eastern empire during the Crusades was written in four considerable works, by Nicephorus Bryennius, his learned consort Anna Comnena, the "honest Aetolian," Johannes Cinnamus, and finally by Nicetas Acominatus in an exhaustive work which is authoritative for the history of the 4th Crusade The melancholy conditions and the ever increasing decay of the empire under the Palaeologi (13th–15th centuries) are described in the same lofty style, though with a still closer following of classical models The events which took place between the taking of Constantinople by the Latins and the restoration of Byzantine rule (1203–61) are recounted by Georgius Acropolita, who emphasizes his own share in them The succeeding period was written by the versatile Georgius Pachymeres, the erudite and high-principled Nicephorus Gregoras, and the emperor John VI Cantacuzenus Lastly, the death-struggle between the East Roman empire and the mighty rising power of the Ottomans was narrated by three historians, all differing in culture and in style, Laonicus Chalcocondyles, Ducas and Georgius Phrantzes With them may be classed a fourth (though he lived outside the Byzantine period), Critobulus, a high-born Greek of Imbros, who wrote, in the style of the age of Pericles, the history of the times of the sultan Mohammed II (down to 1467)

Chronicles.—The essential importance of the Byzantine chronicles (mostly chronicles of the history of the world from the Creation) consists in the fact that they in part replace older lost works, and thus fill up many gaps in our historical survey (*e g*, for the period from about 600 to 800, of which very few records remain) They lay no claim to literary merit, but are often serviceable for the history of language Many such chronicles were furnished with illustrations The authors of the chronicles were mostly monks, who wished to compile handbooks of universal history for their brethren and for pious laymen, and this explains the strong clerical and popular tendency of these works And it is due to these two qualities that the chronicles obtained a circulation abroad, both in the West and also among the peoples Christianized from Byzantium, *e g*, the Slavs, and in all of them sowed the seeds of an indigenous historical literature Thus the chronicles, despite the jejuneness of their style and their uncritical treatment of material, were for the general culture of the middle ages of far greater importance than the erudite contemporary histories designed only for the highly educated circles in Byzantium The oldest Byzantine chronicle of universal history preserved to us is that of Malalas (6th century), which is also the purest type of this class of literature In the 7th century was completed the famous *Easter* or *Paschal Chronicle* (*Chronicon Paschale*) About the end of the 8th or the beginning of the 9th century Georgius Syncellus compiled a concise chronicle, which began with the Creation and was continued down to the year 284 At the request of the author, when on his death-bed, the continuation of this work was undertaken by Theophanes Confessor, who brought down the account from AD 284 to his own times (AD 813) This exceedingly valuable work of Theophanes was again continued (from 813–961) by several anonymous chroniclers Of great influence on the age that followed was Georgius Monachus, only second in importance as chronicler of the early Byzantine period, who compiled a chronicle of the world's history (from Adam until the year 843, the end of the Iconoclast movement), far more theological and monkish in character than the work of Theophanes Among later chroniclers Johannes Scylitza stands out conspicuously His work (covering the period from 811 to 1057), as regards the range of its subject-matter, is something between a universal and a contemporary history. Georgius Cedrenus (*c.* 1100) embodied the whole of Scylitza's work, almost unaltered, in his *Universal Chronicle* In the 12th century the general increase in literary production was evident also in the department of chronicles of the world From this period dates, for instance, the most distinguished and learned work of this class, the great universal chronicle of John Zonaras In the same century Michael Glycas compiled his chronicle of the world's history, a work written in the old popular style and designed for the widest circles of readers Lastly, in the 12th century, Constantine Manasses wrote a universal chronicle in the so-called "political" verse

Only two works dealing with geography and topography need be mentioned, viz, the 6th century *Christian Topography* of Cosmas Indicopleustes which contains important information as to Byzantine trade, and the *Ancient History* (*Patria*) *of Constantinople*

Philosophy.—Ancient Greek philosophy under the empire sent forth two new shoots—Neopythagoreanism and Neoplatonism It was the latter with which moribund paganism essayed to stem the advancing tide of Christianity The last great exponent of this philosophy was Proclus in Athens (d 485) The dissolution, by order of Justinian, of the school of philosophy at Athens in 529 was a fatal blow to this nebulous system, which had long since outlived the conditions that made it a living force In the succeeding period philosophical activity was of two main kinds; on the one hand, the old philosophy, *e g*, that of Aristotle, was employed to systematize Christian doctrine, while, on the other, the old works were furnished with copious commentaries and paraphrases Leontius of Byzantium had already introduced Aristotelian definitions into Christology, but the real founder of mediaeval ecclesiastical philosophy was John of Damascus Owing, however, to his having early attained to canonical authority, the independent progress of ecclesiastical philosophy was arrested, and to this it is due that in this respect the later Byzantine period is far poorer than is the West In the 11th century philosophical studies experienced a satisfactory revival, mainly owing to Michael Psellus, who brought Plato as well as Aristotle again into fashion

Ancient rhetoric was cultivated in the Byzantine period with greater ardour than scientific philosophy, being regarded as an indispensable aid to instruction It would be difficult to imagine anything more tedious than the numerous theoretical writings on the subject and the examples of their practical application None the less, among the rhetorical productions of the time are to be found a few interesting pieces, such as the *Philopatris*, in the style of Lucian, which gives us a remarkable picture of the times of Nicephorus Phocas (10th century) A very charming representative of Byzantine rhetoric is Michael Acominatus, who, in addition to theological works, wrote numerous occasional speeches, letters and poems

The Sciences.—In the field of scientific production, which can be accounted literature in the modern acceptation of the term only in a limited sense, Byzantium was dominated to an extravagant and even grotesque extent by the rules of what in modern times is termed "classical scholarship" The numerous works which belong to this category, such as grammars, dictionaries, commentaries on ancient authors, extracts from ancient literature, and metrical and musical treatises, are of little general interest, although of great value for special branches of philological study, *e g*, for tracing the influences through which the ancient works handed down to us have passed, as well as for their interpretation and emendation, for information about ancient authors now lost, for the history of education, and for the underlying principles of intellectual life in Byzantium The most important monument of Byzantine philology is, perhaps, the *Library* of the patriarch Photius Photius, who in the year 850 was about 30 years of age, set himself with admirable energy to the task of making ancient literature, now for the most part dead and forgotten, known once more to his contemporaries, thus contributing to its preservation He gave an account of all that he read, and in this way composed 280 essays, which were collected in what is commonly known as the *Library* or *Myriobiblon* The character of the individual sketches is somewhat mechanical and formal, a more or less complete account of the contents is followed by critical discussion, which is nearly always confined to the linguistic form With this work may be compared in importance the great *Lexikon* of Suidas, which appeared about a century later, a sort of encyclopaedia, of which the main feature was its articles on the history of literature

The contributions of the Byzantines to jurisprudence, mathe-

matics and military science can merely be alluded to, as falling outside the domain of literature proper. Under Justinian the *Institutes* and the *Digest* were translated into Greek, and the *Novels* issued in Greek form. Under Leo the Wise and Constantine VII. Porphyrogenitus (9th and 10th centuries) came the great compilations of law known as the *Basilica* (Τά βασιλικά). The Canon law was an important contribution of the Byzantines to jurisprudence Such work as the Byzantines did in mathematics and astronomy was mainly under Perso-Arabian influence, but their writings on military science are numerous and excellent. That on tactics, associated with the name of Leo VI, the Wise, may be specially mentioned

Profane Poetry.—Of profane poetry—in complete contrast to sacred poetry—the general characteristic was its close imitation of the antique in point of form All works belonging to this category reproduce the ancient style and are framed after ancient models The metre is, for the most part, either the Byzantine regular 12-syllable trimeter, or the "political" verse; more rarely the heroic and Anacreontic measures

Epic popular poetry, in the ancient sense, begins only with the vernacular Greek literature (*see* below), but among the literary works of the period there are several which can be compared with the epics of the Alexandrine age Nonnus (*c* 400) wrote, while yet a pagan, a fantastic epic on the triumphal progress of the god Dionysus to India, and, as a Christian, a voluminous commentary on the gospel of St John In the 7th century, Georgius Pisides sang in several lengthy iambic poems the martial deeds of the emperor Heraclius, while the deacon Theodosius (10th century) immortalized in extravagant language the victories of the brave Nicephorus Phocas

To these may be added some voluminous poems, which in style and matter must be regarded as imitations of the ancient Greek romances. They all date from the 12th century, a fact evidently connected with the general revival of culture which characterizes the period of the Comneni Two of these romances are written in the duodecasyllable metre, viz, the story of Rodanthe and Dosicles by Theodorus Prodromus, and an imitation of this work, the story of Drusilla and Charicles by Nicetas Eugenianus, one in "political" verse, the love story of Aristander and Callithea by Constantine Manasses, which has only been preserved in fragments, and lastly one in prose, the story of Hysmine and Hysminias, by Eustathius (or Eumathius) Macrembolita, which is the most insipid of all These Byzantine romances are of interest chiefly by way of contrast to the romances in the vernacular produced in the 13th and 14th centuries, partly under Eastern, but more particularly under Western influence. The Byzantine are artificial and repulsive, the popular have the breath of life, and may be regarded as really heralding the rise of true Greek popular poetry

The objective point of view which dominated the whole Byzantine period was fatal to the development of a profane lyrical poetry At most a few poems by Johannes Geometres and Christophorus of Mytilene and others, in which personal experiences are recorded with some show of taste, may be placed in this category The dominant form for all subjective poetry was the epigram, which was employed in all its variations from playful trifles to long elegiac and narrative poems Georgius Pisides (7th century) treated the most diverse themes In the 9th century Theodorus of Studium had lighted upon the happy idea of immortalizing monastic life in a series of epigrams The same century produced the only poetess of the Byzantine period, Casia, from whom we have several epigrammatic productions and church hymns, all characterized by originality. Epigrammatic poetry reached its highest development in the 10th and 11th centuries, in the productions of Johannes Geometres, Christophorus of Mytilene and John Mauropus Less happy are Theodorus Prodromus (12th century) and Manuel Philes (14th century) From the beginning of the 10th century also dates the most valuable collection of ancient and of Byzantine epigrammatic poems, the *Anthologia Palatina* (*see* ANTHOLOGY)

Dramatic poetry, in the strict sense of the term, was as completely lacking among the Byzantine Greeks as was the condition precedent to its existence, namely, public performance. Apart from some moralizing allegorical dialogues (by Theodorus Prodromus, Manuel Philes and others), we possess only a single work of the Byzantine period that, at least in external form, resembles a drama: the *Sufferings of Christ* (Χριστὸς Πάσχων). This work, written probably in the 12th century, or at all events not earlier, is a cento, *i e*, is in great measure composed of verses culled from ancient writers, *e g.*, Aeschylus, Euripides and Lycophron; but it was certainly not written with a view to dramatic production

Vernacular Greek Literature.—The vernacular literature stands alone, both in form and in contents. We have here remarkable originality of conception and probably also entirely new and genuinely mediaeval matter. While in the artificial literature prose is pre-eminent, in the vernacular literature, poetry, both in quantity and quality, takes the first place, as was also the case among the Latin nations, where the vulgar tongue first invaded the field of poetry and only later that of prose Though a few preliminary attempts were made (proverbs, acclamations addressed by the people to the emperor, etc), the Greek vernacular was employed for larger works only from the 12th century onwards; at first in poems, of which the major portion were cast in "political" verse, but some in the trochaic eight-syllabled line Towards the close of the 15th century rhyme came into use. The subjects treated in this vernacular poetry are exceedingly diverse In the capital city a mixture of the learned and the popular language was first used in poems of admonition, praise and supplication In this oldest class of "vulgar" works must be reckoned the *Spaneas*, an admonitory poem in imitation of the letter of Pseudo-Isocrates addressed to Demonicus, a supplicatory poem composed in prison by the chronicler Michael Glycas, and several begging poems of Theodorus Prodromus (Ptochoprodromos) In the succeeding period erotic poems are met with, such as the Rhodian love songs preserved in a ms in the British Museum (ed W Wagner, Leipzig, 1879), fairy-tale-like romances such as the *Story of Ptocholeon*, etc Great epic poems, in which antique subjects are treated, such as the legends of Troy and of Alexander, form a separate group To these may be added romances in verse after the manner of the works written in the artificial classical language, *e g*, *Callimachus and Chrysorrhoe, Belthandrus and Chrysantza, Lybistrus and Rhodamne*, also romances in verse after the Western pattern, such as *Phlorius* and *Platziaphlora* (the old French story of *Flore et Blanchefleur*). Curious are also sundry legends connected with animals and plants, such as an adaptation of the famous mediaeval animal fables of the *Physiologus*, a history of quadrupeds, and a book of birds, both written with a satirical intention, and, lastly, a rendering of the story of Reynard the Fox Of quite peculiar originality also are several legendary and historical poems, in which famous heroes and historical events are celebrated There are, for instance, poems on the fall of Constantinople, the taking of Athens and Trebizond, the devastating campaign of Timur, the plague in Rhodes in 1498, etc In respect of importance and antiquity the great heroic epic of Digenis Akritas stands pre-eminent It is not without reason that Dieterich finds in this 10th century epic the earliest germs of Greek popular poetry as contrasted with the artificial products of Byzantinism The scenes are laid in the eastern marches of the Byzantine empire, and the poem has little to do with the capital The conversion of the Emir indeed betrays Byzantine piety, and there are numerous oriental touches But the Emir's son, Digenis Akritas, in his feeling for nature and strong family affections has much in common with the Greek pallikar of the klephtic ballads In these respects the poem may be regarded as the forerunner of such works as the great Cretan national romance, the *Erotokritos* and as forecasting much that is best in modern Greek popular poetry

The importance of Byzantine culture and literature in the history of the world is beyond dispute The Christians of the East Roman empire guarded for more than 1,000 years the intellectual heritage of antiquity against the violent onslaught of the barbarians They also called into life a peculiar mediaeval culture and literature They communicated the treasures of the

old pagan as well as of their own Christian literature to neighbouring nations; first to the Syrians, then to the Copts, the Armenians, the Georgians; later, to the Arabians, the Bulgarians, the Serbs and the Russians Through their teaching they created a new East European culture, embodied above all in the Russian empire, which, on its religious side, is included in the Orthodox Eastern Church, and from the point of view of nationality touches the two extremes of Greek and Slav Finally the learned men of the dying Byzantine empire, fleeing from the barbarism of the Turks, transplanted the treasures of old Hellenic wisdom to the West, and thereby fertilized the Western peoples with rich germs of culture

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Historical literature A collective edition of the Byzantine historians and chroniclers was begun under Louis XIV, and continued later (1648–1819), called the *Paris Corpus* This whole collection was on B G Niebuhr's advice republished with some additions (Bonn, 1828–78), under the title *Corpus scriptorum historiae Byzantinae* The most important authors have also appeared in the *Bibliotheca Teubneriana* A few Byzantine and oriental historical works are also contained in the collection edited by J B Bury (1898 *seq*), *e g*, *The History of Psellus* (1899), *The Chronicle of the Morea* (1904) To these should be added K N Sathas, *Bibliotheca Graeca Medii Aevi* (7 vols, 1872–94)

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MODERN LITERATURE

After the capture of Constantinople, the destruction of Greek national life and the almost total effacement of Greek civilization naturally involved a more or less complete cessation of Greek literary productions in the regions subjected to the rule of the barbarous conqueror Learned Greeks found a refuge away from their native land, they spoke the language of foreign peoples, and when they wrote books they often used those languages, but in most cases they also wrote in Greek

Frankish Influence.—It is, however, a mistake to regard 1453 as a sharp dividing line between Byzantine and Modern Greek literature It is true that the fall of Constantinople marked the end of what is usually known as Byzantinism, except in so far as this, as we shall see, has been artificially revived in modern Greece The germs of modern Greek popular poetry can be detected as early as the 10th century in the epic of Digenis Akritas (who may be regarded as a forerunner of the klephts), and still more in the Greek romantic poems of the 13th and 14th centuries, some of which, such as *Belthandros and Chrysantza*, while retaining marked Oriental features, have been vivified by the influence of Western Romance, conversely others, such as *Imberios and Margarona*, though essentially French, have in their Greek adaptation received many Greek popular features More directly due to the conquest by the Franks is the *Chronicle of the Morea*, which in its Greek form dates from the 14th century. Here again the Greek vernacular language is employed Italian influence had a predominating share in producing the flourishing Cretan literature of the 16th and 17th centuries, presently to be described The literary debt of modern Greece to the Crusaders has hardly received sufficient recognition The beginnings of the characteristic modern Greek lyric poem, the principal themes of which are love and death, can also be traced to the period of the Frankish domination In this connection the Rhodian love-songs of the 14th century and the Cretan poem *The Fair Shepherdess* (*see* below) may be specifically mentioned .

K Dieterich has shown that modern Greece has really inherited two literary styles—the consciously classicizing, which may be called Byzantine, and the really living popular, which was greatly promoted by the invigorating influence of the Frankish invaders In what follows this main division will be kept in mind, and in a very brief sketch of this character it is more profitable to outline the progress of these two literary streams with the aid of a comparatively small number of representative names and works than to fill the few columns available with a string of names, which can, in the absence of specimens of their works, have but little meaning It is also natural that greater prominence should be given to works written in the vernacular, though their actual bulk may be less, than to the numerous classicizing productions which seem likely to have but little lasting influence on the development of modern Greek literature

Cretan Literature.—We shall, accordingly, begin with a brief description of the very vigorous and remarkable Cretan literature of the 16th and 17th centuries, which flourished under the Venetian occupation of the island, and was brought to a premature and much to be regretted close by the Turkish capture of Candia in 1669 The development of this literature can be followed in its main outlines thanks to the excellent work done in recent times by Cretan scholars, notably by Dr S A Xanthoudidis We can trace the progress made in versification from the rude rhymed 15-syllable "political" lines of Georgios Choumnos in his paraphrase of *Genesis and Exodus*, written early in the 16th century and introducing a wealth of biblical legend, to the finished handling of the same metre by Vincenzo Cornaro in his great romantic poem, the *Erotokritos*, which probably dates from the middle of the 17th century, describing the trials and sorrows of two lovers, Aretousa, the daughter of Herakles, king of Athens, and Erotokritos, the son of the king's counsellor, whose love is finally crowned with a happy issue The poem, despite its admixture of Oriental and feudal elements (*e g*, the prominence given to the tourney) is a genuinely Cretan production, and is, notwithstanding its great length, a powerful and interesting work, deserving to be called the national poem of Crete In connection with the *Erotokritos* should be mentioned the interesting series of Cretan dramas The best known, though not the best of these, the *Erophile* of Georgios Hortatzis, written about 1600, had certainly an influence on the *Erotokritos* The drama, the scene of which is laid at Memphis in Egypt, describes the tragic history of the

love of Panaretos, adopted into his court at an early age by Philogonos the king of Egypt, for the king's daughter Erophile, resulting in the violent deaths of all three principal characters. The drama, which owes much to the Italian, is structurally interesting for the introduction of a chorus and interludes dealing with the enchantment of Rinaldo by the sorceress Armida, an episode taken from the *Gerusalemme Liberata* of Tasso These Cretan plays also include comedies, such as the *Stathis* and *Fortunatus*, which, though in the main borrowed from the Italian and ultimately going back to Plautine and Terentian comedy, are interesting for the introduction of local characters and colouring But the real gems of the Cretan drama are the pastoral comedy called *Gyparis* and the "mystery play," the *Sacrifice of Abraham*, both anonymous The former dates from about 1600 and describes the conversion to love of two shepherd girls who have previously scorned it The character-drawing of the girls and their lovers, the old father Yannoulis and the old nurse Phrosyne, is masterly and humorous, and local Cretan colour abounds The comedy is in many respects extraordinarily modern The *Sacrifice of Abraham* has in its kind an almost equal charm It is said to have been printed as early as 1535, but this is not improbably a mistake for 1635 Though in form a "mystery play," it is really a highly sympathetic study of family life, and herein is infinitely superior to the numerous mystery plays on the same subject in other languages All the characters are alive, from the principals Abraham, Sarah and Isaac, to the four servants, Syban, Sofer, Ada and Tamar

Crete possesses also an interesting series of popular songs, and in connection with these a charming pastoral poem. already mentioned—*The Fair Shepherdess*—deserves to be better known It is usually coupled with the name of Nikolaos Drymitinos of Apokorona, who published the version he selected in 1627 More than one version of the poem is known in modern survivals The theme is that of a shepherd-lad who meets and falls in love with a shepherd-girl, is compelled to leave her, but promises to return in a month He is delayed by illness, and after two months comes back only to find that she has pined away into death The language of this attractive Cretan literature has naturally incorporated a good many Venetian words, but its character generally is that of a vigorous native tongue, which shows of course its peculiar Cretan forms and idioms

Popular Songs and Klephtic Ballads.—The popular song, as exemplified by *The Fair Shepherdess* and other Cretan poems, has its counterpart in the folk-songs of the Aegean islands and of Cyprus Here too strong family feeling, love and death predominate Death is personified in the form of Charos, so prominent in all Greek popular poetry, who struggles with his victim, is sometimes worsted, but as a rule triumphs in the conflict The same elements, modified to suit the particular circumstances, also appear in the songs of the klephts who in their mountain fastnesses maintained a struggle against their Turkish oppressors Most of these klephtic ballads date from the 18th century, are anonymous, and are an excellent example of an entirely spontaneous poetry composed in popular language and in the 15-syllable verse, rhymed or unrhymed. They breathe the aroma of the forests and mountains, and, like so much of Greek popular poetry, lend a voice to the trees, the rocks, the rivers and to the mountains themselves, which sing the prowess of the klepht, bewail his death, and comfort his disconsolate wife or mother In these again we find the prominence of Charos and the strong family affection so characteristic of genuinely popular Greek poetry

Classicizing Greek.—We must turn for a while from this attractive and spontaneous poetry, which we shall again meet with in the 19th century revival, though in not quite so spontaneous a form, in order to trace very briefly the main progress of what may be called classicizing or Byzantine Greek from the fall of Constantinople to the time of Greek independence.

The services of Greeks, such as John Argyropoulos, Demetrios Chalcocondyles, Constantine and John Lascaris and others, who after 1453 spread a knowledge of Greek in the West and enriched Western libraries with Greek manuscripts, should not be forgotten They stimulated the study of ancient philosophy, and it was at the close of the 15th century that the great controversy arose over the merits of the Platonic and Aristotelian philosophies, championed respectively by Gemistos Pletho and Georgios Gennadios. Of historical works written in the 16th and 17th centuries in the literary language, fostered by the patriarchate and the schools founded at Constantinople, Bucharest, Jassy and elsewhere, may be mentioned the history of the patriarchate by Manuel Malaxos, a history of Constantinople from 1391 to 1578 by Theodosios Zygomalas, and a history of the Ottoman empire by Demetrios Cantemir, Hospodar of Moldavia. Great encouragement was also given to Greek culture and to the printing of works in Greek by the Hospodars of Wallachia in the 17th century. A curious instance of this is the translation into Greek in 1686 of an Italian account of the siege of Vienna in 1683, made by a scholarly Cretan, Jeromias Cacavelas, at the instance of Scherban Cantacuzenos, Hospodar of Wallachia Of considerable interest, both philologically and historically, are the earlier chronicles of Cyprus of the 15th century by Leontios Machaeras and Georgios Boustronios, which are written in the Cypriote dialect

Phanariote Literary Activity.—In the 18th century the educational work which has been noted for the 17th century was carried on, and modern Greece owes a debt of gratitude to the Greek clergy, the great Phanariote families of Constantinople, and also to wealthy Greek merchants, who fostered schools and issued educational works in Greek from the printing presses of Venice, Trieste and Vienna This work had an important influence in preparing the Greeks for their emancipation from the Turkish yoke. Literature during this period was mainly theological, but a good many books of an educational character were also produced Representative names are those of two distinguished prelates, Nikephoros Theotokis (1731?–1800) and Eugenios Vulgaris (1715–1806), both natives of Corfu, who wrote in the literary language in defence of Greek orthodoxy, but also produced works on mathematics, physics, geography, archaeology and philosophy, besides translations In connection with the Phanariotes of Wallachia should be mentioned the remarkable figure of Constantine Dapontes, who produced many works in verse of a moralizing and religious character These men may seem to lack originality and their language to be artificial, but considering the dark circumstances of the Greek people their work was really of inestimable value

The greatest name, however, among the forerunners of the Greek revival is that of Adamantios Korais (1748–1833), who, though resident for most of his life in Paris, exercised an enormous influence on his Greek contemporaries, partly by his unwearying issue of editions of Greek classical authors, accompanied by stirring patriotic introductions, partly by his efforts to reform the language—on a classical basis, it is true, but always in a spirit of moderation

Representative names among the classicizing poets of this time are Constantine Rhigas (1754–98), who wrote patriotic poems (poems in the popular language have sometimes been wrongly attributed to him), Christopoulos (1772–1847), who wrote verses of an Anacreontic character, and Jacobos Rizos Neroulos (1778–1850), who wrote tragedies, comedies and lyrics Only one name need be mentioned of those who carried on this tradition throughout the 19th century, but that is an outstanding one—Alexandros Rizos Rhangavis (Rhangabé, 1810–92), who was a writer of extraordinary fertility and considerable charm in the classicizing style his productions include odes, hymns, ballads, narrative poems, tragedies and comedies, and several prose works—a history of ancient Greece, a history of modern Greek literature, novels, and works on ancient art and archaeology. These works are perhaps somewhat hardly dealt with by Dieterich on account of his preference for works in the vernacular, which is certainly better suited to imaginative writings They are, however, excellent representatives of the literature in favour for the greater part of the period in which Rhangavis wrote—works in the "academic-learned" style. Followers of this school in poetry in the 19th century were numerous, of whom John Karasoutsas (1824–73) and Demetrios Paparrhegopoulos (1843–73) may be mentioned Their main themes are partly patriotic and partly contemplative.

Poetry in the Vernacular.—In poetry at all events the vernacular style has now definitely gained the upper hand. The real founder of this school was Dionysios Solomos (1798–1857), who used the dialect of the Ionian islands. His greatness lies rather perhaps in his influence than in his actual achievement; of his works, the famous *Ode to Liberty* and the *Lambros,* a study of a stricken conscience, may be specially mentioned Several excellent poets adopted the Ionian dialect for their work, *e g*, Andreas Kalvos (1796–1869) and Julius Typaldos (1814–83). Others preferred the language of the klephtic ballads, the vernacular of the Epirus district, such as Georgios Terzetis (1806–74), Aristotle Valaoritis (1824–79), whose *Funeral Ode* carries on the Charos tradition, John Vilaras (1771–1823), Georgios Zalakostas (1805–57), and many others. As has been said, the popular language has won a decisive victory with the present generation of Greek lyric poets Only two names will here be mentioned, but they must be regarded as the chief inspirers of a very flourishing school of present-day Greek lyric poets. These are Kostis Palamas (b 1859), whose most remarkable work is perhaps the narrative lyrical poem *The King's Flute*, published in 1910, the scene of which is laid in Byzantium, but whose theme is the continuity of the Greek spirit Palamas stands rather apart in his philosophizing tendencies, and Georgios Drosinis (b 1859) is, in his lyrics dealing with love and death and the charms of nature and in his idylls which revive popular sagas, more typical of the spirit of Greek popular poetry

The classicizing language was unsuited to the production of a really living drama Hence, although numerous dramas were written in this language in the 19th century, notably by Rhangavis, whose *Dukas* pictures the taking of Constantinople by the Crusaders, and by Demetrios Vernadakis, whose *Maria Doxapatri* also deals with the fall of Constantinople, they did little towards laying the foundations of a really national drama The more recent employment of the popular language for the drama under the influence of John Psichari (*see* below) and the choice of themes relating to contemporary life have given plays fresh vitality The names of J Kambisis (1872–1902), G Xenopoulos and Spyros Melas may be mentioned

Vernacular Prose.—The name of John Psichari stands out prominently as the apostle of the vernacular He opened his campaign by the publication in 1888 of a satiric account of a journey to Greece (*My Journey*), and it must be allowed that his teaching has had a very great influence on the employment of the vernacular for prose works of an imaginative character Novels dealing with country and maritime life are amongst the most popular of recent Greek literary productions, in contradistinction to the tendency to translate foreign works of fiction which prevailed during a large part of the 19th century D Vikelas (b 1835), however, though writing in the literary language, really led the way to a native school of novelists with his *Loukis Laras,* an historical romance dealing with the massacre in Chios in 1822, and E Roidis produced a noteworthy historical-satirical romance in his *Pope Joan* Foremost names of writers of tales and novels in the popular language are those of G Drosinis, Papadiamandis, Karkavitzas and Ephthaliotis The recently deceased G Souris created a peculiar form of political satire in his weekly newspaper the *Romiós,* in which current political and social topics were reviewed in verse of a popular character

Finally we glance at prose works of a serious or scientific kind produced since the War of Independence These are naturally written in the literary style Here, continuing the Byzantine tradition, historical works bulk largely Mention must be made of the *History of the Revolution* by Spiridon Trikoupis, a work distinguished by impartiality and fine style, and of the *History of the Greek Nation* by K Paparrhegopoulos, which in its later parts shows independent research Sakellarios wrote on the topography and history of Cyprus Of "local" histories of this type, a good example is the recently published *History of Chios* by Georgios I. Zalotas, a work remarkable for thoroughness of research Scholarship and philological research really fall outside the domain of pure literature, but it would be wrong to omit mention of a name like that of K. N Sathas, whose industry in collecting mediaeval and later Greek texts, if not always equalled by his accuracy, is worthy of high praise G N Hatzidakis has really laid the foundations of scientific research in modern Greek philology, and S A Xanthoudidis has done much to promote an appreciation of the Cretan literature of the 16th and 17th centuries.

(J. D B ; F H. M)

The Living Language.—The troubled years from 1910 to 1928 were marked by one event of capital importance to the literature of modern Greece, the all but total conquest of the entire literary field by the spoken language, commonly called the demotic or romaic, after a century's struggle with the official or scholastic tongue, called the pure or catharévoussa

In 1910, Kostis Palamas published the remarkable narrative lyrical poem *The King's Flute,* in which he celebrates, in the moving atmosphere of Byzantium, the continuity of Greek throughout the ages In *The Immutable Life* he appears as a bold innovator, inspired by French intellectualism, and definitely establishes his position as a poet of world wide fame Before losing himself in memories of his childhood, as he does in his next work (*Longings for the Lagoon,* 1912) he shows that he possesses the eternal spirit of ancient Hellas, of Byzantium and of modern Greece He is a poet of the intellect and of thought, whose work, while showing the influence of Western symbolism, is yet filled with imagery and with glowing verbal music In works such as *Iambs and Anapaests* and *The Grave* he has given expression to the deepest emotions He was strongly influenced by the prophetic genius of Joannes Psuchares, a master in every *genre* of prose, who introduced into Greece all the most recent linguistic theories Without his example it is unlikely that Palamas would have succeeded in realizing his powers So was founded the new School of Athens Palamas, himself an occasional novelist and critic, became the centre of the popular renaissance

Among the stylists pure and simple of the school we find John Gryparis, a disciple of Hérédia; Laurence Mavilis, strongly influenced by Italian literature, who was killed in the war of 1912, the Baudelairean Papantoniou Costas Ouranis, Aristos Cambanis, whose work is chaste and, if anything, a little cold, and the delicate genius of Malakassis, who owes much to Moreas and to *The Intermezzo* Peter Vlastos wanders from sphere to sphere, revelling in subtlety of rhythm and metre All the storied past of Greece comes to life in his work Apart from these, the dreamy Lambros Porphyras has written his *Shadows;* Sotiris Skipis has sung of his longings for his own country (*Song of Apollo*) and the sufferings of the fugitives from Anatolia Myrtiotissa in his moving work has sung of passion, while G Souris and Pol Arcas have turned to satire, and Drossinis, forerunner of many others, has produced his picturesque idylls

But apart from simple melodists like these tardy Parnassians, the newer poets venture even farther than Palamas into uncharted territory Among them are Angelos Sikelianos, who rediscovered the secrets of the ancient myths of sea and land, and who hymns the greatness of life, Rigas Golphis, bitter, eloquent and passionate, the fiery Varnalis, Ph Yophyllis, who embodies in his work the minutest details of modern life, and Kavaphis, who, apart from the others, evokes, in a strange and unadorned style, the Alexandrian decadence which resembles his own depression

Modern Greek prose is unusually rich both in *conte* and in the novel The scattered but recently collected work of Papadiamandis, who disappeared in 1908, remains unequalled Carcavitsas and Ephthaliotis painted the sea and the islands, and left models for others, as also did the regretted poet, novelist, critic and translator, C Hatzopoulos Costis Passayannis, Vlakhoyannis and the Epirote Ch Christovassilis are accomplished writers of the heroic and the picturesque D Voutyras is more deeply moved by the troubles of the working classes. There are also C Theotokis of Corfu, who combined criticism of society with the study of character, and showed himself in his novels, *The Slaves in their Chains* and *The Life and Death of Karavelas,* as a cruel and unrelenting realist, also C Paroritis, the powerful author of *Red He-Goat,* and Madame J Dendrinos, who excels in depicting the ravages of passion No one, however, in the novel or the theatre has excelled G Xenopoulos, the creator of a whole gallery

of pictures of Zante and Athens (*Isabel, Woman from Three Aspects*).

But Xenopoulos is not alone among Greek dramatists. Paulos Nirvânas, that fine critic and subtle observer, brought Ibsenism into fashion Spyros Melas and Pandelis Horn achieved remarkable work with a high social aim, D Tangopoulos distinguished himself in philosophical drama and N Poriotis shows in *Rhodopi* that tragedy in verse is still to be found in Greece Among the younger writers Constantinides in *Photinoula* reveals himself as a coming dramatist, and Valsa wrote a model of philosophic comedy in *The Council of Ministers*

In other spheres, we may mention the names of J Dragoumis as a critic, of Philindas and of Triandoephyllides in philology and the study of language, while we must not forget the well-known Psuchares, Lambros in history, Politis in folklore, Andréades in political and social economy, Xenopoulos, Nirvânas and Cambanis in literary criticism, Voutieridis in the history of literature. The influence of the literary reviews is shown by the fact that modern Greek literature is becoming more and more Westernized in inspiration and form and ceasing to be Byzantine (P Leb)

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For Greek culture in Wallachia, *see* Xenopol, *Istoria Romînilor din Dacia Traianâ*, vol iv, and the French translation, *Histoire des Roumains*, vol. ii, also the collection of texts by A Papadopulos-Kerameus *Texte grecesti privitoare la istoria românească* in Hurmuzaki, *Documente privitoare la istoria Românilor*, vol xiii (Bucharest, 1909) For collections of texts in the vernacular, and for periodicals, *see* bibliography to previous section of this article For reading-books and books on modern Greek language and grammar, *see* under Modern Greek Language

GREEK MUSIC: *see* Music.

GREEK RELIGION. The religion of the Greeks, now no longer absurdly abused nor foolishly idealized can, in the light of modern scholarship, be seen for what it really was It comprises elements—savage, barbarous, and civilized, although the first two have been somewhat exaggerated It developed without any authoritative sacred writing, such as the Bible, or the Koran, or any inflexible and unquestionable tradition to hamper or guide it. It was, according to circumstances, now more backward, now more progressive, yet always retaining certain characteristics which we may describe as normal, namely, a belief in a number, not very large, of gods, generally human in form and largely human in mind (anthropomorphic polytheism), and, for the most part (*see*, however, Mystery) an absence of other-worldliness. Its history extends over some 2,000 years, beginning about the middle of the second millennium B.C.

When the Hellenes entered Greece, probably from the north but perhaps also from Asia Minor (*see* Greece. *History*), they appear to have been advanced and progressive barbarians, rapidly developing a civilization of their own, and ready to adopt and modify what they found good in other civilizations. They spoke a common tongue, the language we know as classical Greek, probably already divided into more or less well-defined dialects They were of the stock variously known as Aryan, Indo-Germanic, Indo-European or Wiro, if indeed this was racially one stock and not a complex Like some other Wiros at least (notably the Hindus and Italians), they had the cult of a sky-god, the "Bright One" or "Bright Father," in their language Zeus, or Zeus Pater. They had also, or soon acquired, certain other deities, notably Apollo, Poseidon, Demeter, perhaps Ares, Hermes and others. These they may have occasionally conceived of as bestial in shape, but probably for the most part as anthropomorphic

They found a population already mixed. In Greece there had long dwelt a people, or group of peoples, whom we know as Helladic In Crete, and perhaps on the mainland also, was the advanced civilization which we call Minoan Either this was largely adopted by the Helladic peoples, or the invaders adopted it and imposed it on their new subjects, or both occurred; at any rate, it reached Greece and formed the Mycenaean (sometimes called the late Helladic) culture. These peoples also had a religion, in which we cannot at present distinguish Cretan from Helladic elements, and therefore are obliged to treat it as a whole We can say that it included the worship of a great goddess[1], or of several great goddesses, whom we almost certainly may trace in Hera and Artemis, probably in Athena, and perhaps in Aphrodite also, certainly in many minor figures, such as Ariadne and Britomartis Of gods, other than a child-god, we hear little, but the figure of Hyacinthus alone (*q v*) would be enough to prove that male figures were not wholly wanting. It is, however, a great mistake to suppose that all goddesses are pre-Greek; Demeter reveals herself as genuine Greek by her name, though no doubt she assimilated pre-Hellenic elements, Hestia (*q v*) is the Holy Hearth, a figure well known and widespread among Wiros. We must examine each figure, god or goddess, separately, using all the evidence philology, archaeology, and comparative religion can give us, to determine its origin Finally we must reckon with the possibility that the other great nations which fringed the Mediterranean—Hittite, Semitic and Egyptian peoples—left their impress on early Greek religion, for, although former scholars may have made rash use of this hypothesis, the influence, at least, of Egypt on Crete is past all doubt[2]

If we try to classify and analyse the facts, we shall at once be struck with the contrast between such civilized cults as those of Zeus, Athena, Apollo, high personal divinities to whom the attributes of a progressive morality could be attached, and practices that long survived in backward communities, such as the Arcadian worship of the thunder and the winds, the cult of Zeus Κεραυνός "the thunder" at Mantineia and Zeus Καππώτας in Laconia, who is none other than the mysterious meteoric stone that falls from heaven These are examples of a religious view in which certain natural phenomena or objects are regarded as mysteriously divine or sacred in their own right and a personal divinity has not yet emerged or been separated from them. Hestia is a similar figure.

Fetishism.—Akin to animism is fetishism, a term which properly denotes the worshipful or superstitious use of objects made by art and invested with mysterious power, so as to be used like amulets for the purposes of protective magic or for higher

[1]This does not mean that the Cretans were matrilineal, a theory for which there is no real evidence. *See* L R Farnell, in *Archiv fur Religionswissenschaft* (1904), H J Rose, in *Folk-Lore*, vol xxii and xxxvii.

[2]V. Bérard has recently revived the discredited theory of a prevalent Phoenician influence in his ingenious but uncritical work, *L'Origine des cultes arcadiens* M. P. Foucart believes in very early borrowing from Egypt, as explaining much in the religion of Demeter and Dionysus; see *Les Grands Mystères d'Éleusis* and *Le Culte de Dionysus en Attique*

purposes of communion with the divinity. From the earliest discoverable period down to the present day fetishism has been a powerful factor in the religion of the Graeco-Roman world. The importance of the sacred stone and pillar in the "Mycenaean" or "Minoan" period which preceded Homer has been impressively shown by Sir Arthur Evans, and the same fetishistic worship continued throughout the historic ages of classic paganism It is a reasonable conjecture that the earliest anthropomorphic images of divinities, which were beginning to make their appearance by the time of Homer, were themselves evolved by slow transformation from the upright sacred column. And the altar itself may have arisen as another form of this; the simple heap of stones, such as those erected to Hermes by the wayside and called Ἑρμαῖοι λόφοι, may have served both as a place of worship and as an *agalma* that could attract and absorb a divine potency into itself. Hence the fetishistic power of the altar was fully recognized in Greek ritual, and hence also in the cult of Apollo Agyieus the god and the altar are called by the same name

It has been supposed that the ancestors of the historic Greeks, before they were habituated to conceive of their divinities as in human form, worshipped divine beasts. But we must not suppose it to be a general law of religious evolution that "theriomorphism" must always precede anthropomorphism and that the latter transcends and obliterates the former. The two systems can exist side by side, and savages of low religious development can conceive of their deities as assuming at one time human, at another bestial, shape Now the developed Greek religion was devotedly anthropomorphic, and herein lay its strength and its weakness, nevertheless, the advanced Hellene could imagine his Dionysus entering temporarily into the body of the sacrificial bull or goat, and the men of Phigaleia in Arcadia were attached to their horse-headed Demeter, and the primitive Laconians possibly to a ram-headed Apollo Theriolatry in itself, *i.e.,* the worship of certain animals or species of animals as of divine power in their own right, apart from any association with higher divinities, can scarcely be traced among the Greek communities at any period The wolf might at one time have been regarded as the incarnation of Apollo, the wolf-god, and here and there we find faint traces of a wolf-sacrifice and of offerings laid out for wolves But the occasional propitiation of wild beasts may fall short of actual worship. The Athenian who slew a wolf might give it a sumptuous funeral, probably to avoid a blood-feud with the wolf's relatives, yet the Athenian State offered rewards for a wolf's head Nor did any Greek individual or State worship flies as a class, although a small oblation might be thrown to the flies before the great sacrifice to Apollo on the Leucadian rock, to please them and to persuade them not to worry the worshippers at the great solemnity, where the reek of roast flesh would be likely to attract them

Theriolatry is not totemism (*q v*), and the attempt to find the latter institution in Greece is now generally recognized as mistaken[1] The totemism of savages does not appear to affect Greek religion in any such way as to suggest a natural explanation for any of the peculiar phenomena of early Hellenic polytheism Here and there we have traces of a snake-tribe in Greece, the Ὀφιεῖ in Aetolia, the Ὀφιογενεῖς in Cyprus and Parium, but we are not told that these worshipped the snake, though the latter clan were on terms of intimacy with it Where the snake was actually worshipped in Hellenic cult—the cases are few and doubtful—it may have been regarded as the incarnation of the ancestor or as the *avatar* of the under-world divinity

Human Sacrifice.—As to human sacrifice, which is not strictly a savage custom, while encouraged at one time by the Delphic oracle, it was becoming rare and repellent to the conscience by the 6th century B C ; but it was not wholly extinct in the Greek world even by the time of Porphyry.

We can now observe the higher aspects of the advanced polytheism And at the outset we must distinguish between mythology and religion strictly understood, between the stories about the divinities and the private or public religious service It is true that the former often arise from the latter, as in the case of Dionysus (*q v*) Yet Greek mythology as a whole was irresponsible, without reserve, and unchecked by dogma or sacerdotal prohibition; and frequently it sank below the level of the current religion, which was almost free from the impurities which shock the modern reader of Hellenic myths Nor again did anyone feel himself called upon to believe any particular myth; in fact, faith, understood as the will to believe certain dogmatic statements about the nature and action of divinity, is a concept which was neither named nor recognized in Hellenic ethics or religious doctrine, only, if a man proclaimed his disbelief in the existence of the gods and refused to join in the ritual of the community, he would become "suspect," and might at times be persecuted by his fellows Greek religion was not so much an affair of doctrine as of ritual, and the most illuminative sources of our knowledge of it are the ritual-inscriptions and other State documents, the private dedications, the monuments of religious art and certain passages in the literature, philology and archaeology being equally necessary to the equipment of the student

Homer and Post-Homeric Period.—We are tempted to turn to Homer as the earliest authority. But Homer's audience was a relatively enlightened nobility, in no way primitive He shows us a pantheon already to some extent systematized, a certain hierarchy and family of divinities in which the supremacy of Zeus is established as incontestable. And the characteristically Greek anthropomorphic impulse is already at its height in the Homeric poems The deities are already clear-cut, individual personalities of distinct ethos, plastically shaped figures such as the later sculpture and painting could work upon, not vaguely conceived *numina* like the forms of the old Roman religion, nor "personifications" of natural phenomena Athena and Apollo are simply Athena and Apollo, divine personages with certain powers and character, as real for their people as Christ and the Virgin for Christendom By the side of these, though generally in a subordinate position, we find that Homer recognized certain divinities that we may properly call nature-powers, such as Helios, Gaia, and the river deities, forms descending probably from a remote animistic period, but maintaining themselves within the popular religion till the end of paganism Again, though Homer may talk and think at times with levity and *banalité* about his deities, his deeper utterances impute an advanced morality to the supreme God His Zeus is on the whole a power of righteousness, never being himself the author of evil—an idea revealed in the opening passage of the *Odyssey*—but protecting the good and punishing the wicked Vengeance, indeed, was one of the attributes of divinity both for Homer and the average Greek of the later period, as it is in Judaic and Christian theology, though Plato and Euripides protested strongly against such a view But the Homeric Zeus is equally a god of pity and mercy, and the man who neglects the prayers of the sorrowful and afflicted, who violates the sanctity of the suppliant and guest, or oppresses the poor or the wanderer, may look for divine punishment Though not regarded as the physical author of the universe or the Creator, he is, in a moral sense, the father of gods and men And though the sense of sin and the need of piacular sacrifice are expressed in the Homeric poems, the relations between gods and men that they reveal are on the whole genial and social, the deity sits unseen at the good man's festal sacrifice, and there is a simple apprehension of the idea of divine communion There is also indeed a glimmering of the dark background of the nether world, and the chthonian powers that might send up the Erinys to fulfil the curse of the wronged Yet on the whole the religious atmosphere is generally cheerful and bright, freer than that of the later ages from the taint of magic and superstition; nor is Homer troubled much about the life after death, he scarcely recognizes the cult of the dead (*see* HERO) and is not oppressed by fear of the ghost-world

This Homeric or "Olympian" system retains a certain life almost to the end of paganism, and it is a serious mistake to suppose that it had lost its hold upon the people of the 5th and 4th century B C We find it, indeed, enriched in the post-Homeric period with new figures of prestige and power; Dionysus, of whom Homer had only faintly heard, becomes a high god with a worship full of promise for the future Demeter and Kore, whom Homer knew well enough, but could not use for his epic purposes, attract the

[1] *See* H J Rose, *Primitive Culture in Greece* (1925), p 47 ff

ardent affections and hopes of the people; and Asclepios, whom the old poet did not recognize as a god, wins a conspicuous place in the later shrines. The deities remain anthropomorphic, and appear as clearly defined individuals Zeus is still supreme, the other gods are clear-cut personalities, but in function rather less clear, for a popular god tended to take on new departments and a once rustic deity to go to town with his people The moral ideas that we find in the Homeric religion are amply attested by cult records of the later period, which are nearly always euphemistic, the doubtful title of Demeter Erinys being possibly an exception The important cults of Zeus *Hikesios* and *Prostropaios,* the suppliant's protecting deity, embody the ideas of pity and mercy that mark advanced religion; and many momentous steps in the development of morality and law were either suggested or assisted by the State religion. For example, the sanctity of the oath, the main source of the secular virtue of truthfulness, was originally a religious sanction, and though the Greek may have been prone to perjury, yet the Hellenic, like the Hebraic religious ethics, regarded it as a heinous sin The sanctity of family duties, the sacredness of the life of the kinsman, were ideas fostered by early Hellenic religion before they generated principles of secular ethics In the post-Homeric period, the development of the doctrine of purity, which was associated with the Apolline religion, combining with a growing dread of the ghost-world, stimulated and influenced in many important ways the evolution of the Greek law concerning homicide[1]. And the beginnings of international law and morality were rooted in religious sanctions and taboo. In fact, Greek state-life was indebted in manifold ways to Greek religion, and the study of the Greek oracles alone would supply sufficient testimony of this In many cases the very origin of the State was religious, the earliest *polis* sometimes having arisen under the shadow of the temple

Yet as Greek religion was always in the service of the State, and the priest a State official, society was the reverse of theocratic Secular advance, moral progress, and the march of science could never long be thwarted by religious tradition, on the contrary, speculative thought and artistic creation were considered as attributes of divinity. We may say that the religion of Hellas penetrated the whole life of the people, but rather as a servant than as a master

Distinct and apart from these public worships and those of the clan and family were the mystic cults of Eleusis, Andania and Samothrace, and the private services of the mystic brotherhoods (*See* MYSTERY) Here we find a strong salvationist tendency, the promise of salvation relying on mystic communion with the deity Also a new and vital principle is at work, Orphism is the only force in Greek religion of a clear missionary and universalist tendency[2]

The later history of Greek paganism is mainly concerned with its gradual penetration by oriental ideas and worships, the result being *θεοκρασία* or syncretism, mysticism and a tendency towards monotheism In its turn the resulting Hellenistic religion influenced the doctrine, organization, and terminology of Christianity. to what extent is one of the most interesting problems of comparative religion, for the study of which a minute knowledge of the ritual and the mystic cults of Hellas is one of the essential conditions

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[1]*See* L R Farnell, *Evolution of Religion* (Hibbert Lectures, 1905), pp 139–52

[2]Save perhaps Eleusis, *see* Th Zielinski, *La Sibylle*

GREELEY, HORACE (1811–1872), American journalist and statesman, was born at Amherst, N H, on Feb 3, 1811 His parents were exceedingly poor and he secured little education At 14 he became an apprentice in the printing office of *The Northern Spectator* at East Poultney, Vt Here he developed a passion for politics and came to be depended upon for more or less of the editing of the paper. In June 1830 *The Northern Spectator* was suspended Experiencing difficulties in obtaining employment, he went to New York

Printer and Editor.—In Jan 1833 Greeley formed a partnership with Francis V Story, a fellow-workman, and undertook the printing of the *Morning Post,* the first cheap paper published in New York The paper failed in less than three weeks They still had a *Bank Note Reporter* to print, and soon got the printing of a tri-weekly paper, the *Constitutionalist* Greeley was soon asked by James Gordon Bennett to go into partnership with him in starting *The Herald,* but declined the venture On March 2, 1834, Greeley and Winchester, his new partner, issued the first number of *The New Yorker,* a weekly literary and news paper By the end of the third year *The New Yorker* had reached a circulation of 9,500 copies, and had sustained a total loss of $7,000. It was published seven years (until Sept. 20, 1841), and was never profitable, but it was widely popular, and it gave Greeley, who was its sole editor, much prominence.

By 1838 he had gained such standing as a writer that he was selected by Thurlow Weed, William H Seward and other leaders of the Whig Party, for the editorship of a campaign paper entitled *The Jeffersonian,* published at Albany So satisfactory was this campaign sheet that on May 2, 1840, some time after the nomination by the Whig Party of William Henry Harrison for the presidency, Greeley began the publication of a new weekly campaign paper *The Log Cabin* It was a brilliant political success, but was not profitable, and in Sept 1841 Greeley merged his weekly papers, *The Log Cabin* and *The New Yorker,* into *The Weekly Tribune* which soon attained a circulation of a quarter of a million In the meantime (April 10, 1841) he had begun the publication of a daily newspaper called *The Tribune*

From the founding of *The Tribune* Greeley was popularly identified with this paper and its share in public discussion of the time is his history It was a financial success, and his assured income should have placed him beyond pecuniary worry But he lacked business thrift, inherited a disposition to endorse for his friends, and was often unable to distinguish between deserving applicants for aid and adventurers He was thus frequently straitened, and, as his necessities pressed, he sold successive interests in his newspaper.

A Supporter of Causes.—From the outset it was a cardinal principle with Greeley to hear all sides, and to extend a special hospitality to new ideas In March 1842 *The Tribune* began to give one column daily to a discussion of the socialistic doctrines of Charles Fourier, contributed by Albert Brisbane, father of the later well-known Arthur Brisbane From boyhood he believed in a protective tariff, and throughout his active life he was its most trenchant advocate and propagandist, both in the columns of *The Tribune* and in public debate He opposed woman suffrage on the ground that the majority of women did not want it and never would Greeley aided practical efforts, however, for extending the sphere of woman's employments He opposed the theatres, and for a time refused to publish their advertisements He held the most rigid views on the sanctity of marriage and against easy divorce, and vehemently defended them in controversies with Robert Dale Owen and others He practised and pertinaciously advocated total abstinence from spirituous liquors He denounced the repudiation of State debts or the failure to pay interest on them Greeley was zealous for Irish repeal, once held a place in the "Directory of the Friends of Ireland," and contributed liberally to its support.

Anti-slavery Leader.—It is as an anti-slavery leader, and as perhaps the chief agency in educating the mass of the Northern people to that opposition through legal forms to the extension of slavery which culminated in the election of Lincoln and the Civil war, that Greeley's main work was done. Incidents in it were his vehement opposition to the Mexican War as a scheme for more slave territory, the assault made upon him in Washington by Congressman Albert Rust of Arkansas in 1856, an indictment in Virginia in the same year for circulating incendiary documents, perpetual denunciation of him in Southern newspapers and speeches, and the hostility of the Abolitionists, who regarded his course as too conservative His anti-slavery work culminated in his appeal to President Lincoln, entitled "The Prayer of Twenty Millions," in which he urged "that all attempts to put down the rebellion and at the same time uphold its inciting cause" were preposterous and futile, and that "every hour of deference to slavery" was "an hour of added and deepened peril to the Union "

The Politician.—Greeley's political activity, first as a Whig, and then as one of the founders of the Republican Party, was incessant; but he held few offices His failure to hold greater political favour was due chiefly to his candour and idiosyncrasy. In 1848–49 he served a three months' term in Congress, filling a vacancy He introduced the first bill for giving small tracts of Government land free to actual settlers, and published an exposure of abuses in the allowance of mileage to members, which corrected the evil In the Republican National convention in 1860, serving as a delegate for Oregon, Greeley actively opposed Seward and did much to prevent the success of that statesman, and to bring about instead the nomination of Abraham Lincoln. In 1861 he was a candidate for U S senator, but was defeated. At the outbreak of the war he favoured allowing the Southern States to secede, provided a majority of their people at a fair election should so decide

When the war began he urged the most vigorous prosecution of it In 1864 he urged negotiations for peace with representatives of the Southern Confederacy then in Canada, and was sent by President Lincoln to confer with them. They were found to have no sufficient authority At the close of the war, contrary to the general feeling of his party, he urged universal amnesty and impartial suffrage as the basis of reconstruction. In 1867 his friends again wished to elect him to the U S. Senate, but he was defeated Later he signed the bail bond of Jefferson Davis, and this provoked a torrent of public indignation The second volume of his popular history of the Civil War was just issued, and the subscribers in their anger refused by thousands to receive it An unsuccessful attempt was also made to expel him from the Union League Club of New York. In 1867 he was a delegate-at-large to the convention for the revision of the State Constitution, and in 1869 and 1870 he was the Republican candidate for controller of the State and member to Congress respectively, but was defeated

Leader of Liberal Republicans.—Greeley was dissatisfied with Grant's administration, and became its sharp critic The discontent which he did much to develop ended in the organization of the Liberal Republican Party, which held its national convention at Cincinnati in 1872, and nominated Greeley for the presidency The tide of feeling ran strongly in his favour until the Democrats, his life-long opponents, also nominated him. His old party associates regarded him as a renegade, the Democrats gave him a half-hearted support In August he made a series of campaign speeches which were regarded at the time by both friends and opponents as among the most brilliant continuous exhibitions of varied intellectual power ever made by a candidate in a presidential canvass General Grant received in the election 3,597,070 votes, Greeley 2,834,079

Closing Events.—He had resigned his editorship of *The Tribune* immediately after the nomination; he now resumed it cheerfully, but it was soon apparent that his powers had been overstrained For years he had suffered greatly from insomnia. During the intense excitement of the campaign the difficulty was increased Returning from his campaign tour, he went immediately to the bedside of his dying wife, and for some weeks had practically no sleep at all This resulted in delirium He died on Nov. 29, 1872. His funeral was a simple but impressive public pageant The body lay in state in the City Hall, where it was viewed by thousands of mourners The ceremonies were attended by the president and vice-president of the United States, the chief justice of the Supreme Court, and a large number of eminent public men of both parties He had been the target of constant attack during his life But his death revealed the high regard in which he was generally held as a leader of opinion and faithful public servant He was a Universalist, and for many years was a conspicuous member of the leading Universalist church in New York

His published works are: *Hints Toward Reforms* (1850); *Glances at Europe* (1851), *History of the Struggle for Slavery Extension* (1856), *Overland Journey to San Francisco* (1860), *The American Conflict* (1864–66); *Recollections of a Busy Life* (1868; new edition, with appendix containing an account of his later years, his argument with Owen on marriage and divorce, and miscellanies, 1873), *Essays on Political Economy* (1870), and *What I Know of Farming* (1871) He also assisted his brother-in-law, J F. Cleveland, in editing *A Political Text-book* (1860), and supervised for many years the annual issues of *The Whig Almanac* and *The Tribune Almanac,* comprising extensive political statistics.

The best Lives of Greeley are those by J Parton (1855, new ed, 1872) and W A. Linn (1903) Lives have also been written by L U Reavis (1872), L. D. Ingersoll (1873); F N Zabriskie (1890) and D. C Seitz (1926); and there is a *Memorial of Horace Greeley* (1873).

GREELEY, a city of Colorado, U S A, 52m N by E of Denver, on the South Platte river, at an elevation of 4,567ft; the county seat of Weld county It is on Federal highways 38 and 85; is served by the Colorado and Southern and the Union Pacific railways, and has an aeroplane landing field The population was 10,958 in 1920 (90% native white), and was estimated locally at 14,500 in 1928 The city is the trading centre of a rich irrigated agricultural and coal-mining region, and has flour, lumber and beet-sugar mills It is the seat of the Colorado State Teachers college (established 1889), which has an enrolment of 1,500 in the winter and nearly 3,000 in the summer quarter

Greeley was founded in 1870 by Nathan Cook Meeker (1817–79), agricultural editor of the New York *Tribune,* with the support of Horace Greeley, after whom it was named The Union Colony of Colorado, organized and chartered for the purpose, bought 11,000ac of land and sold it to its members, colonists mainly from New England and New York, using the proceeds for public improvements The town was organized in 1871 and incorporated as a city in 1886

GREELY, ADOLPHUS WASHINGTON (1844–), American soldier and scientist, was born at Newburyport, Mass, March 27, 1844. Enlisting in 1861 as a private in the Civil War, he rose to be brevet major. In 1867 he was appointed second lieutenant in the regular army and became chief signal officer and brigadier general While commanding at Lady Franklin bay, one of the 13 international circumpolar stations, 1881–84, he reached, in 1882, 83° 24′ N, 42° 45′ W, the farthest N at that time Two relief expeditions failed to reach him, and when the third, under Capt Schley, rescued him at Cape Sabine, all but seven of his party were dead From 1887 to 1906 he administered the Weather bureau and the Signal Corps Under him were built more than 25,000m of cables and telegraph lines in Alaska, China, Cuba, Porto Rico and the Philippine Islands Promoted major general in 1906, he conducted relief operations in San Francisco and put down the Ute rebellion He served with the international telegraph conference, London, 1904, at the request of the British Government and was dean of the American delegation to the wireless conference at Berlin that year He wrote extensively on meteorological, electrical, geographical and other subjects His most popular volumes are *Three Years of Arctic Service* (1886), *Handbook of Polar Discoveries* (1909), *True Tales of Arctic Heroism* (1912); *Handbook of Alaska* (1925), *Reminiscences of Adventure* (1927), and *Polar Regions of the Twentieth Century* (1928).

GREEN, DUFF (1791–1875), American journalist, politician, and private agent of President John Tyler (1841–45) and of the Department of State at various times in Great Britain, France, Texas, and Mexico, first gained national importance by

editing *The United States Telegraph* (Washington, 1825–35), the organ of Jacksonian democracy. In 1830–31, however, he followed John C Calhoun (whose son Andrew Pickens had married his daughter Margaret) in the latter's break with President Jackson. From 1835 until the death of President Harrison and the succession of Tyler (whose nomination for vice-president Green is said to have suggested), he was in a very unsettled condition. For a time he edited with R K Crallé *The Reformer*, a radically partisan, free trade and states' rights weekly, and a daily; but he got into difficulties and withdrew, and the panic of 1837 and the subsequent depression appears to have crippled him financially By 1840 he was seeking Whig support for election as government printer. As early as 1839, Duff Green had planned a visit to Great Britain "to sell stock"; and in the fall of 1841 President Tyler sent him there as a private or personal agent, possibly without any definite object in view. Green immediately became excited over the power of the Bank of England in American business, over British anti-slavery interests in Texas, and over the activities of the Anti-Corn Law League Later on in the same year he returned with a project for a commercial treaty which might undermine the American Whig Tariff of 1842, a protective measure which was just being enacted into law. When this appeared impracticable, he attempted, apparently, some form of co-operation with British free traders and established *The Republic* in New York to advocate free trade and the candidacy of Calhoun for president. But after Calhoun accepted appointment as secretary of state under Tyler and refused to be a candidate for president, Green gave up *The Republic* and went to Galveston, Texas, as United States consul His purpose was, of course, to facilitate the annexation of Texas, for while in London, in 1843, with Ashbel Smith, the Texan minister to Great Britain and France, he had reported the British anti-slavery interest in Texas in such a way as to precipitate the movement for annexation Within a short time President Jones, of the Republic of Texas, resented Green's interference and revoked his *exequator* In 1849, Green served the United States Government effectively in arranging the payment of money due to Mexico under the Treaty of Guadalupe Hidalgo by exchange instead of in specie

There is no satisfactory biography of Duff Green *See* his *Facts and Suggestions* (1866); and *Southern Historical Association Publications*, VII, 160. (T. P. Ma)

GREEN, GEORGE (1793–1841), English mathematician, was born on July 14, 1793, at Sneinton, near Nottingham. He went into his father's business as a miller and his mathematics were practically self-taught It is probably for this reason that Green used unusual methods of his own in solving the physical problems in which he was interested In 1828 he published, by subscription, at Nottingham his *Essay on the Application of Mathematical Analysis to the Theory of Electricity and Magnetism* In this memoir he generalized and extended Poisson's electric and magnetic investigations He introduced the term "potential," and used what is now known as Green's theorem to investigate its properties in the case of magnetic and electric fields This memoir was practically unknown until Lord Kelvin had it reprinted in 1846; it was followed in 1832 and 1833 by papers on the laws of equilibrium of fluids, on attractions in n-dimensional space and on the motion of a fluid agitated by vibrations of a solid ellipsoid At the age of 40 he went to Cambridge where he was fourth wrangler in 1837 He was elected to a fellowship at Caius college in 1839, but ill-health compelled him to return to Sneinton, where he died on March 31, 1841

His collected papers, *The Mathematical Papers of the Late George Green*, were edited by N. M Ferrers (1871).

GREEN, JOHN RICHARD (1837–1883), English historian, was born at Oxford on Dec. 12, 1837, and educated at Magdalen college school and at Jesus college, where he obtained an open scholarship On leaving Oxford he took orders and became the incumbent of St Philip's, Stepney, where he was much loved by his parishioners In 1868 he took the post of librarian at Lambeth, but his health was already breaking down and he was attacked by consumption His *Short History of the English People* (1874) at once attained extraordinary popularity, and was afterwards expanded in a work of four volumes (1877–80). Green is pre-eminently a picturesque historian; he had a vivid imagination and a keen eye for colour. His chief aim was to depict the progressive life of the English people rather than to write a political history of the English state. In accomplishing this aim he worked up the results of wide reading into a series of brilliant pictures. His later histories, *The Making of England* (1882) and *The Conquest of England* (1883), are more soberly written than his earlier books, and are valuable contributions to historical knowledge. Green died at Mentone on March 7, 1883. He was a singularly attractive man, of wide intellectual sympathies and an enthusiastic temperament. Mrs Humphry Ward's *Robert Elsmere* is said to be drawn from him. In 1877 Green married Miss Alice Stopford, herself a good historian. Among her important works are *Town Life in the 15th Century* (1894), *The Making of Ireland and its Undoing* (1908), *History of the Irish State to 1914* (1925), and *Studies from Irish History* (1926–27) Mrs Green became a member of the Irish Senate in 1922.

See the *Letters of J. R. Green* (1901), edit. by Leslie Stephen.

GREEN, MATTHEW (1696–1737), English poet, had a post in the custom house, and died unmarried at his lodging in Nag's Head Court, Gracechurch Street, in 1737. His chief poem, *The Spleen*, an epistle to Mr. Cuthbert Jackson advocating cheerfulness, exercise and a quiet content as remedies, was printed with a preface by Richard Glover in 1737

Green's poems are printed in Chalmers' *Works of the English Poets*, vol. xv. (1810), and were edited by Richardson King Wood (1925).

GREEN, THOMAS HILL (1836–1882), English philosopher, the most typical English representative of *Neo-Kantianism* or *Neo-Hegelianism*, was born on April 7, 1836, at the rectory of Birkin, Yorkshire. He was educated at Rugby and Balliol college, Oxford, of which he was, in 1860, elected fellow His life, henceforth, was devoted to teaching in the university—from 1878 until his death (at Oxford on Mar 26, 1882) as Whyte Professor of Moral Philosophy His lectures form the substance of his two most important works, viz, the *Prolegomena to Ethics* and the *Lectures on the Principles of Political Obligation* published posthumously

Hume's empiricism, combined with a belief in Spencer's biological evolution, coloured English thought during the third quarter of the 19th century By reducing mind to a series of unrelated atomic sensations, this teaching destroyed the possibility of knowledge, and, by representing man as a "being who is simply the result of natural forces," it made any theory of conduct unmeaning, for life in any intelligible sense implies a personal self which (1) *knows* what to do, (2) has *power* to do it

Green, in reacting to the attitude of his day, raised again the question of man's relation to nature To ask "What is man?" is to ask "What is experience?" for experience means that of which I am conscious The facts of consciousness which alone we are justified in asserting to exist, are valid evidence for whatever is logically involved in them Now the chief characteristic of man is *self*-consciousness The simplest mental act, the act of sense-perception, is never merely a *change*, physical or psychical, but the *consciousness* of a change, and of a distinction between the self and the object Knowledge consists, in its simplest equally with its most complex constituents, of the work of the mind To know is to relate The assumption of Locke and Hume that the work of the mind is arbitrary because not "given to" man is unjustified by the results of exact science, with the distinction, universally recognized, which such science draws between truth and falsehood, between the real and "mere ideas" This (obviously valid) distinction logically involves the consequence that the object of knowledge is an intelligible ideal reality, a system of thought relations The existence of this ideal whole presupposes a "principle which renders all relations possible and is itself determined by none of them"; an eternal self-consciousness which knows in whole what we know in part To God the world *is*, to man the world *becomes*

Carrying this analytical method into moral philosophy, Green held that ethics applies to the peculiar conditions of social life that investigation into man's nature by metaphysics began.

The pre-supposition of ethics is the spiritual nature of man. Self-reflection reveals to us human capacity, human function, with, consequently, human responsibility. It brings out certain potentialities in the realization of which man's true good must consist. The idea of some "end" or "good" which man presents to himself as desirable for the realization of his true self, constitutes motive, and the determination to realize the self in some definite way constitutes an "act of will," which is neither arbitrary nor externally determined The identification of the self with such a motive is a *self*-determination, which is at once both rational and free. Freedom is not a supposed ability to do anything but the power to identify one's self with that true good which reason reveals as *one's* true good. This good consists in the realization of personal character; hence the final good, *i e*, the moral ideal, as a whole, can be realized only in some society of persons who, while retaining their individuality, find this perfection attainable only when their separate individualities are integrated as part of a social whole Society is as necessary to form persons as persons are to constitute society

The law of our being, so revealed, involves civic or political duties Moral goodness cannot be limited to the cultivation of self-regarding virtues, but consists in the attempt to realize in practice that moral ideal which self-analysis has revealed to us as *our* ideal From this arises the ground of political obligation, for the institutions of political or civic life are the concrete embodiment of our moral ideas As society exists only for the proper development of persons, these institutions are valuable according as they develop the moral character of individual citizens It is obvious that the final moral ideal is not realized in actually existing civic institutions but the same analysis which demonstrates this deficiency points the direction for a true development Hence arises the conception of rights and duties which *should be* maintained by law, as opposed to those actually maintained; with the further consequence that it may become occasionally a moral duty to rebel against the state in the interest of the state itself, that is, in order better to subserve that function which constitutes the *raison d'être* of the state The state does not consist in any definite concrete organization formed once for all It represents a "general will" which is a desire for a common good Its basis is not an external coercive authority but the spiritual recognition, on the part of the citizens, of that which constitutes their true nature. "Will, not force, is the basis of the state"

Green's teaching was, directly and indirectly, the most potent philosophical influence in England during the later 19th century, while his personal example in practical municipal life did much to bring the universities more into touch with the people His criticism of the older empiricism, and the cogency of the reasoning by which his constructive theory is supported is generally recognized His position, however, presents important difficulties No explanation is given of the fact (obvious in experience) that the spiritual entities of the Universe *appear* material Certain elements in feeling seem to resist any attempt to explain them in terms of thought Again, there is a certain vagueness about Green's spiritual principle and its reproduction in individuals as well as about his idea of moral perfection

BIBLIOGRAPHY —Green's *Prolegomena to Ethics* appeared in 1883, and R L Nettleship's standard edition of his *Works* in 3 vols in 1888 The *Principles of Political Obligation* was published separately in 1901. *See* Andrew Seth (Pringle Pattison), *Hegelianism and Personality;* articles in *Mind* (1884) by A J Balfour and H. Sidgwick, in the *Academy* (xxviii. 242 and xxv. 297) by S. Alexander, and in the *Philosophical Review* (vi, 1897) by S S Laurie; W H. Fairbrother, *Philosophy of T H Green* (1896); D G Ritchie, *The Principles of State Interference* (1891), H Sidgwick, *Lectures on the Ethics of T. H Green* (1902); J. H. Muirhead, *The Service of the State. Four Lectures on the Political Teaching of T H Green* (1908), A W. Benn, *English Rationalism in the XIXth Century* (1906); J MacCunn, *Six Radical Thinkers* (1910). Y. L. Chin, *The Political Theory of Thomas Hill Green* (1920).

GREEN, VALENTINE (1739–1813), British engraver, was born at Halesowen He became a pupil of a line engraver at Worcester and in 1765 he migrated to London and began work as a mezzotint engraver He became a member of the Incorporated Society of Artists in 1767, and an associate-engraver of the Royal Academy in 1775. The enclusive right of engraving and publishing plates from the pictures in the Dusseldorf gallery was granted him by the duke of Bavaria in 1789, but, after he had issued more than 20 of these plates, the siege of that city by the French caused him serious financial loss

Poverty drove him in 1805 to accept the post of keeper of the British Institution, which he held until his death During his career as an engraver he produced some 400 plates after portraits by Reynolds, Romney and other British artists, after the compositions of Benjamin West, and after pictures by Van Dyck, Rubens, Murillo and other old masters. He was one of the first engravers to show how admirably mezzotint could be applied to the translation of pictorial compositions as well as portraits, but his portraits are most valued by collectors.

See Alfred Whitman, *Valentine Green* (1902).

GREENAWAY, KATE (1846–1901), English artist and book illustrator, was the daughter of John Greenaway, a well-known draughtsman and engraver on wood, and was born in London on March 17, 1846 After a course of study at South Kensington, at "Heatherley's" life classes, and at the Slade School, Kate Greenaway began, in 1868, to exhibit water-colour drawings at the Dudley gallery, London Her illustrations for children (*e g.*, for *Little Folks*, 1873, *et seq*) attracted much attention In 1877 she began to draw for the *Illustrated London News* In the year 1879 she produced *Under the Window*, of which 150,000 copies are said to have been sold, and of which French and German editions were also issued

Then followed *The Birthday Book, Mother Goose, Little Ann*, and other books for children, which had an enormous success and are now very highly valued "Toy-books" though they were, these little works created a revolution in book illustration, they were praised by John Ruskin (*Art of England* and *Fors Clavigera*), by Ernest Chesneau and Arsène Alexandre in France, by Dr. Muther in Germany, and by leading art critics throughout the world In 1890 Kate Greenaway was elected a member of the Royal Institute of Painters in Water Colours, and in 1891, 1894 and 1898 she exhibited water-colour drawings, including illustrations for her books, at the gallery of the Fine Art Society (by which a representative selection was exhibited in 1902) Kate Greenaway's use of the quaint costume of the beginning of the 19th century lent humour to her fancy, and so captivated the public taste that it has been said that "Kate Greenaway dressed the children of two continents" From 1883 to 1897, with a break only in 1896, she issued a series of *Kate Greenaway's Almanacs*. Although she illustrated *The Pied Piper of Hamelin* and other works, the artist preferred to provide her own text; the numerous verses which were found among her papers after her death show real talent. She had great charm of character, but was extremely shy of public notice, and not less modest in private life She died at Hampstead on Nov. 6, 1901

See M. H Spielmann and G S Layard, *Life of Kate Greenaway* (1905).

GREENBACK PARTY, the name for the American Independent National Party, which held its first national convention in 1874 Its earliest appearance in a presidential campaign was in 1876, when its candidate, Peter Cooper, received 81,740 votes It advocated increasing the volume of greenbacks (*q v*), forbidding bank issues, and the paying in greenbacks of all Government bonds not expressly payable in coin In 1878, after fusing with certain labour groups, it changed its name to the Greenback Labor Party By this and other fusions the party in that year (a period of very hard times) cast over 1,000,000 votes and elected 14 congressmen In 1880 it joined with other labour reformers and cast 308,578 votes for its presidential candidate, James B Weaver, and elected 8 congressmen In 1884 its candidate, Benjamin F Butler, received only 175,370 votes, and the party disintegrated soon thereafter. Many of its adherents later joined the Populist Party, which was organized in 1891

GREENBACKS, a form of paper currency in the United States, so named from the green colour used on the backs of the notes They are treasury notes, and were first issued by the

government in 1862, "as a question of hard necessity," to provide for the expenses of the Civil War. The government, following the example of the banks, had suspended specie payment. The new notes were therefore for the time being an inconvertible paper currency, and, since they were made legal tender, were really a form of fiat money. The first act, providing for the issue of notes to the amount of $150,000,000, was that of Feb. 25, 1862; the acts of July 11, 1862 and March 3, 1863 each authorized further issues of $150,000,000. The notes soon depreciated in value, and at the lowest were worth only 35 cents on the dollar The act of April 11, 1866 authorized the retirement of $10,000,000 of notes within six months and of $4,000,000 per month thereafter; this was discontinued by act of Feb 4, 1868 On Jan. 1, 1879 specie payment was resumed, and the nominal amount of notes then stood at $346,681,000.

GREEN BAY, a city of eastern Wisconsin, U S A, at the south end of Green bay (Lake Michigan) where the Fox river empties into it, 114m N of Milwaukee; a port of entry and the county seat of Brown county It is on Federal highways 41 and 141, has an airport, and is served by the Chicago and North Western, the Chicago, Milwaukee, St Paul and Pacific and the Green Bay and Western railways, by inter-urban motor bus and trolley-car lines, and by lake and river steamers. The population was 31,017 in 1920 (88% native white) and was estimated locally at 45,000 in 1928 The city lies on high level ground on both sides of the river. It has a fine harbour, usually open from early April until December The commerce of the port in 1925 amounted to 1,414,634 tons (largely coal), valued at $9,638,800 There are large paper mills and other important manufacturing industries, with an output in 1925 valued at $23,598,506 Large quantities of grain, fish, cheese and other dairy products are shipped The assessed valuation of property in 1926 was $55,830,191; bank clearings amounted to $75,700,000 Five miles south-west of the city is the State reformatory (opened 1899) Green Bay is the oldest town in Wisconsin and the seat of the earliest Roman Catholic bishopric established in the north-west The "Tank Cottage" (now in Washington park), built by Joseph Roy, a French-Canadian *voyageur,* in 1766, near the mouth of the river, is reputed to be the oldest house in the State In 1634 Jean Nicollet came to this region and found (probably at the Red Banks, 10m. below the present city) a village of Winnebago Indians, whom at first he took for Chinese Radisson, Groseilliers and other *coureurs des bois* were visitors between 1654 and 1658, Joliet and Marquette in 1673; Le Sueur and Perrot in 1683–85. Claude Jean Allouez, the Jesuit missionary, had his mission at the Red Banks before he established it permanently 5m. up the river at Rapides des Pères in 1671–72 In 1718–20 Ft St. Francis was built at the mouth of the river, and in 1745 the first permanent settlement in the State was made at La Baye (within the present boundaries of Green Bay) by Augustin de Langlade The fort was occupied by a British garrison from 1761 to 1763, and again for a short time during the War of 1812 Until 1816, when the American fort (Ft Howard) was garrisoned, the inhabitants of La Baye were regarded as British subjects Fur traders employed by John Jacob Astor were stationed here as early as 1810, and about 1820 Astor put up a warehouse and other buildings For many years there were two distinct settlements, Astor and Navarino, which were united in 1839 as Green Bay. The city was chartered in 1854, and in 1893 Ft Howard was consolidated with it. From about 1890 it was an important lumber centre The first newspaper in Wisconsin, the Green Bay *Intelligencer,* began publication here in 1833

GREENCASTLE, a city of Indiana, U S A, on the Big Walnut river, half way between Indianapolis and Terre Haute; the county seat of Putnam county It is served by the Chicago, Indianapolis and Louisville, the Big Four and the Pennsylvania railways. The population was 3,780 in 1920 (95% native white) and was estimated locally at 7,000 in 1928. It is in a blue-grass region which makes heavy shipments of grain and live stock, and has lumber, zinc, and steel mills, stone quarries, and a large cement plant. Greencastle was settled about 1820 and was chartered as a city in 1861 It is the seat of De Pauw university, a Methodist Episcopal institution, founded in 1837 as Indiana Asbury university, and re-named in 1884 after Washington C De Pauw (1822–87) who made a liberal gift in 1883. The endowment is now over $5,000,000, and the enrolment about 2,000

GREEN DRAGON (*Arisaema Dracontium*), a North American plant of the arum family (Araceae), found chiefly in low woods from Maine to Ontario and Minnesota and southward to Florida and Texas. It is a somewhat fleshy perennial rising from a cluster of acrid corms and bearing a single large leaf, ½ ft to 4 ft long, which is pedately divided into 5 to 17 oblong leaflets, and a single flower stalk (scape) ending in a spadix with a short basal flower-bearing portion and long, slender tip, sometimes 7 in. long, protruding beyond the green, tubular but not hooded ensheathing spathe. The fruit, a cluster of orange-yellow berries, ripens in the autumn Because of its inconspicuous flowering parts, this interesting aroid, though abundant in many parts of its range, is much less known than its showy relative, the Jack-in-the-pulpit (*q v*). (*See* ARACEAE; CALLA, GOLDEN CLUB.)

GREENE, GEORGE WASHINGTON (1811–1883), American historian, was born at East Greenwich (R I), on April 8, 1811, the grandson of Maj-Gen Nathanael Greene He entered Brown university in 1824, left in his junior year on account of ill-health, was in Europe during the next 20 years, except in 1833–34, when he was principal of Kent academy at East Greenwich, and was the U S consul at Rome from 1837 to 1845 He was instructor in modern languages in Brown university (1848–52); and in 1871–75 was non-resident lecturer in American history in Cornell university He died at East Greenwich (R I), on Feb 2, 1883. His works include: *Historical View of the American Revolution* (1865); *Life of Nathanael Greene* (1867–71); *The German Element in the War of American Independence* (1876); and a *Short History of Rhode Island* (1877)

GREENE, MAURICE (1695–1755) English composer, was born in London and became a chorister of St Paul's Cathedral, where he studied under Charles King, and then under Richard Brind, organist of the cathedral from 1707 to 1718, whom, on his death in the last-named year, he succeeded Nine years later he became organist and composer to the chapel royal, on the death of Dr Croft In 1730 he was elected to the chair of music in the university of Cambridge Dr Greene was a voluminous composer of church music, showing contrapuntal skill and sound musical scholarship and his collection of *Forty Select Anthems* became a standard work of its kind He died on Dec 1, 1755.

GREENE, NATHANAEL (1742–1786), American general, son of a Quaker farmer and smith, was born at Potowomut, in the township of Warwick, R I., on Aug 7 (not, as has been stated, June 6), 1742 At Coventry, R I, where he went in 1770, he was the first to urge the establishment of a public school In the same year he was chosen a member of the legislature of Rhode Island, to which he was re-elected in 1771, 1772 and 1775. He sympathized strongly with the Whigs and in 1774 joined the local militia At this time he began to study the art of war His zeal in attending to military duty led to his expulsion from the Society of Friends.

In 1775, in command of the contingent raised by Rhode Island, he joined the American forces at Cambridge, and on June 22 was appointed a brigadier by Congress To him Washington assigned the command of the city of Boston after it was evacuated by Howe in March 1776. On Aug 9, 1776 he was promoted to be one of the four new major generals and was put in command of the Continental troops on Long Island, but severe illness prevented his taking part in the battle of Long Island Greene was placed in command of Ft. Lee, and on Oct. 25 succeeded Gen Israel Putnam in command of Ft. Washington. Greene ordered Col Magaw, who was in immediate command, to defend the place until he should hear from him again, and reinforced it to meet Gen Howe's attack Nevertheless, the blame for the losses of Fts Washington and Lee was put upon Greene, but without his losing the confidence of Washington, who assumed the responsibility At Trenton Greene commanded one of the two American columns; he commanded the reserve at Brandywine, and was prominent in the battle of Germantown, though his troops arrived late

At the request of Washington, on March 2, 1778, he accepted the office of quartermaster general (succeeding Thomas Mifflin), and succeeded with it as well as anyone could under the circumstances, meanwhile continuing to command troops in the field. In August he resigned the office of quartermaster general, after a struggle with Congress over the interference in Army Administration by the Treasury board. On Oct 4 he succeeded Gates as commander-in-chief of the Southern army, and took command at Charlotte, N.C, on Dec. 2. The army was weak and badly equipped and was opposed by a superior force under Cornwallis Greene decided to divide his own troops, thus forcing the division of the British as well. This strategy led to Gen Daniel Morgan's victory of Cowpens, S C, Jan. 17, 1781, and to the battle at Guilford Court House, N C., March 15, in which after having weakened the British troops by continued movements, Greene was defeated indeed, but only at such cost to the victor that Tarleton called it "the pledge of ultimate defeat" Three days after this battle Cornwallis withdrew toward Wilmington Greene allowed Cornwallis to march north to Virginia and then turned swiftly to the reconquest of the inner country of South Carolina This, in spite of a reverse sustained at Lord Rawdon's hands at Hobkirk's Hill (April 25) he achieved by the end of June, the British retiring to the coast. Greene then gave his forces a six weeks' rest, and on Sept 8, with 2,600 men, engaged the British under Lieut Col James Stuart at Eutaw Springs; the battle, although tactically drawn, so weakened the British that they withdrew to Charleston, where Greene penned them during the remaining months of the war Greene's Southern campaign showed remarkable strategic features that remind one of those of Turenne, the commander whom he had taken as his model in his studies before the war He excelled in dividing, eluding and tiring his opponent by long marches, and in actual conflict forcing him to pay for a temporary advantage a price that he could not afford

South Carolina and Georgia voted Greene liberal grants of lands and money On the Georgia estate, Mulberry Grove, 14m above Savannah, he settled in 1785, after twice refusing (1781 and 1784) the post of secretary of war, and there he died of sunstroke on June 19, 1786

Bibliography —*See* the *Life of Nathanael Greene* (1867–71), by his grandson, George W Greene, and the biography (1893), by Brig Gen F V Greene, in the "Great Commanders Series." His letters are in the University of Michigan library.

GREENE, ROBERT (1558–1592), English dramatist and miscellaneous writer, was baptized at Norwich on July 11, 1558 He entered St John's college, Cambridge, as a sizar in 1575 and took his B A thence in 1579, proceeding M A in 1583 from Clare Hall His life at the university was, according to his own account, spent "among wags as lewd as himself, with whom he consumed the flower of his youth" In 1588 he was incorporated at Oxford, so that on some of his title pages he styles himself "utriusque Academiae in Artibus Magister", and Nashe humorously refers to him as "utriusque Academiae Robertus Greene" Between the years 1578 and 1583 he had travelled abroad, according to his own account very extensively, visiting France, Germany, Poland and Denmark, besides learning at first-hand to "hate the pride of Italie" and to know the taste of that poet's fruit, "Spanish mirabolones" After taking his M A degree, he went to London, and his earliest extant literary production was in hand as early as 1580 By his own account he rapidly sank into the worst debaucheries of the town, though Nashe declares that he never knew him guilty of notorious crime It is possible that he, as well as his bitter enemy, Gabriel Harvey, exaggerated the looseness of his conduct. His marriage, which took place in 1585 or 1586, failed to steady him, if Francesco, in Greene's pamphlet *Never too Late to Mend* (1590), is intended for the author himself, it had been a runaway match; but the fiction and the autobiographical sketch in the *Repentance* agree in their account of the unfaithfulness and desertion which followed on the part of the husband In his last years he made war on the cutpurses and "conny-catchers" with whom he came into contact in the slums, and whose doings he fearlessly exposed in his writings. He tells us how at last he was friendless "except it were in a fewe alehouses," where he was respected on account of the score he had run up. The story of his death is told by Gabriel Harvey, whose family Greene had attacked in the prose-tract *A Quip for an Upstart Courtier, or a Quaint Dispute between Velvet Breeches and Cloth Breeches* (1592). After a banquet where the chief guest had been Thomas Nashe, Greene had fallen sick "of a surfeit of pickle herringe and Rennish wine" At the house of a poor shoemaker near Dowgate, deserted by all except his compassionate hostess (Mrs Isam) and two women—one of them the sister of a notorious thief named "Cutting Ball," and the mother of his illegitimate son, Fortunatus Greene—he died on Sept 3, 1592 Shortly before his death he wrote under a bond for £10 which he had given to the good shoemaker, the following words addressed to his long-forsaken wife "Doll, I charge thee, by the loue of our youth and by my soules rest, that thou wilte see this man paide, for if hee and his wife had not succoured me, I had died in the streetes —Robert Greene."

Four Letters and Certain Sonnets, Harvey's attack on Greene, appeared almost immediately after his death Nashe took up the defence of his dead friend and ridiculed Harvey in *Strange News* (1593), and the dispute continued for some years But, before this, the dramatist Henry Chettle published a pamphlet from the hand of the unhappy man, entitled *Greene's Groat's-worth of Wit bought with a Million of Repentance* (1592), containing the story of Roberto, who may be regarded, for practical purposes, as representing Greene himself. In it he exhorted to repentance three of his *quondam* acquaintance Of these three Marlowe was one—to whom and to whose creation of "that Atheist Tamberlaine" he had repeatedly alluded The second was Peele, the third probably Nashe But the passage addressed to Peele contained a transparent allusion to a fourth dramatist, who was an actor likewise, as "an vpstart crow beautified with our feathers, that with his *Tygres heart wrapt in a player's hyde* supposes hee is as well able to bombast out a blanke-verse as the best of you, and being an absolute Iohannes-fac-totum, is in his owne conceyt the onely shake-scene in a countrey" The phrase italicized parodies a passage occurring in *The True Tragedie of Richard, Duke of York,* etc, and retained in Part III of *Henry VI* If Greene (as many eminent critics have thought) had a hand in *The True Tragedie,* he must here have intended a charge of plagiarism against Shakespeare But while it seems more probable that (as the late R Simpson suggested) the upstart crow beautified with the feathers of the three dramatists is a sneering description of the actor who declaimed their verse, the *animus* of the whole attack (as explained by Dr Ingleby) is revealed in its concluding phrases This "shake-scene," *i.e.*, this *actor* had ventured to intrude upon the domain of the regular staff of playwrights—their monopoly was in danger!

Two other prose pamphlets of an autobiographical nature were issued posthumously Of these, *The Repentance of Robert Greene, Master of Arts* (1592) bears traces of having been improved from the original, while *Greene's Vision* was certainly not, as the title-page avers, written during his last illness

Altogether not less than 35 prose-tracts are ascribed to Greene Nearly all of them are interspersed with verses, in their themes they range from the "mysticall" wonders of the heavens to the familiar but "pernitious sleights" of the sharpers of London His "love-pamphlets" brought upon him the outcry of Puritan censors The earliest of his novels, as they may be called, *Mamillia,* was licensed in 1583. Part ii, of which, though probably completed several years earlier, the earliest extant edition bears the date 1593, had a sequel, *The Anatomie of Love's Flatteries,* which contains a review of suitors recalling Portia's in *The Merchant of Venice The Myrrour of Modestie* (the story of Susanna) (1584); *The Historie of Arhasto, King of Denmarke* (1584); *Morando, the Tritameron of Love,* a rather tedious imitation of the *Decameron* (1584), *Planetomachia* (1585) (a contention in story-telling between Venus and Saturn); *Penelope's Web* (1587) (another string of stories); *Alcida, Greene's Metamorphosis* (1588) and others, followed In these popular productions he appears very distinctly as a follower of John Lyly; indeed two of Greene's novels are by their titles announced as a kind of

sequel to the parent romance: *Euphues his Censure to Philautus* (1587), *Menaphon. Camilla's Alarum to Slumbering Euphues* (1589), named in some later editions *Greene's Arcadia.* This pastoral romance, written in direct emulation of Sidney's, with a heroine called Samila, contains St Sephestia's charming lullaby, with its refrain "Father's sorowe, father's joy" On his *Pandasto, The Triumph of Time* (1588) Shakespeare founded *A Winter's Tale;* in fact, the novel contains the entire plot of the comedy, except the device of the living statue; though some of the subordinate characters in the play, including Autolycus, were added by Shakespeare, together with the pastoral fragrance of one of its episodes

Greene's *Never too Late* (1590) has a vivacity and truthfulness of manner which savour of an 18th century novel rather than of an Elizabethan tale concerning the days of "Palmerin, King of Great Britain" Philador, the prodigal of *The Mourning Garment* (1590), is obviously also in some respects a portrait of the writer. The experiences of the Roberto of *Greene's Groat's-worth of Wit* (1592) are even more palpably the experiences of the author himself, though they are possibly overdrawn—for a born rhetorician exaggerates everything, even his own sins Besides these and the posthumous pamphlets on his repentance, Greene left realistic pictures of the very disreputable society to which he finally descended, in his pamphlets on "conny-catching". *A Notable Discovery of Coosnage* (1591), *The Blacke Bookes Messenger. Laying open the Life and Death of Ned Browne, one of the most Notable Cutpurses, Crossbiters and Conny-catchers that ever lived in England* (1592). Much in Greene's manner, both in his romances and in his pictures of low life, anticipated what proved the slow course of the actual development of the English novel; and it is probable that his true *métier,* and that which best suited the bright fancy, ingenuity and wit of which his genius was compounded, was pamphlet-spinning and story-telling rather than dramatic composition.

Only four plays remain to us of which Greene was indisputably the sole author. The earliest of these seems to have been the *Comicall History of Alphonsus, King of Arragon* (*c.* 1587), written in emulation as well as in direct imitation of Marlowe's tragedy. In the *Honourable History of Friar Bacon and Friar Bungay* (not known to have been acted before Feb. 1592, but probably written in 1589) Greene once more attempted to emulate Marlowe; and he succeeded in producing a masterpiece of his own *Friar Bacon* remains a dramatic picture of English Elizabethan life with which *The Merry Wives* alone can vie *The History of Orlando Furioso, one of the Twelve Peeres of France,* known to have been acted on Feb 21, 1592, is a free dramatic adaptation of Ariosto, Harington's translation of whom appeared in 1591. In *The Scottish Historie of James IV* (*c* 1591, licensed for publication 1594) the story has no pretence to be historical, but is taken from one of Giraldi Cinthio's tales It contains a prelude and some dances between the acts—"presented by Oboram, King of Fayeries," who is, however, a very different person from the Oberon of *A Midsummer Night's Dream. George-a-Greene the Pinner of Wakefield* (acted 1593, printed 1599), a delightful picture of English life fully worthy of the author of *Friar Bungay,* has been attributed to him on slight evidence. The conjecture as to his supposed share in the plays on which the second and third parts of *Henry VI* are founded has been already referred to. He was certainly joint author with Thomas Lodge of the curious drama called *A Looking Glasse for London and England* (acted in 1592 and printed in 1594)—a dramatic apologue conveying to the living generation of Englishmen the warning of Nineveh's corruption and prophesied doom, often reproduced as a street puppet play

Greene's dramatic genius has nothing in it of the intensity of Marlowe's tragic muse; nor perhaps does he ever equal Peele at his best. His comic humour is undeniable, and he had the gift of light and graceful dialogue. His diction is overloaded with classical ornament, but his versification is easy and fluent, and its cadence is at times singularly sweet. He creates his best effects by the simplest means; and he is indisputably one of the most attractive of early English dramatic authors.

Greene's dramatic works and poems were edited by Alexander Dyce. His complete works were edited for the Huth Library by A. B. Grosart (15 vols 1881–86); by J. C Collins (2 vols, 1905); and by T. H. Dickinson (Mermaid Series, 1909) Grosart's edition contains a translation of Nicholas Storojhenko's monograph on Greene (Moscow, 1878) An account of his pamphlets is to be found in J. J. Jusserand's *English Novel in the Time of Shakespeare* (Eng. trans., 1890). *See* also F. M. Bodenstedt, in *Shakespeare's Zeitgenossen und ihre Werke* (1858); W. Bernhardi, *Robert Greenes Leben und Schriften* (1874); an introduction by A. W Ward to *Friar Bacon and Friar Bungay* (1886, 4th ed, 1901); C. R Gayley, "Robert Greene: His Life and the Order of his Plays in *Representative English Comedies* (vol. i, 1903); and an account by E. K. Chambers in *The Elizabethan Stage* (vol iii 1923) where other references will be found.

GREENER, WILLIAM (1806–1869), gunmaker and inventor, was born at Felling near Newcastle-on-Tyne in 1806 and began business in Newcastle in 1829. In 1844 he removed to Birmingham His most important invention, the first expansive rifle bullet, consisted of an oval ball a diameter and a half in length, with a flat end, perforated, in which a cast metallic taper plug was inserted. (*See* AMMUNITION) In 1843 he patented a process with W. E Stait for the manufacture of pencils from the hard graphite carbon deposited in the interior of gas retorts. (*See* LIGHTING) Other valuable inventions followed, the most important being the cape rifle. (*See* RIFLE)

His son William Wellington Greener (1834–1921) invented the treble-wedgefast mechanism of modern shotguns in 1865—perfected in 1873

BIBLIOGRAPHY—*See* W. Greener, *The Gun* (1834); *The Science of Gunnery* (1841), W. W Greener, *The Breech Loader and How to Use it* (1892 and 10 subsequent editions); *Sharpshooting for Sport and War* (1900), G T. Teasdale-Buckell, *Experts on Gun and Gunnery* (1900).

GREENFIELD, a city of central Indiana, U S A., 21m E of Indianapolis, on Federal highway 40, the Pennsylvania railroad, and a branch of the Blue river, the county seat of Hancock county The population in 1920 was 4,168 (98% native white). It is surrounded by fertile farmlands, and has canning plants and other factories. Greenfield was founded about 1828 and was incorporated in 1850 It was the birthplace of James Whitcomb Riley.

GREENFIELD, a town of north-western Massachusetts, U S A, on the Connecticut river, county seat of Franklin county It is the eastern terminus of the Mohawk trail, and is served by the Boston and Maine railroad. It has an area of 20 sq m., and a population in 1925 of 15,246, estimated at 17,000 in 1928 It is a busy trading centre, and has diversified manufacturing industries, producing more screw-cutting tools than any other place. The factory output in 1927 was valued at $8,568,000 A winter sports carnival is held here annually. Greenfield was settled in 1686 and incorporated as a district of Deerfield in 1753 and as a separate town in 1775 It was a centre of disaffection during the Shay's Rebellion.

GREENFIELD, a village of Highland county, Ohio, U S A, 47m S by W of Columbus, served by the Baltimore and Ohio and the Detroit, Toledo and Ironton railways. The population was 4,344 in 1920 (94% native white) and was estimated locally at 5,300 in 1928 There are large stone quarries and a variety of manufacturing and commercial industries Cattle-shipping and poultry-packing are important. Greenfield has a unique public school system, with a fine plant (elementary, high and vocational schools grouped together on a large campus) erected at a cost of $3,000,000, largely contributed by one of the citizens.

GREENFINCH or **GREEN LINNET,** *Ligurinus chloris,* is a common European bird The cock, in his plumage of yellowish-green and yellow, is finely coloured but heavily built, and his song is hardly to be commended. The hen is less brightly tinted. The species pervades almost the whole of Europe, and in Asia reaches the river Ob It extends to Palestine, but is unknown in Egypt It is, however, abundant in north-west Africa In the north-east of Asia and its adjacent islands occur two allied species—*L sinica, L kawarahiba.*

GREENHEART, one of the most valuable of timbers, the produce of *Nectandra Rodiaei,* family Lauraceae, a large tree,

native of tropical South America and the West Indies. From its bark and fruits is obtained the febrifuge principle bibirine. Greenheart wood is of a dark-green colour, sap wood and heart wood being only distinguished with difficulty. The heart wood is one of the most durable of all timbers, and its value is greatly enhanced by the fact that it is proof against the ravages of many marine borers which rapidly destroy piles and other submarine structures of most other kinds of wood available for such purposes Greenheart is one of the strongest of all woods, and is exceedingly dense, its specific gravity being about 1150. It is extensively used for keelsons, beams, engine-bearers and planking, etc., but its excessive weight unfits it for many purposes for which its other properties would render it eminently suitable.

GREENHILL, SIR ALFRED GEORGE (1847–1927), English mathematician, born in London on Nov 29, 1847, was educated at Christ's Hospital and St John's college, Cambridge. He held the posts of fellow and lecturer in mathematics at Emmanuel college, Cambridge (1873–76), and professor of mathematics to the advanced class of artillery officers, Woolwich (1876–1906). He retired in 1906, and occupied himself with activities connected with the Royal Society and the London Mathematical Society Greenhill was a member of many foreign learned societies; and received many academic honours, including a knighthood in 1908 He died in London on Feb 10, 1927.

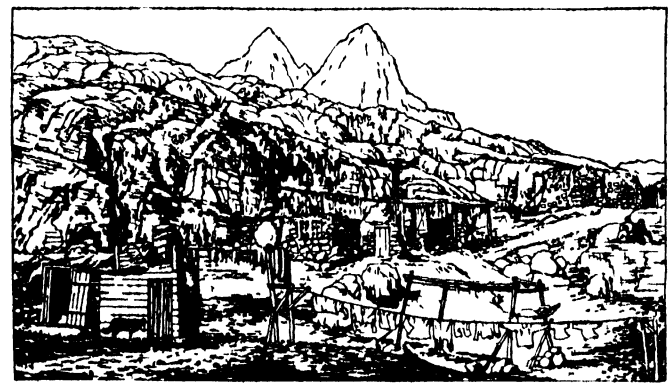
Greenhill's mathematical work consisted of original contributions to dynamics, hydrodynamics and elasticity In these he made extensive use of elliptic functions and also applied the sigma-functions due to Weierstrass The investigation of the problem of the steadiness of flight of a projectile due to rifling and the amount of rifling required for various types of projectile was very warmly received at Woolwich He applied elliptic functions to the investigation of special problems for the advisory committee on aeronautics and he issued two reports, the first on *Stream Line Motion past a Plane Barrier* (1910), and a supplementary report dealing with curved boundaries in 1916 Another well known problem solved by Greenhill was that of the greatest height a vertical shaft can attain without bending under its own weight He tested his solution by the measurement of the heights of trees Greenhill wrote *Hydrostatics* (1894), *Differential and Integral Calculus* (1886), *Applications of Elliptic Functions* (1882), *Notes on Dynamics* (1908)

See obituary notice by Love in *Journal of the London Mathematical Society*, vol. iii. (1928)

GREENLAND, a large island, the greater portion of which lies within the Arctic Circle, while the whole is arctic in character It is not connected with any portion of Europe or America except by suboceanic ridges; but in the extreme north it is separated only by a narrow strait from Ellesmere island in the Canadian Arctic archipelago. The Faroe-Icelandic ridge, about 300 fathoms deep at its deepest, unites Greenland with Iceland (across Denmark strait), the Faroes and Scotland, and another ridge apparently joins north-east Greenland and Spitsbergen A similar submarine ridge crosses Davis strait Peary Land, in the north, is an integral part of Greenland and is not, as was once supposed, separated by a strait Its most northerly point is Cape Morris Jesup in 83° 39′ N Cape Farewell, the most southerly point (on a small island), is in 50° 45′ N. The extreme length of Greenland is about 1,650 m while its extreme breadth, which occurs about 70° N is nearly 800 miles The area is estimated at 827,275 sq miles Greenland is a Danish possession

The southern and south-western coasts have been known, since the 10th century, when Norse settlers appeared there, but the communication between the Norse settlements and Norway was broken off in the 15th century, and the Norsemen's knowledge of their distant colony was gradually lost The south and west coast of Greenland was re-discovered by John Davis in July 1585, though previous explorers, as Rining, Cortereal, Frobisher and others, had seen it, and at the end of the 16th and the beginning of the 17th century the work of Davis (1586–88), Hudson (1610) and Baffin (1616), in the western seas, afforded some knowledge of the west coast This was added to by later explorers and whalers Among explorers who, in the 19th century, were specially connected with the north-west coast may be mentioned E A. Inglefield (1852), who sailed into Smith sound, E K Kane (1853–55) who worked northward through Smith sound into Kane basin, and C F. Hall (1871) who explored the strait (Kennedy) and Robeson channels to the north of this

The northern east coast was sighted by Hudson (1607) in about 73° 30′ N (C Hold with Hope), and during the 17th century and later this northern coast was probably visited by many Dutch whalers The first who gave more accurate information was the Scottish whaler, Capt W Scoresby, Jr (1822), who, with his father, explored the coast between 69° and 75° N, and gave the first fairly trustworthy map of it Captains Edward Sabine and D Clavering (1823) visited the coast between 72° 5′ and 75° 12′ N and met the only Eskimo ever seen in this part of Greenland The German expedition in 1870, under C Koldewey, reached 77° N (Cape Bismarck); and the duke of Orleans in 1905 ascertained that this point was on an island and penetrated farther north to about 78° 16′ From this point the north-east coast remained unexplored until a Danish expedition under Mylius Erichsen, with J P Koch, in 1906–08 explored it, discovering North-east Foreland, the easternmost point A Wegener explored the ice sheet along that coast E Mikkelsen in 1910 mapped Danmark fjord (*see* ARCTIC REGIONS) The southern part of the east coast was first explored by the Dane, W A Graah (1829–30), between Cape Farewell and 65° 16′ N In 1883–85 the Danes, G Holm and T V Garde, mapped the coast from Cape Farewell to Angmagsalik in 66° N A E Nordenskiold, in the "Sophia," landed near Angmagsalik in 65° 36′ N in 1883 Capt C Ryder in 1891–92, mapped the large Scoresby sound, Lieut G Amdrup, in 1899, explored the coast from Angmagsalik, north to 67° 22′ N In 1899 Dr A G Nathorst explored the land between Franz Josef fjord and Scoresby fjord, where the large King Oscar fjord, connecting Davy sound with Franz Josef fjord, was discovered In 1900 Amdrup explored the still unknown east coast from 69° 10′ N south to 67° N In 1926 J M Wordie added details to the coast between Sabine island and Davy sound and in 1926–27 L Koch explored from Scoresby sound to Danmark harbour



UMANAK, ONE OF THE MOST NORTHERLY SETTLEMENTS IN THE WORLD
Umanak is situated in latitude 70° 40′ N Nevertheless, it is not always freezing there, and during the two or three months of mild weather its inhabitants, whose primitive dwellings are seen, grow broccoli, lettuce and, sometimes, turnips

Towards the close of the 19th century several explorers gave attention to the North of Greenland, including L A Beaumont of the Nares expedition (1876); J B Lockwood, of the Greely expedition (1882), and R E Peary on several journeys (1892, 1895, and 1901) For details *see* ARCTIC REGIONS

The scanty exploration of the great ice-cap, or inland ice, which covers the whole of the interior of Greenland, has been prosecuted chiefly from the west coast In 1751 Lars Dalager, a Danish trader, took some steps in this direction from Frederikshaab In 1867 E Whymper and R Brown made the first attempt of modern times to penetrate the interior, but failed In 1870 A E Nordenskiöld and S Berggren walked 35 m inland from the head of Aulatsivik fjord to an elevation of 2,200 feet Jens Jensen reached, in 1878, the Jensen Nunataks (5,400 ft above the sea), about 45 m from the western margin in 62° 50′ N Nordenskiöld penetrated, in 1883, about 80 m inland in 68° 20′ N, and

two Lapps of his expedition went still farther on skis to about 43° W., at an elevation of 6,600 ft Peary and Maigaard reached in 1886 about 100 m. inland, a height of 7,500 ft. in 69° 30′ N. Nansen, with five companions, in 1888 made the first complete crossing of the inland ice, working from the east coast to the west, about 64° 25′ N., and reached a height of 8,922 feet. Peary and Astrup, in 1892, crossed the northern part of the inland ice between 78° and 82° N, reaching a height of about 8,000 ft, and determined the northern termination of the ice-covering. Peary made very nearly the same journey again in 1895 T. V Garde, in 1893, between 61° and 62° N, reached a height of 7,080 ft about 60 m from the margin of the ice M Ericksen crossed its north-eastern corner in 1907 and E Mitkkelsen in 1910 In 1912 K. Rasmussen and P. Freuchen crossed from Inglefield gulf to Danmark fjord and back In 1913 the Swiss, A de Quervain, who had investigated the ice cap in 1909, crossed it from Disco bay to Angmagsalik, reaching a greatest altitude of 8,364 feet. The same year J P. Koch and A. Wegener crossed from Louise Land on the north-east coast to near Proven, rising to 9,500 feet

The station of Thule, founded in 1910, in North Star bay (76° 32′ N) by K Rasmussen has been the base of five Danish expeditions under Rasmussen and L Koch, which have, since that date, explored the north of Greenland and investigated the Eskimo tribes. In 1926–27 L Koch continued his researches in the Scoresby sound district on the east coast. In 1926–27 W H Hobbs made meteorological researches at high altitudes in the Holstenborg district

Coasts.—The coasts of Greenland are for the most part deeply indented with fjords The coast-lines of Melville bay and around North-east Foreland are to some degree exceptions, though the fjords may here be somewhat filled with glaciers The east side of Peary Land is unbroken, the mountains recede inland, and there is shoal water for a considerable distance from the coast Numerous small islands lie off the coasts, where they are indented The largest is Disco, off the west, which is crossed by the parallel of 70° N This lofty island has an area of 3,200 sq miles

The extensive glaciation of the east coast is evidently owing to the north polar current carrying the ice masses from the north polar basin south-westward along the land, and giving it an entirely arctic climate down to Cape Farewell In some parts the interior ice-covering extends down to the outer coast, while in other parts its margin is situated more inland, and the ice-bare coast-land is deeply intersected by fjords extending far into the interior, where they are blocked by enormous glaciers, which discharge icebergs into them Scoresby sound has a length of about 180 m from the outer coast to the point where it is blocked by the glaciers, and with its numerous branches covers an enormous area. Franz Josef fjord with its branch, King Oscar fjord, communicating with Davy sound, forms a system of fjords on a similar scale These fjords are very deep, the greatest depth found by Ryder in Scoresby sound was 300 fathoms, but there are certainly still greater depths, like the Norwegian fjords they have, however, probably all of them a threshold or sill, with shallow water near their mouths. A few soundings made outside this coast seem to indicate that the fjords continue as deep submarine valleys on the coastal shelf These fjords are drowned valleys of erosion and not of tectonic origin On the west coast there are also many great fjords One of the best known from earlier days is the great Godthaab fjord (or Baals revier) north of 64° N Along the east coast there are many high mountains, exceeding 6,000 ft and 7,000 ft in height In the region of Angmagsalik, which is very mountainous, the most prominent peak is Ingolf's fjeld in 66° 20′ N, about 6,000 ft, which is seen from far out at sea and forms an excellent landmark This is probably the Blaaserk (*i.e*, Blue Sark or blue shirt) of the old Norsemen, their first landmark on their way from Iceland to the Öster Bygd, on the south-west coast of Greenland The highest mountains near the inner branches of Scoresby sound are about 7,000 feet. The Petermann Spitze, near the shore of Franz Josef fjord is estimated to be 11,000 ft., and is considered to be the highest mountain in Greenland It lies in a mountainous ice-free region.

Along the west coast of Greenland the mountains are generally not quite so high, but even here peaks of 5,000 and 6,000 ft. are not uncommon. As a whole the coasts are unusually mountainous, and Greenland forms in this respect an interesting exception, as there is no other known land of such a size so filled along its coasts on all sides with high mountains and deep fjords and valleys.

The Ice Sheet.—The whole interior of Greenland is completely covered by the so-called inland ice, an enormous sheet of ice burying all valleys and mountains far below its surface. Its area is about 721,000 sq m, and it is by far the greatest glacier of the northern hemisphere. Only occasionally there emerge lofty rocks, isolated but not completely covered by the ice-sheet, such rocks are known as *nunataks* (an Eskimo word). The ice-sheet rises in the interior to a level of 8,000 ft. and (on the Arctic Circle) 10,000 ft or more in 75° N and descends gradually by extremely gentle slopes towards the coasts or the bottom of the fjords on all sides, discharging a great part of its yearly drainage in the form of icebergs in the fjords on the west and east coasts The surface of the ice-sheet forms in a transverse section from the west to the east coast a regular curve approaching an arc of a wide circle but with greater elevation nearer the eastern than the western side If the ice-sheet lies on high ground, as is probable, its thickness must be at least 1,000 feet In the interior the surface of the ice is composed of loose dry snow, which never melts, but is carried outwards to the borders, where also there is heavier snowfall. The snow is often carried off the ice by the outward blowing winds and pours through the mountain rim of Greenland, and is piled up in valleys as snow drift glaciers or is carried out on to the sea-ice and forms snow deltas Near its margin the ice-sheet is broken up by numerous crevasses The steep ice-walls at the edge show, especially where the motion of the ice is slow, a distinct striation, which indicates the strata of annual precipitation with the intervening thin seams of dust (Nordenskiold's cryoconite) This is partly dust blown on to the surface of the ice from the ice-bare coast-land, and partly the dust of the atmosphere brought down by the falling snow and accumulated on the surface of the glacier's covering by the melting during the summer In the rapidly-moving glaciers of the ice-fjords this striation is not distinctly visible, being evidently obliterated by the strong motion of the ice masses

The ice-sheet of Greenland must be considered as a viscous mass which, by the vertical pressure in its interior, is pressed outwards and slowly flows towards the coasts The motion of the outwards creeping ice-sheet will naturally be more independent of the configurations of the underlying land in the interior, where its thickness is great, than near the margin where it is thinner Here the ice converges into the valleys and moves with increasing velocity, in the form of glaciers, into the fjords, where they break off as ice-bergs After A Helland had, in July 1875, discovered the amazingly great velocity, up to 64¾ ft in 24 hours, with which the glaciers of Greenland move into the sea, the margin of the ice-sheet and its glaciers was studied by several expeditions. K J V Steenstrup during several years, Captain Hammer in 1879–80, Captain Ryder in 1886–87, Dr E von Drygalski in 1891–93, and several American expeditions in later years, all examined the question closely The highest known velocities of glaciers were measured by Ryder in the Upernivik glacier (in 73° N) where he found a velocity of 125 ft in 24 hours, and an average velocity during several days of 102 feet. It was, however, ascertained that there is a great difference between the velocities of glaciers in winter and summer There seem to be periodical oscillations in the extension of the glaciers and the ice-sheet similar to those that have been observed on the glaciers of the Alps and elsewhere Numerous glacial marks, such as polished striated rocks, moraines, erratic blocks, etc, prove that the whole of Greenland, even the small islands and skerries outside the coast, has once been covered by the ice-sheet.

Numerous raised beaches and terraces, containing shells of marine mollusca, etc, occur along the whole coast of Greenland, and indicate that the whole of this large island has been raised, or the sea has sunk, in post-glacial times, after the ice-sheet covered its now ice-bare outskirts. In the north, along the shores of

Smith sound, these traces of the gradual upheaval of the land, or sinking of the sea, are very marked; but they are also very distinct in the south, although not found so high above sea-level, which seems to show that the upheaval has been greater in the north. The elevation of the raised beaches varies between 150 and 480 feet. There is a common belief that during quite recent times the west and south-west coast, within the Danish possessions, has been sinking Although there are many indications which may make this probable, none of them can be said to be quite decisive.

Geology and Structure.—The geological structure of Greenland can be judged only from the ice-free marginal zone The island appears to be a mountainous plateau in which Archaean rocks predominate, but in the northern half there are considerable areas of younger rocks. The extreme north, including most of Peary Land and the equally ice-free areas of Nyeboe and Hall Lands, are built of early Palaeozoic sandstones and limestones To the south there is a belt of Silurian limestones well seen in Washington Land, while in the Smith sound region there are Cambrian sandstones which lie remarkably horizontal and undisturbed All these series are continued into Ellesmere island The Palaeozoic rocks of the west as well as Lower, Middle and Upper Carboniferous and Permian beds occur also on the north-east side Volcanic activity and much faulting took place in East Greenland at the close of the Palaeozoic period The lowest Mesozoic beds are Lower Triassic sandstones and shales in about 74° N on the east coast Later Triassic beds occur farther south on the same coast, and Rhaetic plant beds are abundant in Jameson Land Jurassic beds (Lias, Dogger, Kimmeridge and Portland) are found only on the east between Jameson Land and Danmark Harbour. Cretaceous beds occur on both east and west, but chiefly the west, where coal is found in the Cretaceous sandstones of the eastern edges of Disko island and the borders of Nugsuaq peninsula The abundant plant fossils in those rocks give clear indication of a warm, temperate climate persisting until Tertiary times Tertiary lavas, either surface flows or intrusive sills, are associated on both sides with rocks of that age and cover them in places The sedimentary Tertiaries are chiefly sandstone, with a little coal Disko island, Nugsuaq and Svartenhule peninsulas on the west, and Sabine and Kuhn islands and adjacent regions on the east, are the chief Tertiary basalt areas L Koch has suggested that Greenland consists of two plateaux divided about 70° N, where the ice-sheet is lowest With this break he associates the belt of volcanic activity which continues into Iceland, northern Ireland and Scotland It may be noted that in this belt warm springs occur in Disko island (temp 66° F), in Scoresby sound (140° F) and on Hold with Hope In any case the whole of Greenland is part of the Laurentian shield of Canada In the North and on the north-east there can be traced the continuation of the Caledonian foldings of Europe and Spitsbergen These cause the high mountains of Peary Land and their westward continuation into Ellesmere island, and are associated with an overthrust in the Franz Josef fjord area

Minerals.—Native iron of meteoric origin has been found at Ovifak on Disko island and at Cape York Since John Ross's voyage in 1818 it has been known to exist there, and from it the Eskimo got iron for their weapons In 1897 Peary brought the largest nodule (weighing 90 tons) to New York. This iron is considered to be of meteoric origin, but the Disco island deposit has now been proved to be telluric. Graphite is abundant, particularly near Upernivik, cryolite is found almost exclusively at Ivigtut, copper has been observed at several places, but only in nodules and laminae of limited extent; and coal of poor quality is found in the districts about Disko bay and Umanak fjord, and a little is mined Steatite or soapstone has long been used by the natives for the manufacture of lamps and vessels

Climate.—The climate is very uncertain, the weather changing suddenly from bright sunshine to dense fog or heavy falls of snow and icy winds The January mean at Ivigtut is 18° F and at Upernivik −7° F The July means are 49° and 42°. A branch of the North Atlantic drift flows north on the east side of Davis strait and accounts for relatively high temperatures in south-west Greenland On the east coast temperatures are lower than on the west, for the ice sheet is more developed on its eastern side, and a cold current washes the coast. On the coasts, particularly the south-west, frost is rare in June, July and August, and the summer warmth is appreciable Rainfall, which is mainly in summer, is heavy in the south-west, but light elsewhere. Snow may fall in any month of the year In the lofty interior temperatures are always low, ranging from about 14° F in summer to perhaps −90° F in winter These low temperatures are caused by radiation from the snow surface, which also causes great range between day and night. Over the interior lies a permanent anti-cyclone from which cold winds glide outwards to the coasts These winds, heated by compression and blowing down valleys, sometimes give rise to warm, relatively dry, fohn winds On the ice-sheet, precipitation as snow or ice-crystals is slight, especially away from the edges Mists are not uncommon in the interior and occur frequently on the coasts in summer



AN ESKIMO FAMILY OF GREENLAND
Existing on sea food, the Eskimo lives near the coast. His hut is usually of stone covered with turf, and his clothes are fashioned from furs and bird skins

Fauna and Flora.—The land mammals of Greenland are decidedly more American than European; the musk-ox, lemming, polar wolf, Eskimo and the dog—probably also the reindeer—have all come from America, while the other land mammals, the polar bear, fox, arctic hare, stoat are circumpolar forms The species of seals and whales are, if anything, more American than European, and so to some extent are the fishes The seals include the hooded or bladder nose, the harp or saddle back, the thong seal, walrus and several smaller ones Of the 51 species of birds breeding in Greenland, 23 are permanent dwellers and 28 leave in winter Of the visitors, 60 per cent come from America About 390 species of vascular plants are found, of which about 316 probably come from America, and 74 from Europe Of these 74 some 50 may have been brought by the early Norsemen A few species may possibly have survived the maximum glaciation About 70 species are circumpolar, 15 endemic and the rest common both to America and Europe or Asia

In the south a few goats, sheep and cattle have been introduced The whaling industry was formerly prolific off the west coast, but decayed when the right whale nearly disappeared The white whale fishery of the Eskimo, however, continued, and sealing is important, walruses are also caught and sometimes narwhal There are also important fisheries for cod, caplin, halibut, red fish and *nepisak*, a shark is taken for the oil from its liver, and sea-trout are found in the streams and small lakes of the south Norwegian trawlers sometimes work in Davis strait On land, reindeer were formerly hunted, to their practical extinction in the south, musk ox are found in the north and the east The eider-duck, guillemot and ptarmigan are in some parts valuable for food Eggs of sea-birds are collected Valuable fur is obtained from the white and blue fox and the polar bear and excellent down from the eider-duck

At Umanak (70° 40′ N) is the most northern garden in the world Broccoli and radishes grow well, turnips (but not every year), lettuce and chervil succeed sometimes, but parsley cannot be reared At Jacobshavn (69° 12′ N), only some 15 m from the ice-sheet, gardening succeeds well; broccoli and lettuce grow, spinach produces large leaves; chervil, pepper-grass, leeks, parsley and turnips grow well; radishes are sown and gathered twice during the summer (June to August) In the south, in the Julianehaab district, even flowering plants, such as aster, nemophilia and mignonette are cultivated, and broccoli, spinach, sorrel, chervil, parsley, rhubarb, turnips, lettuce, radishes grow well Potatoes give fair results when they are taken good care of, carrots grow

to a thickness of 1½ in., while cabbage does poorly. Strawberries and cucumbers have been ripened in a forcing frame In the "Kongespeil" (King's Mirror) of the 13th century it is stated that the old Norsemen tried in vain to raise barley.

The wild vegetation in the height of summer is, in favourable situations, profuse in individual plants, though scanty in species. There are no forests. In the north, where the lichen-covered or ice-worn rocks do not protrude, the ground is covered with a carpet of mosses, creeping dwarf willows, crowberries and similar plants, while the flowers most common are the andromeda, the yellow poppy, pedicularis, pyrola, etc, besides the "flowering" mosses, but in South Greenland there is something in the shape of bush, the dwarf birches even rising a few feet in very sheltered places, the willows may grow higher than a man, and the vegetation is less arctic and more abundant. The Eskimo probably migrated southward along the west coast during the period of the Norse colonies. No doubt they reached the east coast round Cape Farewell Rasmussen has shown that a route by the north coast is almost impassable, owing to lack of hunting grounds. All west coast Eskimo have now some Danish blood and are called Greenlanders.

Government and Trade.—The trade of Greenland is a monopoly of the Danish Crown, dating from 1774, and is administered in Copenhagen by a Government board, *Styrelsen af Kolonierne i Gronland*, and in the country by various Government officials. For government and trade the west coast is divided into two inspectorates, the southern extending to 67° 40′ N., the northern comprising the rest of the country, the respective seats of government being at Godthaab and Godhavn These inspectorates are ruled by two Danish inspectors, responsible to the director for Greenland in Copenhagen Each of the inspectorates is divided into districts, each district having, in addition to the chief settlement or *coloni*, under a Danish factor, several outlying posts and Eskimo hunting stations, each presided over by a native factor (*udligger*) who is responsible to the *colonibestyrer* or factor of the district These trading settlements, which dot the coast for a distance of 1,000 m., are over 60 in number, the chief ones following the west coast northward, are these in the south inspectorate Sydproven, the largest settlement, Julianehaab, near which are remains of the early Norse settlements of Eric the Red and his companions (the *Oster-Bygd*); Frederikshaab, in which district are the cryolite mines of Ivigtut, Godthaab, the principal settlement of all, in the neighbourhood of which are also early Norse remains (the *Vester-Bygd*); Sukkertoppen, a most picturesque locality, and Holstenborg In the north inspectorate the chief centres are· Egedesminde, on an islet at the mouth of Disko bay; Christianshaab, one of the pleasantest settlements in the north, and Jacobshavn, on the inner shores of the same bay; Godhavn (or Lievely) on the south coast of Disko island, formerly an important seat of the whaling industry, and now the seat of a Danish station for scientific research, Ritenbenk, Umanak, Upernivik and Tasiusak The station at Thule in 76° 32′ N is privately owned On the east coast Angmagsalik, in 65° 30′ N, was established in 1894, and new settlements on Scoresby sound were started in 1925 The east coast settlements are not under the inspector for Greenland Government ships arrive and leave between May and November For the rest of the year navigation is stopped, though the winter months form the busy seal-killing season. The principle upon which the Government acts is to give the natives low prices for their produce, but to sell them European articles of necessity at prime cost, and other stores, such as bread, at prices that will scarcely pay for the purchase and freight, while no merchandise is charged, on an average, more than 20% over the cost price in Denmark In addition the Greenlanders are allowed to order goods from private dealers on paying freight at fixed rates The prices to be paid for European and native articles are fixed every year, the prices current in Danish and Eskimo being printed and distributed by the Government Out of the payment five-sixths are given to the sellers, and one-sixth devoted to the Greenlanders' public fund, spent in "public works," in charity and on other unforeseen contingencies. This is the only tax. The object of the monopoly is solely for the good of the Greenlanders, to prevent spirits being sold to them, and the vice, disease and misery which usually attend the collision between natives and civilization of the trader's type being introduced into the primitive arctic community. The inspectors, in addition to being trade superintendents, are magistrates, but serious crime is very rare. There are no police Though the officials are all-powerful, local councils of *parsissaet* were organized in 1857 in every district. To these parish councils delegates are sent from every station. No Danes are eligible The council has the disposal of 20% of the annual profits made on produce purchased within the confines of each district. It holds two sessions every year, and the discussions are entirely in the Eskimo language. In addition to their functions as guardians of the poor, the parish members have to investigate crimes and punish misdemeanours, settle litigations and divide inheritances They can impose fines for small offences not worth sending before the inspector, and, in cases of high misdemeanour, have the power of inflicting corporal punishment. A special paper currency is in use in Greenland.

A Danish *coloni* in Greenland might seem to many not to be a cheerful place at best; though in the long summer days they would certainly find some of those on the southern fjords comparatively pleasant The fact is, however, that most people who have lived some time in Greenland always long to go back. There are generally in a *coloni* three or four Danish houses, built of wood and pitched over, in addition to storehouses and a blubber-boiling establishment The Danish residents may include, besides a *coloni-bestyrer* and his assistant, a *missionair* or clergyman, at a few places also a doctor, and perhaps a carpenter and a schoolmaster In addition there are generally from 20 to several hundred Eskimo, who live in huts built of stone and turf, each entered by a short tunnel Lately, their houses in the *colonis* have also to some extent been built of imported wood For ecclesiastical purposes Danish Greenland is reckoned in the province of the bishop of Zeeland The Danish mission in Greenland has a yearly grant from the State The Moravian mission, which used to work in Greenland, retired from the country in 1900 At Godthaab there is a seminary from which Greenlanders who wish to be ordained go to Copenhagen All settlements have schools, generally under native teachers. There are two monthly newspapers in Eskimo Wireless stations are working at Godthaab, Godhavn, Julianshaab and Angmagsalik The trade of Greenland has decreased in modern times, and the Danish State has an annual deficit of about £30,000 on the administration of Greenland. This would be greater if the cryolite royalties did not bring in a large sum (£51,000 in 1926–27) The trade in cryolite is outside the State monopoly In 1925 the mine produced 31,800 tons, of which 22,400 tons went to Copenhagen and the rest to the United States of America The annual value of imports from Denmark, consisting of manufactured goods, foodstuffs, etc, is about £180,000 The chief articles of export, including seal oil, seal, fox, bird and bear skins, fish products and eiderdown, with some quantity of worked skins, were valued at £7,800 in 1925 In addition, the exports of cryolite were valued at £455,000 Walrus tusks and walrus hides, which in the days of the old Norse settlements were the chief articles of export, are now of little importance Proposals to modify the State monopoly in trade are being considered

Population.—The population in 1921 was 14,355, including 274 Danes, of whom over 150 are employed at the cryolite mines Hans Egede, in the middle of the 18th century, estimated the population then at 30,000, but this was probably a large overestimate The decrease may chiefly have been due to infectious diseases, especially a very severe epidemic of smallpox During the last half of the 19th century there was, on the whole, a slight increase of the native population The population of the east coast is small and has decreased within historic times. Several hundreds live at Angmagsalik and a few of recent importation on Scoresby sound In the region of Scoresby fjord and Franz Josef fjord, numerous ruins of Eskimó settlements are found, and in 1823 Clavering met Eskimo there, but they have since died out or wandered south. A little tribe of Eskimo living in the region

of Cape York, near Smith sound—the so-called "Arctic Highlanders" or Polar Eskimo—number about 240.

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History.—In the beginning of the 10th century the Norwegian Gunnbjorn, son of Ulf Kráka, is reported to have found islands to the west of Iceland, and he may have seen the south-east coast of Greenland In 982 the Norwegian, Eric the Red, sailed from Iceland to find Gunnbjorn's land, and he spent three years on its south-western coasts exploring the country. On his return to Iceland in 985 he called the land Greenland, in order to make people more willing to go there, and in 986 started again from Iceland with 25 ships, of which 14 reached Greenland, where a colony was founded on the south-west coast. Eric built his house at Brattalid, just north of the present Julianehaab Other settlers followed and in a few years two colonies had been formed, one called Osterbygd, in the present district of Julianehaab, comprising later about 190 farms, and another called Vesterbygd, farther north, on the west coast, in the present district of Godthaab, comprising, later, about 90 farms At the height of their prosperity the colonists numbered about 3,000. Numerous ruins indicate the location of these colonies When the Norsemen came to Greenland they found various traces of *Skraeling* (the meaning of the word is uncertain, it means possibly elves or fairies); but the sagas do not report that they actually met natives Somewhat later they met the Eskimo farther north, on the west coast, in the neighbourhood of Disko bay, where the Norsemen went to catch seals, walrus, etc The Eskimo were probably migrating south at that time Christianity was introduced by Leif Ericson about 1000, and in 1126 Greenland got its own bishop, who resided at Gardar on Igaliko fjord There were 12 churches, including a cathedral, a monastery and a nunnery in Osterbygd, and four churches in Vesterbygd The last bishop died in 1540, but from 1377 to that date the bishops did not reside in Greenland Greenland was a republic until 1261, when the colonists swore allegiance to the king of Norway At the dissolution of the union between Norway and Denmark, in 1814, neither Greenland, Iceland nor the Faroes were mentioned, and they were therefore retained by Denmark

After the middle of the 14th century communications with Norway became infrequent The trade was a Crown monopoly and was conducted by an annual ship (Knarren) The growing dominance in Norway's shipping of the Hanseatic league, which had no interest in Greenland, brought the trade to an end The last vessel from Greenland returned to Norway in 1410, but vessels in the Icelandic fish trade probably visited Iceland till the end of that century When J Davis visited Greenland in 1585 there was no sign of the Norse colonists Excavations in the Norse burial grounds in Greenland throw some light on the disappearance of the colonists. Style and texture of clothes show European influences of the 15th century, but little or no trace of Eskimo culture Skeletons show malformation, rickets and low stature, and include an undue proportion of infants and youths. There is clear evidence that the Norsemen perished either by excessive intermarriage among themselves or by adverse conditions of life, but there is no indication of absorption in the Eskimo race or of destruction by Eskimo onslaught It was not until 1721 that the first of the modern settlements was formed, near Godthaab, by the Norwegian missionary, Hans Egede Many of the 18th century colonists were convicts, but gradually the new colonies prospered, in spite of a devastating smallpox epidemic in 1733–34 In 1774 trade became a Government monopoly From 1807 to 1814 communications with Europe were cut off owing to the war A century later the World War again restricted shipping with Greenland, but not to the extent of causing real want Until 1917 Denmark's sovereignty extended only over the west coast, between Cape Farewell and 74° 30′ N, and the one trading station of Angmagsalik in the east In that year, however, it was extended to embrace the whole island, which led to a dispute with Norway regarding hunting and sealing rights on the east coast (*See* ARCTIC REGIONS, *Sovereignty.*) In 1921, for the first time in history, the king of Denmark visited Greenland

GREENLAW (a "grassy hill"), a village of Berwickshire, Scotland Pop (1921) 558. It is situated on the Blackadder, 6¼ m. S E of Edinburgh by the L N E railway Rebuilt in the 17th century, it takes the place of an older settlement a mile to the south-east It was the county town from 1696 to 1853, sharing this dignity with Duns for some time afterwards About 3 m south is Hume castle, founded in the 13th century It changed hands on many occasions during border strife.

GREENLEAF, SIMON (1783–1853), American jurist, was born at Newburyport (Mass), on Dec. 5, 1783. He died at Cambridge (Mass.), on Oct 6, 1853. Greenleaf's principal work is a *Treatise on the Law of Evidence* (3 vol, 1842–53) He also published *Examination of the Testimony of the Four Evangelists by the Rules of Evidence administered in the Courts of Justice, with an account of the Trial of Jesus* (1846).

GREEN MONKEY, a west African representative of the guenon monkeys, technically known as *Cercopithecus callitrichus.* It is olive green above, with white whiskers and belly

GREEN MOUNTAINS are a part of the Appalachian system of North America extending from the Massachusetts border northwards through the centre of the State of Vermont to the Canadian line For two-thirds of the length of the State the range is only slightly broken, forming a water-parting between the streams which flow W. or N W into Lake Champlain or the Hudson river and those flowing S E into the Connecticut river; but further north the range is cut deep by the valleys of the Winooski and Lamoille rivers The ranges, about 30m. wide in southern Vermont, narrow down to 1m wide at Mount Mansfield and broaden again to the north The crest line is generally more than 2,000ft ; 32 summits are over 3,000ft , and the following peaks exceed 4,000ft . Mount Mansfield, 4,406ft ; Killington Peak, 4,241ft ; Lincoln, 4,135ft ; Camel's Hump, 4,083ft , and Jay Peak, 4,018ft Smuggler's Notch, just north of Mt Mansfield, is one of Vermont's wonders Here one finds a rocky wooded canyon with walls of solid rock on either side rising almost perpendicularly 1,000ft or more; the massive chin of Mt Mansfield towers majestically 3,000ft above The entire range, except four of the highest peaks, is heavily wooded with spruce, maple, beech, and birch; a fact which probably suggested the name The region is made accessible to tourists by railways, highways, and within the mountains, by the "Long Trail" of the Green Mountain Club which traverses the entire length of the range

See W C O'Kane, *Trails and Summits of the Green Mountains* (1926), *Guide Book of the Long Trail* (5th ed, 1924); and T W. Dale in the *Annual Report of the U S Geological Survey* (1894–95).

GREENOCK (grĕn′ŏk), municipal burgh and seaport, Renfrewshire, Scotland, on the S shore of the Firth of Clyde, 23 m W. by N of Glasgow by the L M S R (four stations), 21 m by the river and firth Pop (1921) 81,120 The town has a water frontage of nearly 4 m and rises gradually to the hills behind the

town in which are situated, about 3 m. distant, Loch Thom and Loch Gryfe, sources of water supply for domestic use and for power. The streets are laid out on the comparatively level tract behind the firth, the older thoroughfares and buildings lying in the centre The west end contains a fine esplanade, 1½ m long, running from Prince's pier to Ft Matilda. The bay is protected by a sandbank that ends here, and is hence known as the Tail of the Bank. The fairway between this bank, which begins to the west of Dumbarton, and the southern shore constitutes the safest anchorage in the upper firth Electric tramways connect with Port Glasgow on the east and Gourock on the west The annual rainfall amounts to 64 in and Greenock thus has the reputation of being the wettest town in Scotland

Modern public buildings include the municipal buildings; the custom house on the old steamboat quay, the county buildings, and the Watt Institution, founded in 1837 by a son of the famous engineer, James Watt, and containing the public library, the Watt scientific library and the marble statue of James Watt by Sir Francis Chantrey. Adjoining the latter are the museum and lecture hall, the gift of James McLean, opened in 1876. The schools include the Greenock academy for secondary education The old North Kirk (1591), with its pre-Raphaelite windows, has been moved to Seafield to allow of the extension of the shipbuilding yards A large cemetery in the south-western district contains the tomb of Burns' "Highland Mary," removed from the North Kirk graveyard The parks and open spaces include Wellington park, Well park in the heart of the town (these were the gift of Sir Michael Shaw-Stewart), Whin hill, and Lady Alice and Lady Octavia parks

Greenock is under a town council with provost and bailies It is a parliamentary burgh, represented by one member. The staple industries are shipbuilding and sugar refining (1765). Greenock-built vessels have always been esteemed, and many Cunard, P & O and other liners have been constructed in the yards Other industries include the manufacture of engines, marine and otherwise, the making of sailcloth, ropes, paper, woollen and worsted goods, and general engineering, and there are distilleries, an aluminium factory, a flax-spinning mill, and a torpedo factory. Ships and machinery are the chief exports and raw sugar the chief import. The seal and whale fisheries, once vigorously prosecuted, are extinct, but the fishing-fleets are considerable The first harbour (finished in 1710) has been periodically added to and improved, and there are now seven tidal harbours, Garvel graving dock and other dry docks, and an "always afloat" dock, the entrances to which are closed by caissons to keep in 32 ft of water at low tide The quay walls are over 3 m in length The large Princess pier is a centre for passenger traffic on the Clyde, and to and from English and Scottish ports.

In the early 17th century Greenock was a fishing village of one row of thatched cottages In 1635 it was erected by Charles I. into a burgh of barony under a charter granted to John Shaw the government being administered by a baron-bailie, or magistrate, appointed by the superior Its commercial prosperity received an enormous impetus from the Treaty of Union (1707), under which trade with America and the West Indies rapidly developed The American War of Independence suspended progress for a brief interval, but revival set in in 1783, and within the following seven years shipping trebled in amount Meanwhile Sir John Shaw by charter (dated 1741 and 1751) had empowered the householders to elect a council of nine members, which proved to be the most liberal constitution of any Scots burgh prior to the Reform act of 1832, when Greenock was raised to the status of a parliamentary burgh with the right to return one member to parliament Greenock was the birthplace of James Watt and Dr John Caird (1820–1898), principal of Glasgow University Rob Roy is said to have raided the town in 1715

GREENOCKITE, a rare mineral composed of cadmium sulphide, CdS, occurring as small, brilliant, honey-yellow crystals or as a canary-yellow powder Crystals are hexagonal with hemimorphic development, being differently terminated at the two ends, they are translucent to transparent, and have an adamantine to resinous lustre, hardness 3–3½; specific gravity 4 9 Crystals have been found only at one or two places in the neighbourhood of Glasgow, where they occur singly on prehnite in the amygdaloidal cavities of basaltic igneous rocks. At all other localities the mineral is represented only as a powder dusted over the surface of zinc minerals, especially blende and calamine, which contain a small amount of cadmium replacing zinc

GREENORE, a seaport and watering place on Carlingford lough, Co Louth, Ireland. Pop (1921), 289 Passenger steamers cross regularly to and from Holyhead, Wales. A steam ferry crosses the lough In the vicinity is a raised beach, some 10 ft. above the present sea-level.

GREENOUGH, GEORGE BELLAS (1778–1855), English geologist, was born in London on the 18th of January 1778. He studied mineralogy at Freiburg under Werner, travelled in various parts of Europe and the British Isles, and worked at chemistry at the Royal Institution He was elected F.R S in 1807, and was one of the founders of the Geological Society of London in 1807 He was the first chairman of that society, and was three times president His famous *Geological Map of England and Wales,* in six sheets (1819; 2nd ed 1839) was to a large extent based on the original map of William Smith; but much new information was embodied He also prepared a *Geological Map of India* (1854) He died at Naples on April 2, 1855

GREEN RIBBON CLUB, THE, had its meeting-place at the King's Head tavern in Chancery lane, and was originally known as the "King's Head club" Founded about the year 1675 as a resort for members of the political party hostile to the court, the name was changed about 1679 to the Green Ribbon club, in reference to the bow or "bob" of green ribbon which the members were in the habit of wearing in their hats, as a badge convenient for mutual recognition in street brawls The president was either Lord Shaftesbury or Sir Robert Peyton, M P. for Middlesex, who afterwards turned informer. Roger North tells us that "they admitted all strangers that were confidingly introduced, for it was a main end of their institutions to make proselytes, especially of the raw estated youth newly come to town" Thomas Dangerfield (*q v*) supplied the court with a list of 48 members of the Green Ribbon club in 1679, and although Dangerfield's numerous perjuries invalidate his unsupported evidence, it receives some confirmation from a list given to James II by Nathan Wade in 1685 (Harleian mss 6845), while a number of more eminent personages are mentioned in *The Cabal,* a satire published in 1680, as also frequenting the club Among those who appear to have been members are the duke of Monmouth, Halifax, Shaftesbury, Buckingham, Macclesfield, Cavendish, Bedford, Herbert of Cherbury; Scroop, Mulgrave and Shadwell, Falconbridge, Henry Ireton and Claypole, and rogues of the type of Dangerfield and Oates An allusion to Dangerfield, notorious among his other crimes and treacheries for a seditious paper found in a meal-tub, is found in connection with the club in *The Loyal Subjects' Litany,* in which occur the lines—

> From the dark-lanthorn Plot, and the Green Ribbon Club
> From brewing sedition in a sanctified Tub,
> *Libera nos, Domine*

The genius of Shaftesbury found in the Green Ribbon club the means of constructing the first systematized political organization in England North relates that "every post conveyed the news and tales legitimated there, as also the malign constructions of all the good actions of the Government, especially to places where elections were depending, to shape men's characters into fit qualifications to be chosen or rejected" The club was responsible for promoting the Exclusion bill, and the popish plot was deliberately stimulated by members who went about in silk armour, supposed to be bullet proof, and carrying in their pockets the weapon of offence invented by Stephen College and known as the "Protestant flail" In the general election of Jan. and Feb 1679, the Whig interest throughout the country was managed and controlled by a committee sitting at the club in Chancery lane, and the agitation of the petitioners in 1679 was engineered there. The petitions were prepared in London and sent down to every part of the country, where paid canvassers took them from house to house collecting signatures with an air of authority that made refusal

difficult. The great "pope-burning" processions in 1680 and 1681, on the anniversary of Queen Elizabeth's accession, were also organized by the club. They ended by the lighting of a huge bonfire in front of the club windows; and, as they proved an effective means of inflaming the religious passions of the populace, it was at the Green Ribbon club that the *mobile vulgus* first received the nickname of "the mob." The activity of the club was, however, short-lived. The fiasco of the Exclusion bill damaged its influence, and after the flight of Shaftesbury, the confiscation of the City of London's charter, and the discovery of the Rye House plot, in which many of its members were implicated, it declined rapidly In 1685 John Ayloffe, who was found to have been "a clubber at the King's Head tavern and a green-ribbon man," was executed in front of the premises on the spot where the "pope-burning" bonfires had been kindled; and although the tavern was still in existence in the time of Queen Anne, the club which made it famous did not survive the accession of James II The precise situation of the King's Head tavern, described by North as "over against the Inner Temple gate," was at the corner of Fleet street and Chancery lane, on the east side of the latter thoroughfare

See Roger North, *Examen* (1740), Anchitell Grey, *Debates of the House of Commons, 1667–84*, vol. viii (1769), Sir John Bramston, *Autobiography* (1845), Sir George Sitwell, *The First Whig* (Scarborough, 1894), containing an illustration of the Green Ribbon Club and a pope-burning procession.

GREENS. The formation and maintenance of fine turf for putting greens has been the subject of systematic research in America since 1919 This article is a summary of the chief results that have been published in *The Bulletin of the U S. Golf Association Green Section* (Washington, D C)

The finest turf is composed of certain varieties of bent grass The best is velvet bent (*Agrostis canina*) Then comes creeping bent (*A stolonifera*) and then common bent (*A vulgaris*); seaside bent (*A maritima*) is also used on suitable soils. Red Fescue (*Festuca rubra*) is a beautiful fine grass, but does not form a dense turf when cut very close, owing to the axils from which the young shoots arise being well above the ground In the bent grasses these axils are so low that they are not injured by the very close cutting that is necessary on a golf green

The best seed to use is South German mixed bent, which usually consists of 80 to 85% of *A vulgaris*, 15% of *A. canina* and a trace of *A stolonifera* This should be used at the rate of 3 to 5 lb per 1,000 square feet

The vegetative method of propagation has been successfully applied to creeping bent, which is almost a non-seeding variety The runners or stolons are strung out in rows in a nursery With proper attention to cultivation a dense mass of these stolons are produced in a few months They are cut up into lengths of about 2in and broadcast on the ground, that is prepared as for sowing There should be one piece of grass to each square inch The whole is covered about ½in with a fine compost and lightly rolled With daily watering for about two weeks each piece of grass that contains a node will root, under favourable conditions, and with proper treatment a perfect turf will result There are a great many strains of creeping bent The American workers have selected two, called "Metropolitan" and "Washington," which are most suitable from their resistance to the fungoid disease known as brown patch, and from the fact that the blades of grass grow vertically upwards "Metropolitan" seems to be slightly the better for the climatic conditions in Great Britain Velvet bent can also be propagated by the vegetative method, but it does not spread so rapidly The turf is even finer than that obtained with creeping bent

Treatment of Established Greens.—Cutting should be as close as possible, provided that the turf is not "scalped" They must be cut once a day in the growing season Neglect of this, especially with bent greens, will result in a fluffy and grained condition of the turf Should this occur, the greens must be well raked, cut close and top dressed with compost as described below.

The American workers have definitely established the fact that it is most advantageous to apply fertilizers that will slowly render the soil markedly acid, the optimum being about pH 3 8 It has been found that at this reaction the fine grasses grow luxuriantly, whilst coarse grasses, clovers and most weeds and also worms and grubs disappear This result is achieved by regular dressings of either the sulphate or phosphate of ammonia, the former being generally used because of its lower price To avoid scorching the grass it should be applied at the rate of 3 lb per 1,000sq ft, and well watered in by a fine spray immediately afterwards. If a water supply is not available it must be applied on a rainy day. The dressings should be given every fortnight or every month from March to September During hot dry weather it is advisable to limit the amount to 2 lb. per 1,000 square feet On a very alkaline chalk soil it may take from three to four years to reach the desired acidity. After this the amounts used can be decreased. It must be added that sulphate of ammonia should not be used on young grass Further, that treatment with lime, basic slag or any other alkaline fertilizer is most undesirable.

Systematic topdressing has been shown to be essential, particularly with bent greens under treatment with sulphate of ammonia Otherwise a mat of fluffy turf will develop, which it is impossible to cut and which is most undesirable for putting purposes The compost should be made up of equal parts of loamy soil, sharp sand and well rotted stable manure, leaf mould or other organic matter It should also contain about 20 lb. of ammonium sulphate per load (cubic yard) The whole must be well screened so that there are no lumps to interfere with play One load is broadcast over 5,000sq ft, well worked into the roots with the back of a rake and then lightly watered, especially if it contains any sulphate of ammonia This dressing should be given monthly from March to September The old practice of using one heavy dressing of manure in the winter is objectionable and harmful, as it tends to smother the grass and seriously to increase the risk of infection from grubs and worms

The risk of trouble with earth worms and grubs like leather jackets is much decreased if the soil be rendered sufficiently acid Before this result is obtained, worms are best removed by use of mercuric chloride (corrosive sublimate) Three ounces are dissolved in a wooden bucket The solution is poured into a 50gal tank and well mixed This is distributed over 1,000sq ft and then the ground is thoroughly soaked with water It must be remembered that it is a deadly poison The operation must be carried out on a mild day between November and April Where there is any risk of infection by leather jackets or similar grubs, the addition of 5 lb of arsenate of lead to each load of topdressing will give excellent results.

GREENSAND. A geological term having a double significance Among the sedimentary rocks (*q v*) it is used to indicate a sand or sandstone with abundant grains of glauconite Stratigraphically the name is used for several sub-divisions of the Cretaceous system (*q v*).

GREENSBORO, a city in the Piedmont section of North Carolina, U S A, 80m N W of Raleigh, the county seat of Guilford county It is on Federal highways 70 and 170, is served by the Atlantic and Yadkin and the Southern railways, and has a municipal airport The population was 19 861 in 1920 (30% negroes) and was estimated at 50,300 in 1928 (19% negroes) It has a large wholesale trade, is an important insurance centre and has numerous and varied manufacturing industries, with an output in 1927 valued at $47,500,000 The cotton mills, which make chiefly blue denim, had in 1928 over 7,800 looms and 210,000 spindles The city has fine public buildings, a Memorial stadium seating 10,000, and a park system which provides an acre to each 50 inhabitants The assessed valuation of property in 1928 was $103,000,000, and bank clearings amounted to $312,500,000 Greensboro is one of the chief educational centres of the State In the city are the Greensboro college for women (Methodist Episcopal South; chartered 1838) and the North Carolina college for women (1892). Six miles west is Guilford college, founded in 1837 by the Society of Friends, and 17m east is Elon college (Christian), chartered in 1889 Greensboro was founded in 1808, in the exact centre of the county, to be the new county seat, in place of Martinsville, where the battle of Guilford Court House was fought on March 15, 1781, and was named after General Nathanael Greene, hero of the battle The battlefield, 6m N W

of the city, has been made a national park The town was organized in 1829 and chartered as a city in 1870. Since 1923 it has had a commission-manager form of government.

GREENSBURG, a city of south-eastern Indiana, U.S.A., on a branch of Sand creek; the county seat of Decatur county. It is served by the Big Four railroad The population in 1920 was 5,345 (98% native white). It is situated in a farming and stock-raising district; there are stone quarries in the vicinity; and the city has various manufacturing industries.

GREENSBURG, a city of Pennsylvania, U S A , 30m E. by S of Pittsburgh, on the Lincoln highway and the Pennsylvania railroad, at an altitude of 1,000–1,200ft ; the county seat of Westmoreland county The population was 15,033 in 1920 (86% native white) Including the adjacent suburbs, the local estimate for 1928 was 25,000 It is in the heart of the bituminous coal-fields of western Pennsylvania, and natural gas is abundant There are large coke-ovens and railroad repair shops, and over 30 varieties of smaller industrial establishments The annual value of the manufactured products is estimated at $10,000,000. Greensburg (named after Gen Nathanael Greene) was settled in 1784–85, immediately after the opening of the State road built along the trail followed by General Forbes on his march to Fort Duquesne in 1758 It was made the county seat in 1787, was incorporated as a borough in 1799; and became a city in 1928 Near Greensburg, during the Conspiracy of Pontiac, was fought the battle of Bushy Run (Aug 5–6, 1763), when Colonel Henry Bouquet by a stratagem gained a decisive victory over the Indians Three miles north-east of the city, at the village of Hanna's Town (almost completely destroyed by the Indians on July 13, 1782) the first court west of the Alleghenies opened on April 6, 1773

GREENSHANK (*Tringa nebularia*), one of the largest of the sandpipers. The long olive-coloured legs of this species distinguish it from two allied species (*T totanus* and *T erythropus*) having red legs and called redshanks The greenshank is a native of the northern parts of the Old World, but in winter it wanders far to the south from South Africa to Australia Almost as bulky as a woodcock, it is of a more slender build The cock exhibits the gesticulations in which the males of so many *Limicolae* indulge during the breeding-season—with variations of its own It breeds in Scotland, Norway, Sweden and Finland, and thence to Kamchatka.

GREENSTONE, in geology, an old term used by many of the earlier writers to indicate fine-grained dark coloured and often considerably decomposed and altered basic igneous rocks, either intrusive or extrusive It is still—like "felsite" (*q v*)—a useful word in descriptive field geology, since it indicates the appearance and general character of the rock, but does not imply anything definite as to its exact nature and composition, which may be determined later by laboratory methods.

GREENVILLE, a city of Montcalm county, Michigan, U.S A., 35 m N E of Grand Rapids, on the Grand Trunk and the Pere Marquette railways. The population was 4,304 in 1920 (90% native white) and was estimated locally at 5,600 in 1928 It is an important potato market, and has refrigerator factories and other manufacturing industries The city was founded about 1844 by John Green and incorporated in 1870

GREENVILLE, a city of western Mississippi, U S A , on the Mississippi river, 75m above Vicksburg, at the centre of the Yazoo Delta, the county seat of Washington county It is served by the Columbus and Greenville and the Yazoo and Mississippi Valley railways, and by river steamers and barges The population in 1920 was 11,560 (60% negroes) It is the trading centre and shipping point for a large part of the Delta, one of the richest agricultural regions of the country, producing about half the cotton crop of the State. The lumber and dairy industries also are important. Greenville is the only considerable city of the lower Mississippi river which is not built on bluffs, and it suffered gravely in the disastrous floods of 1927. Water reached a height of 15ft , half the population lived for a time in camps on the levees; for weeks the city was accessible only by boat and plane, and no railroad train reached it for two months Old Greenville, just south of the present site, was the county seat of Jefferson county until 1825, and later of Washington county. Part of it caved into the river, and during the Civil War the town was burned by Federal forces soon after the capture of Memphis. The present site was then adopted for re-building Greenville was incorporated as a town in 1870, and as a city in 1886.

GREENVILLE, a city of eastern North Carolina, U S A , on the Tar river; the county seat of Pitt county. It is served by the Atlantic Coast Line and the Norfolk Southern railways The population was 5,772 in 1920 (49% negroes) and was estimated locally at 12,000 in 1928 It is a shipping point for tobacco and other agricultural products, and is the seat of the East Carolina Teachers college (established 1907)

GREENVILLE, a city of western Ohio, U S A , 36m. N W. of Dayton, on Greenville creek, at an altitude of 1,050ft ; the county seat of Darke county It is served by the Baltimore and Ohio, the Big Four and the Pennsylvania railways The population was 7,104 in 1920 (98% native white) It has various manufacturing industries, and is the trade centre for a fertile agricultural region, producing largely grains and tobacco Greenville occupies the site of an Indian village and of Ft Greenville, built by Gen Anthony Wayne in 1793 and burned in 1796 Here on Aug 3, 1795, Gen. Wayne concluded a treaty with 12 Indian tribes, by which they ceded to the United States a considerable part of Ohio and smaller tracts in Illinois, Indiana and Michigan, and the United States promised to pay them $20,000 worth of goods immediately and an annuity for ever. The chief Tecumseh lived here from 1805 to 1809, and here in July, 1814, a second Indian treaty, securing the aid of several tribes in the war with Great Britain, was negotiated by Gen W H Harrison and Lewis Cass. Permanent settlement dates from 1808, when the town was laid out It was made the county seat in 1809, incorporated as a town in 1838 and chartered as a city in 1887

GREENVILLE, a borough of Mercer county, Pa , U.S A , 80m N. of Pittsburgh, on the Shenango river It is served by the Bessemer and Lake Erie, the Erie and the Pennsylvania railways The population was 8,101 in 1920 (94% native white) It has railroad repair shops, and its manufactures include steel cars, bridges and tanks Thiel college (Lutheran, co-educational), opened in 1866 at Monaca, in Beaver county, was moved to Greenville in 1870 Greenville was founded in 1798.

GREENVILLE, a city of north-western South Carolina, U S A , on the Reedy river, the county seat of Greenville county It is on Federal highways 25, 29 and 76, has a municipal airport, and is served by the Charleston and Western Carolina, the Piedmont and Northern (electric), and the Southern railways The population in 1920 was 23,127 (35% negro) and was estimated locally at 35,000 in 1928 For the area within 2 5m of the centre of the city, the estimate for 1928 was 65,000 Greenville lies amid beautiful mountain scenery, at an altitude of 1,040ft., near the foot of the Blue Ridge The incorporated area is a circle with an area of 4·82 sq m , but for economic and social purposes the urban unit includes a fringe of textile mills and a village population of 30,000 just outside the corporate limits It is an important cotton market, handling 1,000,000 bales a year, and is one of the principal textile centres of the South The 28 textile establishments in the county in 1928 had over 20,000 looms and 770,000 spindles, and manufactured 4,500 different patterns of cloth, from heaviest duck to fine silks, voiles and shirtings The Southern Textile Exposition is held here in alternate years. The city has various industries complementary to the spinning and weaving of cotton, such as bleaching, finishing and dyeing, and it is possible here to see the entire process of production, from the growing of the staple to the turning out of garments ready to wear There are also sundry diversified industries, including plants making equipment for the textile mills and a meat-packing house. Greenville is the seat of Furman university for men (Baptist; opened 1852), which grew out of an institution established elsewhere in 1826; and of Greenville Woman's college (Baptist), established in 1854 The site of the city is part of a tract that was ceded to South Carolina by the Cherokee Indians on May 20, 1777 In 1797 a town was laid out here for the county seat, and was named Pleasantburg, and in 1831 the name was changed to Greenville

The city was chartered in 1868.

GREENVILLE, a city of north-eastern Texas, U S A , 48m N.E. of Dallas, near the head-waters of the Sabine river; the county seat of Hunt county It is on Federal highway 67, and is served by the Louisiana Railway and Navigation company, the Missouri-Kansas-Texas, the St Louis Southwestern and the Texas Midland railways The population was 12,384 in 1920 (18% negroes) It is the trading centre for a cotton-growing and farming region, and has cottonseed-oil mills, a petroleum refinery, railroad shops and various other industries The total output of the factories in 1925 was valued at $3,852,585. Burleson college (Baptist) and Wesley college (Methodist) are situated here. The village of Peniel, one mile from the city, is a community of the "holiness" sect Greenville was settled in 1844; chartered as a city in 1875; and in 1907 adopted a commission form of government.

GREENWICH, a south-eastern metropolitan borough of London, England, bounded north by the river Thames, east by Woolwich, south by Lewisham and west by Deptford Pop (1921) 100,450 It is first noticed in the reign of Ethelred, when it was a station of the Danish fleet (1011–1014) It has a river-frontage of 4½ m., the Thames making two deep bends, enclosing the Isle of Dogs on the north and a similar peninsula on the Greenwich side Greenwich is connected with Poplar on the north shore by the Greenwich tunnel to the Isle of Dogs (Cubitt Town), and by the Blackwall Tunnel to a point between the East and West India Docks The main thoroughfare from west to east is Woolwich Road, representing the old high road through Kent, the Roman Watling Street.

The most noteworthy buildings are the hospital and the observatory Greenwich hospital, as it is still called, became in 1873 a Royal Naval college On the site once stood Greenwich House, a royal residence as early as 1300, granted by Henry V to Thomas Beaufort, duke of Exeter, from whom it passed to Humphrey, duke of Gloucester, who improved it and named it *Placentia* It did not revert to the crown till his death in 1447 It was the birthplace of Henry VIII , Queen Mary and Queen Elizabeth, and here Edward VI died The building was enlarged by Edward IV , by Henry VIII , who made it one of his chief residences, by James I and by Charles I , who erected the "Queen's House" for Henrietta Maria The tenure of land from the crown "as of the manor of East Greenwich" became at this time a recognized formula, and occurs in a succession of American colonial charters from those of Virginia in 1606, 1609 and 1612 to that of New Jersey in 1674 Along with other royal palaces Greenwich was at the Revolution appropriated by the Protector, but it reverted to the crown on the restoration of Charles II , by whom it was pulled down; and the west wing of the present hospital was erected and designed by Inigo Jones Parts were built by Queen Anne and King William and designed by Sir Christopher Wren In its unfinished state it was assigned by the patent of William and Mary to certain of the great officers of state, and it was opened as a hospital for seamen in 1705 The walls and ceilings of the painted hall were painted by Sir James Thornhill with various emblematic devices, and it is hung with portraits of the most distinguished admirals and paintings of the chief naval battles of England In the Queen Anne range is the Royal Naval museum In the upper quadrangle is a bust of Nelson by Chantrey, and there are various other memorials and relics Formerly 2,700 retired seamen were boarded, and 6,000 out pensioners received stipends out of its funds; but by the act of 1865 the Admiralty granted liberal pensions in lieu of board to those willing to quit the hospital; by the act of 1869 they were compelled to leave and it was devoted to the accommodation of the students of the Royal Naval college, the Infirmary being granted to the Seamen's Hospital Society

To the south of the hospital is Greenwich park (185 ac). It was enclosed by Humphrey, duke of Gloucester, and laid out by Charles II , and contains a fine avenue of Spanish chestnuts planted in his time In it is the Royal Observatory, built in 1675 for the advancement of navigation and nautical astronomy. From it the exact time is conveyed each day at one o'clock by electric signal to the chief towns throughout the country; British, and the majority of foreign geographers reckon longitude from its meridian. A standard clock and measures are seen at the entrance. The new magnetic pavilion lying 400 yd to the east was completed in 1899, to avoid the disturbance of instruments which would be occasioned by the iron used in the principal building South of the park lies the open common of Blackheath, mainly within the borough of Lewisham, and in the east the borough includes the greater part of Woolwich common The parish church of Greenwich, in Church Street, is dedicated to St Alphege, archbishop, who was martyred here by the Danes in 1012

At Greenwich an annual banquet of cabinet ministers, the whitebait dinner, formerly took place This ceremony arose out of a dinner held annually at Dagenham, by the commissioners for engineering works carried out there in 1705–20—to save the lowlands from flooding To one of these dinners Pitt was invited, and was subsequently accompanied by some of his colleagues Early in the 19th century the venue of the dinner, now a ministerial function, was transferred to Greenwich, and celebrated at the "Ship," an hotel of ancient foundation The banquet continued till 1868, was revived in 1874–80, and was held for the last time in 1894

The parliamentary borough of Greenwich returns one member Two burgesses were returned in 1577, but it was not again represented till 1832

GREENWICH, a town of Fairfield county, Conn , U S A , on Long Island sound, in the extreme south-west of the State, 28 m N E of New York city It contains a borough of the same name and nine villages, including Cos Cob, Riverside and Sound Beach, and is served by the New York, New Haven and Hartford railroad, by motorbus lines, as well as in summer by a ferry to Oyster Bay, Long Island The population of the borough in 1920 was 5,939; of the town 22,123 (estimated at 27,500 in 1928) The town occupies 48 sq m of gently rolling land, rising from the sea-level to an elevation of 550 ft , and presents a beautiful panorama of bays, coves, lakes, rivers, hills, woods and valleys It is primarily a residential community and a summer resort, the home of many New York business men, artists and writers There are beautiful estates, clubs, hotels and facilities for all kinds of sports, the northern part of the town is covered with a network of 330 m of bridle paths Greenwich was settled in 1614 as a part of New Amsterdam The Dutch relinquished their claim in 1650, 6 years later the town submitted to the New Haven colony; in 1662 it was one of the first towns of the colony to submit to Connecticut On the old post-road is the inn (built about 1729 and restored as a memorial in 1901) where Israel Putnam was surprised by Tryon in Feb 1779, and, according to tradition, escaped by riding down a steep flight of stone steps The borough of Greenwich was incorporated in 1858

GREENWOOD, FREDERICK (1830–1909), an English journalist and man of letters, was born in London In 1862, when Thackeray resigned the editorship of the *Cornhill,* Greenwood became joint editor with G H Lewes In 1864 he was appointed sole editor, a post which he held until 1868 Greenwood then conceived the idea of an evening newspaper, which, in addition to the news, should contain authoritative and impartial articles by outside contributors on literature, art and public affairs Canning's *Anti-Jacobin* and the *Saturday Review* of 1864 were the joint models he had before him The idea was taken up by George Smith, and the *Pall Mall Gazette* was launched in Feb 1865, with Greenwood as editor Within a few years he had come to exercise a great influence on public affairs His views ripened from what was described as philosophic Liberalism into Conservatism No minister in Great Britain, Gladstone declared, ever had a more able, a more zealous, a more effective supporter for his policy than Lord Beaconsfield had in Greenwood It was on the suggestion of Greenwood that Beaconsfield purchased in 1875 the Suez canal shares of the Khedive Ismail, the British Government being ignorant, until informed by Greenwood, that the shares were for sale and likely to be bought by France It was characteristic of Greenwood that he declined to publish the news

of the purchase of the shares in the *Pall Mall* before the official announcement was made.

Early in 1880 the *Pall Mall* changed owners, and the new proprietor required it to support Liberal policy. Greenwood at once resigned his editorship, but in May a new paper, the *St. James's Gazette,* was started for him by Henry Hucks Gibbs (afterwards Lord Aldenham), and in the new paper Greenwood was a pungent critic of the Gladstone administration (1880–85) and an independent supporter of Lord Salisbury His connection with the *St James's Gazette* ceased in Aug 1888, when the paper changed hands. The *Anti-Jacobin,* which he started in 1891, lasted for only a year Greenwood continued to write on political and social questions in various papers Towards the end of his life his political views reverted in some respects to the Liberalism of his early days He died at Sydenham on Dec 14, 1909.

GREENWOOD, JOHN (d 1593), English Puritan and Separatist (the date and place of his birth are unknown), was educated at Corpus Christi college, Cambridge. By 1586 he was the recognized leader of the London Separatists, many of whom had been imprisoned at various times since 1567. Greenwood was arrested early in Oct. 1586, and the following May was committed to the Fleet prison During his imprisonment he wrote some controversial tracts in conjunction with his fellow-prisoner Henry Barrowe He was certainly at large in Sept 1592, when he was elected "teacher" of the Separatist church Meanwhile he had written (1590) "An Answer to George Gifford's pretended Defence of Read Prayers" On Dec 5 he was again arrested; and the following March was tried, together with Barrowe, and condemned to death on a charge of "devising and circulating seditious books" After two respites, one at the foot of the gallows, he was hanged on April 6, 1593

See B. Brook, *Lives of the Puritans* (1813); H. M. Dexter, *The Congregationalism of the last three hundred years* (1880) and *The England and Holland of the Pilgrims* (1905), F J Powicke, *Henry Barrow and the Exiled Church of Amsterdam* (1900)

GREENWOOD, a city of western Mississippi, U S A , on the Yazoo river, 115m S by W of Memphis, the county seat of Leflore county It is served by the Columbus and Greenville and the Yazoo and Mississippi Valley railways The population was 7,793 in 1920 (52% negroes) and was estimated locally at over 10,000 in 1928 It ships great quantities of cotton (of which 77,247 bales were ginned in the county in 1926), and has saw mills, furniture factories, wood-working plants and canneries, besides cotton gins and compresses and cotton-seed oil mills Greenwood was incorporated in 1844 It has a commission form of government. The city and the county were named after the Choctaw chief, Greenwood Leflore, whose mansion "Malmaison" (built in 1854) stands a few miles from the city, equipped and furnished practically as he left it

GREENWOOD, a city in the Piedmont section of western South Carolina, U S A , at an altitude of 670ft ; the county seat of Greenwood county It is on Federal highway 25, and is served by the Charleston and Western Carolina, the Georgia and Florida, the Piedmont and Northern (electric), the Seaboard Air Line and the Southern railways The population was 8,703 in 1920 (33% negro) and was estimated locally at 15,900 in 1928 It is an important trading centre for the western part of the State, is the seat of Lander college for women (1872) and Bailey military institute, and has large cotton mills, with 3,500 looms and over 150,000 spindles in 1928 The town was founded about 1872, incorporated in 1891 and chartered as a city in 1926

GREGARINA. Parasitic single-celled animals (Protozoa), which occur chiefly in the intestines, and sometimes also in the body-cavity of various animals, and are characterized chiefly by their manner of reproduction Almost all of them are harmless (*See* Protozoa)

GRÉGOIRE, HENRI (1750–1831), French revolutionist and constitutional bishop of Blois, son of a peasant, was born at Vého near Lunéville, on Dec 4, 1750. Educated at the Jesuit college at Nancy, he became *curé* of Emberménil and a teacher at the Jesuit school at Pont-à-Mousson In 1783 he was crowned by the academy of Nancy for his *Éloge de la poésie,* and in 1788 by that of Metz for an *Essai sur la régénération physique et morale des Juifs.* He was elected in 1789 by the clergy of the *bailliage* of Nancy to the states-general, where he became conspicuous in the group of deputies of Jansenist or Gallican sympathies who supported the Revolution. He presided at the permanent sitting of sixty-two hours while the Bastille was being attacked by the people, and made a vehement speech against the enemies of the nation He subsequently took a leading share in the abolition of the privileges of the nobles and the Church. Under the new civil constitution of the clergy, to which he was the first priest to take the oath (Dec. 27, 1790), he was elected bishop by two departments He selected that of Loire-et-Cher, taking the old title of bishop of Blois, and for ten years (1791–1801) ruled his diocese with exemplary zeal In the first session of the National Convention (Sept 21, 1792) he proposed the abolition of the kingship, asserting that "kings are in the moral order what monsters are in the natural" On Nov. 15, he demanded the king's trial, and was elected president of the Convention During the trial of Louis XVI , being absent on a mission for the union of Savoy to France, he wrote a letter urging the condemnation of the king, but omitting the words *à mort;* and later proposed in the Convention that the penalty of death should be suspended

When on Nov. 7, 1793 Gobel, bishop of Paris, resigned his episcopal office at the bar of the Convention, Grégoire refused to abjure either his religion or his office His courage won the day and the hubbub subsided in cries of "Let Grégoire have his way!" Throughout the Terror, in spite of attacks in the Convention and in the press, he appeared in the streets in his episcopal dress and daily read mass in his house After Robespierre's fall he spoke in support of the reopening of the churches on Dec 21, 1794 He initiated measures for restraining vandalistic fury against monuments of art, and devoted his attention to the reorganization of the public libraries and technical education On the establishment of the new constitution, Grégoire was elected to the Council of 500, and after the 18th Brumaire he became a member of the Corps Législatif, then of the Senate (1801). He took the lead in the national church councils of 1797 and 1801, but was opposed to Napoleon's policy of reconciliation with the Holy See, and after the signature of the concordat he resigned his bishopric (Oct. 8, 1801) He voted with the minority in the Senate against the proclamation of the empire, but he was subsequently created a count of the empire and officer of the Legion of Honour During the later years of Napoleon's reign he travelled in England and Germany, but returned in 1814 and was concerned in the overthrow of the Empire

Grégoire, as a revolutionist and a schismatic bishop, was an object of double loathing to the clerical and ultra-royalist faction He was expelled from the Institute and forced into retirement, but his influence was still felt and feared His work, *De la constitution française de l'an 1814,* (1814) in which he commented on the Charter from a Liberal point of view, reached its fourth edition in 1819 In that year he was elected to the Lower Chamber by the department of Isère By the powers of the Quadruple Alliance this event was regarded as of the most sinister omen, and the question was even raised of a fresh armed intervention in France under the terms of the secret treaty of Aix-la-Chapelle Louis XVIII decided on a modification of the franchise, the Dessolle ministry resigned, and the first act of Decazes, the new premier, was to carry a vote in the chamber annulling the election of Grégoire. From this time onward the ex-bishop lived in retirement, occupying himself in literary pursuits. He died on May 20, 1831.

To the last Grégoire remained a devout Catholic, fulfilling his obligations as a priest, but he refused to modify his revolutionary principles The refusal of the archbishop of Paris to allow him the last sacrament roused great excitement in Paris, and the government had to take precautions to avoid riots

Besides several political pamphlets, Grégoire was the author of *Histoire des sectes religieuses, depuis le commencement du siècle dernier jusqu'à l'époque actuelle* (2 vols , 1810), *Essai historique sur les libertés de l'église gallicane* (1818), *De l'influence du Christianisme sur la condition des femmes* (1821); *Histoire des confesseurs des empereurs, des rois, et d'autres princes* (1824); *Histoire du mariage des prêtres en France* (1826). *Grégoireana, ou résumé général de la conduite, des*

actions, et des écrits de M. le comte Henri Grégoire, preceded by a biographical notice by Cousin d'Avalon, was published in 1821; and the *Mémoires . . . de Grégoire,* with a biographical notice by H. Carnot, appeared in 1837 (2 vols). *See* also A Debidour, *L'Abbé Grégoire* (1881); A. Gazier, *Études sur l'histoire religieuse de la Révolution Française* (1883); L. Maggiolo, *La Vie et les oeuvres de l'abbé Grégoire* (Nancy, 1884), and numerous articles in *La Révolution Française;* E. Meaume, *Étude hist. et biog. sur les Lorrains révolutionnaires* (Nancy, 1882); and A. Gazier, *Études sur l'histoire religieuse de la Révolution Française* (1887).

GREGORAS, NICEPHORUS (*c.* 1295–1360), Byzantine historian, man of learning and religious controversialist, was brought up at Heraclea in Pontus At an early age he settled at Constantinople, where he won the favour of Andronicus II In 1326 Gregoras proposed (in a still extant treatise) certain reforms in the calendar, very similar to those introduced by Gregory XIII. in 1582 When Andronicus was dethroned (1328) by his grandson Andronicus III., Gregoras retired into private life But after the death of the elder Andronicus, Gregoras won the favour of his grandson and was appointed to conduct the negotiations (for a union of the Greek and Latin churches) with the ambassadors of Pope John XXII (1333) Gregoras was then famous as a teacher, but was ruined by his opposition to Palamas in the Hesychast controversy After the doctrines of Palamas had been recognized at the synod of 1351, Gregoras, who refused to acquiesce, was practically imprisoned in a monastery for two years Nothing is known of the end of his life. His chief work is his *Roman History,* in 37 books, of the years 1204 to 1359, which supplements and continues the work of George Pachymeres This work and that of John Cantacuzene supplement and correct each other and should be read together The other writings of Gregoras, which (with a few exceptions) still remain unpublished, attest his great versatility Amongst them may be mentioned a history of the dispute with Palamas, biographies of his uncle and early instructor John, metropolitan of Heraclea, and of the martyr Codratus of Antioch, funeral orations for Theodore Metochita and the two emperors Andronicus, commentaries on the wanderings of Odysseus and on Synesius's treatise on dreams, tracts on orthography and on words of doubtful meaning, a philosophical dialogue called *Florentius; or, Concerning Wisdom;* astronomical treatises on the date of Easter and the preparation of the astrolabe; and an extensive correspondence

Editions in Bonn *Corpus scriptorum hist Byz*, by L. Schopen and I Bekker, with life and list of works by J Boivin (1829–55), J P Migne, *Patrologia graeca,* cxlviii, cxlix, *see* also C. Krumbacher, *Geschichte der byzantinischen Literatur* (1897); R. Guilland, *Essai sur Nicéphore Grégoras* (1926), with bibliography.

GREGORIAN CALENDAR or **NEW STYLE,** the calendar substituted for the ancient church calendar—founded on two erroneous suppositions, namely, that the year contains 365¼ days and that 235 lunations are exactly equal to nineteen solar years—in March 1582 by Pope Gregory XIII It was introduced into Spain, Portugal and part of Italy the same day as at Rome, France and Germany followed and it has since been received in almost all Christian countries For the computation of the Gregorian calendar *see* Calendar.

GREGORIAN MUSIC. The most famous division of the ecclesiastical monodic music of the early and mediaeval church, which is comprehensively known as Plainsong or Plainchant This is so called because of the part which Pope Gregory I (d 604) took in reforming and standardizing it. *See* Gregory, St; Music (Sec 3); Plainsong

GREGOROVIUS, FERDINAND (1821–1891), German historian, was born at Niedenburg on Jan. 19, 1821, and studied at Konigsberg. He lived for over 20 years in Italy, and died at Munich on May 1, 1891 His great work *Geschichte der Stadt Rom in Mittelalter* (Stuttgart, 1859–72; Eng trans, 13 vols., 1894–1900), covers the period A D 400 to 1534.

His *Römische Tagebücher* were edited by F Althaus (Stuttgart, 1892), and were translated into English as the *Roman Journals of F. Gregorovius,* by A Hamilton (1907); J Hoenig, *F. Gregorovius, der Geschichtschreiber der Stadt Rom* (Stuttgart, 1921).

GREGORY, ST., OF NAZIANZUS (*c* 329–*c.* 389), surnamed Theologus, one of the four great fathers of the Eastern Church, was born at or near Nazianzus, Cappadocia, where his father, also named Gregory, had lately become bishop After studying at the two Caesareas, Alexandria and Athens, he was induced by Basil (*q v.*) to share his religious seclusion in Pontus, and there prepared the Φιλοκαλία, a sort of chrestomathy compiled with Basil's help from the writings of Origen Gregory was ordained about 361, and though made bishop of Sasima, a small village near Tyana, about 372, he seems to have lived at Nazianzus, assisting his aged father, on whose death (374) he retired to Seleucia in Isauria for some years Towards 378–379 the small remnant of the orthodox party in Constantinople requested him to undertake the resuscitation of their cause, so long borne down by the Arians. His success was immediate, the famous five discourses on the Trinity delivered there earning for him the distinctive appellation of *theologus.* With the arrival of Theodosius in 380 came the visible triumph of the orthodox cause. The metropolitan see was then conferred upon Gregory, and after the assembling of the second oecumenical council in 381 he received consecration from Meletius In consequence, however, of a spirit of discord which appeared at his promotion, he soon resigned his dignity and withdrew into retirement. The rest of his days were spent partly at Nazianzus in ecclesiastical affairs, and partly on his neighbouring patrimonial estate at Arianzus His festival is celebrated in the Eastern Church on Jan. 25, and in the Western on May 9

Gregory's extant works, which consist of poems, epistles and orations, were published by Hervagius (Basle, 1550), by Billius (Paris, 1609, 1611), by Caillau (1840) and by Migne in *Patrol Graec*, vols 35–38 The *Theological Orations* (ed A J Mason) appeared separately at Cambridge in 1899. Of the poems, which include epigrams, elegies and an autobiographical sketch, the *editio princeps* is that of Aldus (1504) Partial English translations were made by Drant (1568), by Boyd (1826) and by Newman A translation of selected orations and letters appeared in *The Library of Nicene Fathers,* vol 7

See C Ullmann, *Gregorius von Nazianz, der Theologe* (1825, Eng. trans, 1857), A Bénoit, *St Grégoire de Nazianze* (1877), Montaut, *Revue critique de quelques questions historiques se rapportant à St Grégoire de Nazianze* (1879), M Guignet, *S Grégoire de Nazianze* (1911) and H Pinault, *Le Platonisme de S Grégoire de Nazianze* (1925); full bibliography in Herzog's *Realencyk*

GREGORY, ST., OF NEOCAESAREA (*c.* 213–*c* 270), known as Thaumaturgus (the miracle-worker), was born of noble pagan parents at Neocaesarea in Pontus He studied law, but at Caesarea met Origen, and became his convert (A D 233) He was consecrated bishop of his native town (*c.* 240), and in spite of the Decian persecution (250–251) converted nearly the whole city during his office of 30 years He was active at the first synod of Antioch (A D 264–265), which condemned the heresies of Paul of Samosata; and the rapid spread in Pontus of a Trinitarianism approaching the Nicene type is attributed largely to his influence His festival is observed on Nov 17

Gregory's works, which include the *Panegyricus in Origenem, Metaphrasis in Ecclesiasten, Epistola canonica* and *Expositio fidei,* throw light on the personality and method of Origen, on the organization of the church in Pontus and on Gregory's orthodox Trinitarian doctrine.

Editions by G Voss (Mainz, 1604), Fronto Ducaus (Paris, 1622) and Migne, *Patr Graec* x Eng. trans in *Ante-Nicene Fathers,* vi. *See* Herzog-Hauck, *Realencyk* vii. for full bibliography.

GREGORY, ST., OF NYSSA (*c.* 331–*c* 396), one of the four great fathers of the Eastern Church, and younger brother of Basil the Great, was born probably at Neocaesarea In 371 or 372 he was ordained by Basil to the bishopric of Nyssa, a small town in Cappadocia, and there parted from his wife Theosebia, who became a deaconess His strict orthodoxy concerning the Trinity and the Incarnation made him peculiarly obnoxious to the Arians, and in 375 the synod of Ancyra, convened by Demetrius the Arian governor of Pontus, condemned him for alleged irregularities in his election and in the administration of the finances of his diocese. In 376 he was exiled, and did not return till the publication of the edict of Gratian in 378 Shortly afterwards he took part in the synod which met at Antioch in Caria to consider the Meletian schism At the Council of Constantinople in 381, he was a conspicuous champion of orthodoxy, and in 382 he was commissioned to set in order the churches of Arabia, in connection

with which mission he also visited Jerusalem In 394 he was present at the synod held in Constantinople under the presidency of Nectarius to settle ecclesiastical disorders in Arabia The exact date of Gregory's death is unknown. His festival is observed by the Greek Church on Jan. 10, and by the west on March 9

Gregory of Nyssa was not so able an administrator as his brother Basil, nor so magnificent an orator as Gregory of Nazianzus, but he excelled them both as a speculative and constructive theologian His teaching, though strictly trinitarian, shows considerable freedom, and in many points, affinities with Origen, as in his Christology and his doctrine of final restoration

Gregory's numerous works may be classified under five heads. (1) Treatises in doctrinal and polemical theology, the most important of which are that *Against Eunomius*, which defends the Nicene creed against Arianism and vindicates the character of Basil, the *Oratio catechetica* or defence of Christianity against pagans and Jews; *On Faith*, against the Arians, *On Common Notions*, in explanation of the terms in current employment with regard to the Trinity, *Ten Syllogisms*, against the Manichaeans, *To Theophilus*, against the Apollinarians; *Against Fate* and *De anima et resurrectione*. (2) Practical treatises, including the tracts *On Virginity* and *On Pilgrimages* and the *Canonical Epistle* upon the rules of penance (3) Expository and homiletical works, including the *Hexaemeron*, and the discourses *On the Creation of Man, On the Titles of the Psalms, On the Sixth Psalm, On Ecclesiastes*. (4) Biographical, consisting chiefly of funeral orations (5) Letters

The works were edited by Fronton le Duc (Paris, 1615, 1618 and 1638), by Migne, *Patrol Graec*, vols 44–46 and by V Jaegar (Berlin, 1921 *seq*). G H Forbes edited the *Hexaemeron* and the *De opificio hominis* (Burntisland, 1855 and 1861), and F Oehler the *Opera dogmatica* (1865) There have been numerous editions of single treatises, *e g*, the *Oratio catechetica* (J G Krabinger, Munich, 1838, J H Srawley, 1903), and Eng. trans. of the Letters and select works in *The Library of Nicene Fathers*, vol 5 (1893). Monographs cited in Hauck-Herzog's *Realencyk* vii

GREGORY, ST., OF TOURS (538–594), historian of the Franks, was born in the chief city of the Arverni (the modern Clermont-Ferrand) on Nov. 30, 538 His real name was Georgius Florentius, but he was called Gregory after his maternal great-grandfather, the bishop of Langres Gregory belonged to an illustrious senatorial family, many of whose members held high office in the church and bear honoured names in the history of Christianity.

Gregory lost his father early and was taken to Clermont-Ferrand to be brought up by his uncle Gallus and by his successor, Avitus, and there he received his education Among profane authors he read the first six books of the *Aeneid* and Sallust's history of the Catiline conspiracy, but his education was mainly religious. The principles of religion he learnt from the Bible, Sulpicius Severus and some lives of saints, but to patristic literature and the subtleties of theology he remained a stranger In 563, at the age of twenty-five, he was ordained deacon Falling seriously ill, he went to Tours to seek a cure at the tomb of St Martin. At Tours he lived with Euphronius, and so great was the young man's popularity that, on the death of Euphronius in 573, the people unanimously designated him bishop

At that time Tours belonged to Austrasia, and King Sigebert hastened to confirm Gregory's election After the assassination of Sigebert (575), the province was ruled by Chilperic for nine years, during which period Gregory displayed the greatest energy in protecting his town and church from the Frankish king He had to contend with Count Leudast, the governor of Tours; despite all the king's threats, he refused to give up Chilperic's son Meroving, who had sought refuge from his father's wrath at the sanctuary of St. Martin; and he defended Bishop Pretextatus against Chilperic, by whom he had been condemned for celebrating the marriage of Merovech and Queen Brunhilda. In 580 Gregory was himself accused before a council at Berny of using abusive language against Queen Fredegond, but he cleared himself of the charge by an oath and was acquitted On the death of Chilperic, Tours remained for two years (584–85) in the hands of Guntram, but when Guntram adopted his nephew Childebert, Sigebert's son, it again became Austrasian. This change was welcome to Gregory, who often visited the court. In 586 he was at Coblenz, and on his return to Yvois (the modern Carignan) visited the stylite Wulfilaic; in 588 we hear of him at Metz and also at Chalon-sur-Saône, whither he was sent to obtain from King Guntram the ratification of the pact of Andelot; in 593 he was at Orleans, where Childebert had just succeeded his uncle Guntram In the intervals of these journeys he governed Tours with great firmness, repressing disorders and reducing the monks and nuns to obedience He died on Nov 17, 594

Gregory left many writings, of which he himself gives an enumeration at the end of his *Historia Francorum:* "Decem libros Historiarum, septem Miraculorum, unum de Vita Patrum scripsi, in Psalterii tractatu librum unum commentatus sum, de Cursibus etiam ecclesiasticis unum librum condidi" The ten books of history are discussed below The seven books of miracles are divided into the *De gloria martyrum*, the *De virtutibus sancti Juliani*, four books of *Miracula sancti Martini*, and the *De gloria confessorum*, the last dealing mainly with confessors who had dwelt in the cities of Tours and Clermont The *Vitae patrum* consists of twenty biographies of bishops, abbots and hermits belonging to Gaul The commentary on the Psalms is lost, the preface and the titles of the chapters alone being extant The treatise *De cursibus ecclesiasticis*, discovered in 1853, is a liturgical manual for determining the hour of divers nocturnal offices by the position of the stars Gregory also left a life of St Andrew, translated from the Greek, and a history of the Seven Sleepers of Ephesus, translated from Syriac

His most important work, however, is the *Historia Francorum*, which is divided into three parts The first four books, which were composed at one time, cover the period from the creation of the world to the death of Sigebert in 575 The first book, which is a mere compilation from the chronicles of St Jerome and Orosius, is of no value The second book, from 397 to 511, deals with the invasions of the Franks, and is based on the histories of Sulpicius Alexander and Renatus Profuturus Frigeridus, now lost, on the catalogues of the bishops of Clermont and Tours; on some lives of saints, *e g*, Remigius and Maxentius, now lost; on the annals of Arles and Angers, now lost; and on legends, either collected by Gregory himself from oral tradition, or cantilenes or epics written in the Latin and Germanic languages In the third and fourth books the earlier part is based on materials collected from men older than himself; of the later events he was himself an eye-witness The fifth and sixth books, up to the death of Chilperic (584), deal with matters within his own experience The first six books are often separate in the mss, and it was these alone that were used by the chronicler Fredegarius in his abridgment of Gregory's history To the first six books Gregory subsequently added chapters on the bishops Salonius and Sagittarius, and on his quarrels with Felix of Nantes. The authenticity of these chapters has been undeservedly attacked by Catholic writers Books vii to x, from 584 to 591, were written in the form of a diary; of each important event, as it occurred, he inserted an account in his book The last six books are of great historical value.

Gregory was at great pains to be an impartial writer, but in this he was not always successful. His devotion to Austrasia made him very bitter against, and perhaps unjust to, the sovereigns of Neustria, Chilperic and Fredegond As an orthodox Christian, he had no good word for the Arians He excuses the crimes of kings who protected the church, such as Clovis, Clotaire I and Guntram, but had no mercy for those who violated ecclesiastical privileges. This attitude, no doubt, explains his hatred for Chilperic But if Gregory's historical judgments are suspect, he at least concealed nothing and invented nothing; and we can correct his judgments by his own narrative.

BIBLIOGRAPHY —T Ruinart brought out a complete edition of Gregory's works at Paris in 1699 The best modern complete edition is that of W Arndt and B Krusch in *Mon Germ hist script rer. Merov* (vol i., 1885) Of the many editions of the *Historia Francorum* may be mentioned those of Guadet and Taranne in the *Soc. de l'hist de France* (4 vols, with Fr trans, 1836–38), of Omont (the first six books, a reproduction of the Corvey ms) and of G Collon

(the last four books; a reproduction of the Brussels ms No. 9, 403). Gregory's hagiographic works were published by H. Bordier in the *Soc de l'hist. de France* (4 vols, with Fr. trans, 1857–64) *Cf* J W. Lobell, *Gregor von Tours und seine Zeit* (2nd ed, Leipzig, 1868); G. Monod, "Études critiques sur les sources de l'histoire mérovingienne" in the *Bibl de l'École des Hautes Études* (1872); G Kurth, "Grégoire de Tours et les études classiques au VIe siècle" in the *Revue des questions historiques* (xxiv 586 *seq.*, 1878); Max Bonnet, *Le Latin de Grégoire de Tours* (1890). For details, *see* Ulysse Chevalier, *Biobibliographie* (2nd ed). (C. PF)

GREGORY THE ILLUMINATOR (257?–337?), the reputed founder of the Armenian Church, was, according to legend, the son of Anak, head of the Parthian clan of Suren, who was bribed by the Sassanid king of Persia to assassinate the Armenian king, Chosroes Anak was slain by his victim's soldiers, Gregory was rescued by his Christian nurse, carried to Caesarea in Cappadocia, and brought up a Christian When he refused to assist Tiridates, now king of Armenia, in offering pagan sacrifice, and his parentage became revealed, he was confined to a pit at Artashat for fourteen years About 301 Tiridates killed the nun Ripsimé, who had sought his protection against Diocletian Providence, incensed at such cruelty, turned Tiridates into a wild boar and afflicted his subjects with madness, but his sister had a revelation to bring Gregory out of his pit The king consented, the saint was permitted to preach, and after his vision of Christ at Valarshapat, Christianity became the national faith of Armenia About 290 Gregory went to Caesarea, where Leontius ordained and consecrated him vicar-general of Armenia. This ordination is historical, though the vision at Valarshapat was invented later by the Armenians when they broke with the Greeks, in order to give to their church the semblance, if not of apostolic, at least of divine origin

About 315, Tiridates went with Gregory, Aristaces, son of Gregory, and Albianos, head of the other priestly family, either to Rome or to Sardica, to make a pact with Constantine, newly converted to the faith. In 325 he sent Aristaces to the Council of Nice, and Gregory is related to have added a clause to the creed which Aristaces brought back About 332, Gregory became a hermit on Mount Sebuh where he died

Gregory did not really convert Great Armenia, for it had been already converted by Syrian missionaries to the Adoptionist or Ebionite faith which was dominant in the far East, and was afterwards known as Nestorianism Marcionites and Montanists had also worked in the field Gregory persuaded Tiridates to destroy the last relics of paganism, and carried out in the religious sphere his sovereign's policy of detaching Great Armenia from the Sassanid realm and allying it with the Graeco-Roman empire and civilization He set himself to Hellenize or Catholicize Armenian Christianity, and in furtherance of this aim set up a hierarchy dependent on the Cappadocian

BIBLIOGRAPHY —Agathangelus's *Life of Gregory*, which is highly embellished with miraculous stories, was compiled about 450 It was published in Armenian by the Mechitarists at Venice in 1835, and in Greek by Lagarde in 1889. *See* also S Weber, *Die Catholische Kirche in Armenien* (Freiburg, 1903, with bibliography), C Fortescue, *The Armenian Church* (1872), H Gelzer, *Die Anfange der armenischen Kirche* (Leipzig, 1895) (*Sachs Gesells der Wissensch*), v Gutschmid, *Kleine Schriften* (Leipzig, 1892), Arshak Ter Mikelian, *Die arm Kirche* (Leipzig, 1892); Malan, *S Gregory the Illuminator* (Rivingtons, 1868)

GREGORY, the name of 16 popes and one anti-pope

SAINT GREGORY, surnamed the Great (*c* 540–604), the first pope of that name, and the last of the four doctors of the Latin Church, was born in Rome, the son of a wealthy patrician His mother was Silvia, who is commemorated as a saint on Nov 3 About 573, Gregory held the office of prefect of the city of Rome; but about 574, feeling irresistibly attracted to the religious life, he resigned his post, founded six monasteries in Sicily and one in Rome, and in the last—the famous monastery of St Andrew—became a monk In 579 Pope Pelagius II. appointed him "apocrisiarius," or resident ambassador, at the imperial court in Constantinople Some seven years later he was made abbot of his old monastery at Rome where he completed his well-known exposition of Job, and delivered lectures on the Heptateuch, the books of Kings, the Prophets, the book of Proverbs and the Song of Songs To this period Bede's incident of the English slave-boys (if indeed it be accepted as historical) ought to be assigned. Passing one day through the Forum, Gregory saw some handsome slaves offered for sale, and enquired their nation "Angles," was the reply. "Good," said the abbot, "they have the faces of angels, and should be coheirs with the angels in heaven. From what province do they come?" "From Deira" "Deira Yea, verily, they shall be saved from God's ire (*de ira*) and called to the mercy of Christ How is the king of that country named?" "Aella." "Then must Alleluia be sung in Aella's land" Gregory determined personally to undertake the conversion of Britain, and with the pope's consent actually set out upon the mission, but on the third day of his journey he was overtaken by messengers recalling him to Rome. In 590 Pelagius II died of the plague, and the clergy and people unanimously chose Gregory as his successor The abbot tried to avoid the dignity and petitioned the emperor Maurice not to ratify his election, but he was consecrated on Sept 3, 590

As pope, Gregory surrounded himself with clerics and monks, with whom he lived as though he were still in a monastery, and in spite of constant ill-health, ministered unceasingly to the physical and spiritual needs of his people During his pontificate the papal estates increased in value, while at the same time the grievances of the tenants were redressed and their general position materially improved Gregory's principal fault as a man of business was that he was too lavish of his revenues

Within the strict bounds of his patriarchate, he wisely tolerated local deviations from Roman usage (*e g*, in the ritual of baptism and confirmation), and took pains to enforce the celibacy of the clergy, the trial of clerics only in ecclesiastical courts, the deprivation of clerics who had lapsed into scandalous offences, and the division of the revenues of each church into equal parts, to be assigned to the bishop, the clergy, the poor and the repair of the church

Regarding the churches which lay outside the strict limits of his patriarchate, in northern Italy, Spain, Gaul, Africa and Illyricum and also in the East, Gregory tried to increase the authority of the Roman See Rome, as the see of the Prince of the Apostles, was by divine right "the head of all the churches" The decrees of councils would have no binding force "without the authority and consent of the apostolic see": appeals might be made to Rome against the decisions even of the patriarch of Constantinople all bishops, including the patriarchs, if guilty of heresy or uncanonical proceedings, were subject to correction by the pope On the other hand he respected the rights of metropolitans and disapproved of unnecessary interference within the sphere of their jurisdiction canonically exercised. In Italy Gregory occupied an almost regal position. He boldly stepped into the place which the emperors had left vacant and the Lombard kings had not the strength to seize. For the first time in history the pope appeared as a political power, a temporal prince He appointed governors to cities, issued orders to generals, provided munitions of war, sent his ambassadors to negotiate with the Lombard king and concluded a private peace

A strong supporter of monasticism, Gregory tried to enforce a strict observance of the Rule of St Benedict (of whom, it may be noted, he was the earliest biographer), and to protect the monks from episcopal oppression by issuing *privilegia*, or charters in restraint of abuses, in accordance with which the jurisdiction of the bishops over the monasteries was confined to spiritual matters He forbade monks to minister in parish churches, ordaining that any monk who was promoted to such ecclesiastical cure should lose all rights in his monastery and should no longer reside there Of his missionary enterprises, the most important was the two-fold mission to Britain—of St Augustine in 596, of Mellitus, Paulinus and others in 601 Gregory also made strenuous efforts to uproot paganism in Gaul, Italy, Sicily, Sardinia and Corsica, Arianism in Spain, Donatism in Africa, Manichaeism in Sicily, the heresy of the Three Chapters in Istria and northern Italy Towards the Jews he acted with lenity, protecting them from persecution and securing them the enjoyment of their legal privileges The so-called "simoniacal heresy," particularly prevalent in Gaul, Illyri-

cum and the East, he repeatedly attacked, and also the Gallican abuse of promoting laymen to bishoprics

Gregory's work in connection with the liturgy and church music is a subject of dispute If we are to credit a 9th century biographer, Gregory abbreviated and otherwise simplified the Sacramentary of Gelasius, producing a revised edition with which his own name has become associated, and which represents the groundwork of the modern Roman Missal But though it is certain that he introduced three changes in the liturgy (viz, the addition of some words in the prayer *Hanc igitur*, the recitation of the Pater Noster immediately before the fraction of the Host, and the chanting of the Alleluia after the Gradual besides at paschal time) and two others in the ceremonial (forbidding deacons to perform any musical portion of the service except the chanting of the gospel, and subdeacons to wear chasubles), no evidence warrants belief that the Gregorian Sacramentary is his work A doubtful tradition ascribes to Gregory the compilation of an Antiphonary, the revision and rearrangement of the system of church music, and the foundation of the Roman *schola cantorum*

Finally, as Fourth Doctor of the Latin Church, Gregory is the last of the great Latin Fathers and the first representative of mediaeval Catholicism The importance of his teaching lies mainly in its simple summarization of the doctrine of Augustine and in its detailed exposition of contemporary religious conceptions which had not hitherto been defined (*e g*, the views on angelology and demonology, on purgatory, the Eucharist and the efficacy of relics) From his time to that of Anselm no teacher of equal eminence arose in the church

Gregory died on March 12, 604, and was buried in the portico of the basilica of St Peter, in front of the sacristy Translations took place in the 9th, 15th and 17th centuries, and the remains now rest beneath the altar in the chapel of Clement VIII

BIBLIOGRAPHY —Of Gregory's writings, which appeared at Paris (1518) and in Migne's *Patrol Lat*, vols 75–79, and at other times, the following are generally accepted as genuine —

Epistolarum libri xiv, *Moralium libri xxxv*, *Regulae pastoralis liber*, *Dialogorum libri iv*, *Homiliarum in Ezechielem prophetam libri ii*, *Homiliarum in Evangelia libri ii* The *Epistolae* have been published separately by P Ewald and L M Hartmann in the *Mon Germ hist* (1887–99) Eng trans of selected epistles and the *Pastoral Care* in *Nicene and Post-Nicene Fathers*, vols 12 and 13, and a trans of *Magna Moralia* appeared in "The Library of the Fathers" (1844) An old Eng trans of the *Life of St Benedict* was edited by H Coleridge (1874) and of the Dialogues by E G Gardner (1911) *See* Gregory of Tours, *Historia Francorum* (in Migne's *Patrol Lat* vol 71) and the *Liber pontificalis* (ed Duchesne 1884)—both practically contemporary *See* also G J Lau, *Gregor I der Grosse* (Leipzig, 1845), L Pingaud, *La Politique de Saint Grégoire le grand* (1872), F W Kellett, *Gregory the Great and his relations with Gaul* (1889), T Bonsmann, *Gregor I der Grosse, ein Lebensbild* (1890), C Wolfsgruber, *Gregor der Grosse* (1897), F H Dudden, *Gregory the Great* (2 vols, 1905), E G P Wyatt, *St Gregory and the Gregorian Music* (1904), H H Howorth, *Gregory the Great* (1912), Snow, *St Gregory the Great* (2nd ed 1924), and the bibliographies in Chevalier, *Répertoire des sources historiques du moyen âge*, and A Potthast, *Bibliotheca historica medii aevi*

GREGORY II, pope from 715 to 731, succeeded Constantine I whom he accompanied to Constantinople in 710 To spread Christianity in Germany, Gregory gave special encouragement to the mission of St Boniface, whom he consecrated bishop in 722 He was a staunch adherent of the East Roman empire, which still exercised sovereignty over Rome, Ravenna and some other parts of Italy, and he impeded as far as possible the progress of the Lombards About 726, however, he came into conflict with the emperor Leo the Isaurian on account of the excessive taxation of the Italians, and, later, on account of his iconoclastic edicts Leo endeavoured to rid himself of the pope by violence, but Gregory, supported by the people of Rome and by the Lombards, succeeded in eluding the emperor and died peacefully on Feb 11, 731.

GREGORY III, pope from 731 to 741, condemned the iconoclasts at a council convened at Rome in 731, and, like his predecessor Gregory II, stimulated the missionary labours of St Boniface, on whom he conferred the pallium

GREGORY IV, pope from 827 to 844 His name is chiefly associated with the quarrels between Lothair and Louis the Pious, in which he espoused the cause of the former, for whom, in the Campus Mendacii (*Lugenfeld*, field of lies), as it is usually called (833), he secured by his treachery a temporary advantage. The institution of the feast of All Saints is usually attributed to this pope He died on Jan 25, 844

GREGORY V, pope from 996 to 999, a great-grandson of the emperor Otto the Great Until the council of Pavia (997) his rival was the anti-pope John XVI, whom the people of Rome, in revolt against the will of the youthful emperor Otto III, had chosen after having expelled Gregory The most memorable acts of his pontificate were those arising out of the contumacy of the French king, Robert, who submitted after a sentence of excommunication. Gregory died suddenly, and not without suspicion of foul play, on Feb 18, 999 Twenty-two of his bulls are in Migne's *Patrol Lat.*, vol 137

GREGORY VI, pope from 1045 to 1046 As Johannes Gratianus he had earned a reputation for learning and probity, and in 1045 he bought the pontificate from his unworthy godson Benedict IX. At a council held by the emperor Henry III at Sutri in 1046, he was accused of simony, deposed and banished to Germany.

GREGORY VII (HILDEBRAND) SAINT, pope from 1073 to 1085, was born of humble parents in Tuscany *c* 1023, and was educated in the convent of St Mary on the Aventine at Rome where he became a Benedictine As chaplain to the exiled Gregory VI, he lived for a year at Cologne acquiring an intimate knowledge of the political and ecclesiastical conditions of Germany He returned to Rome with Bishop Bruno of Toul, who became Pope Leo IX. (1048–54) Under him Hildebrand was made a cardinal subdeacon and administrator of the patrimony of St Peter and acted as a legate in France, where he was occupied *inter alia* with the question of Berengarius of Tours (*q v*) On the death of Leo IX he went as the envoy of the Romans to the German court, to conduct the negotiations with regard to his successor The emperor pronounced in favour of Bishop Gebhard of Eichstadt, who, as Victor II (1055–57), again employed Hildebrand as his legate to France When Stephen IX (Frederick of Lorraine) was raised to the papacy, without previous consultation with the German court, Hildebrand and Bishop Anselm of Lucca were despatched to Germany to secure a belated recognition Stephen, however, died before his return, and, by the hasty elevation of Bishop Johannes of Velletri, the Roman aristocracy made a last attempt to recover their influence in papal appointments Hildebrand, however, secured the election of Bishop Gerhard of Florence The reign of Nicholas II (1059–61) saw three great transactions —the *rapprochement* with the Normans in the south of Italy, the alliance with the democratic and, subsequently, anti-German movement of the Patarenes in the north, and the legal enactment which transferred the papal election to the College of Cardinals In these measures Hildebrand, already a dominant personality on the Curia, though he was only an archdeacon played a large part Under Alexander II (1061–73) Hildebrand became the soul of the Curial policy, and sagaciously utilized the general political conditions, especially in Germany

On Alexander's death, he became Pope Gregory VII It is proof of the popular faith in his qualifications that, although the circumstances of his election invited assault in 1073, no attempt was then made to set up a rival pontiff When, however, the opposition against him had gone so far as to produce a pretender to the chair, his long and undisputed possession tended to prove the original legality of his papacy, and the appeal to irregularities at its beginning only assumed the appearance of a mere biased attack On May 22 he received sacerdotal ordination, and on June 30 episcopal consecration

The focus of the ecclesiastico-political projects of Gregory VII is to be found in his relationship with Germany The young Henry IV was compelled by the Saxon rebellion to come to amicable terms with the pope at any cost Consequently in May 1074 he did penance at Nuremberg in presence of the legates to expiate his intimacy with the members of his council banned by Gregory, took an oath of obedience, and promised his support in the work of reforming the church This attitude, however, he abandoned so soon as he gained the upper hand of the Saxons by

his victory at Hohenburg on the Unstrut (June 9, 1075), and he now attempted to reassert his rights of suzerain in upper Italy without delay. He sent Count Eberhard to Lombardy to combat the Patarenes; nominated the cleric Tedaldo to the archbishopric of Milan; and finally endeavoured to establish relations with the Norman duke, Robert Guiscard. Gregory's severe reprimands infuriated Henry and his court, and their answer was the hastily convened national council in Worms, which met on Jan 24, 1076 In a document full of gross accusations the bishops renounced their allegiance. In another King Henry pronounced him deposed, and the Romans were required to choose a new pope Two bishops were despatched to Italy in company with Count Eberhard under commission of the council, and they succeeded in procuring a similar act of deposition from the Lombard bishops in the synod of Piacenza The communication of these decisions to the pope was undertaken by the priest Roland of Parma, and he was fortunate enough to gain an opportunity for speech in the synod, which had barely assembled in the Lateran church, and there to deliver his message announcing the dethronement of the pontiff Such indignation was aroused that it was only due to the moderation of Gregory himself that the envoy was not cut down on the spot On the following day the pope excommunicated the German king, divested him of his dignity and absolved his subjects from the oaths sworn to him The excommunication of the king made a profound impression both in Germany and Italy In Germany there was a general revulsion of sentiment in favour of Gregory, and the particularism of the princes utilized the auspicious moment for prosecuting their anti-regal policy under the cloak of respect for the papal decision In October, they met at Tribur to elect a new German king, and Henry was only saved from the loss of his sceptre by their failure to agree on the question of his successor They settled that, if, on the anniversary of his excommunication, Henry still lay under the ban, the throne should be considered vacant Henry wisely went to Italy in person and did penance before Gregory at Canossa The reconciliation was only effected after prolonged negotiations and definite pledges on the part of the king, though no basis was gained for a settlement of the great questions at issue—notably that of investiture A new conflict was inevitable because Henry IV naturally considered the sentence of deposition repealed with that of excommunication, while Gregory on the other hand, intent on reserving his freedom of action, gave no hint on the subject at Canossa

That the excommunication of Henry IV was simply a pretext for the opposition of the rebellious German nobles is manifest They persisted in their policy after his absolution, and set up a rival king in the person of Duke Rudolph of Swabia (Forchheim, March 1077) Gregory tried to remain neutral but finally decided for Rudolph of Swabia in consequence of his victory at Flarchheim (Jan 27, 1080), and again pronounced the excommunication and deposition of King Henry (March 7, 1080) Rudolph died on Oct 16, and a new claimant—Hermann of Luxemburg—was put forward in Aug 1081 The king refused to acknowledge the ban on the ground of illegality, and the council summoned at Brixen on June 25, 1080, pronounced Gregory deposed and nominated the archbishop Guibert of Ravenna as his successor In 1081 Henry opened the conflict against Gregory in Italy The latter had now fallen on evil days, and he lived to see 13 cardinals desert him, Rome surrendered by the Romans to the German king, Guibert of Ravenna enthroned as Clement III (March 24, 1084), and Henry crowned emperor by his rival, while he himself had to flee from Rome

As regards other countries, Gregory had attempted to establish a claim of suzerainty on the part of the see of St Peter, and to secure the recognition of its rights of possession On the ground of "immemorial usage" Corsica and Sardinia were assumed to belong to the Roman Church Spain and Hungary were also claimed as her property, and an attempt was made to induce the king of Denmark to hold his realm as a fief from the pope Philip I of France, by his simony and the violence of his proceedings against the church, provoked a threat of summary measures; and excommunication, deposition and the interdict, appeared to be imminent in 1074 In England, William the Conqueror interfered autocratically with the management of the church, forbade the bishops to visit Rome, filled bishoprics and abbeys, and evinced little anxiety when the pope prohibited him from commerce or commanded him to acknowledge himself a vassal of the apostolic chair.

For Gregory, the church, as a divine institution, had been entrusted with the task of embracing all mankind in a single society in which the divine will is the only law; and the pope, *qua* head of the church, had been made the vice-gerent of God on earth, so that disobedience to him implies disobedience to God He looked on the worldly State as an unhallowed edifice whose character is sufficiently manifest from the fact that it abolishes the equality of man, and that it is built up by violence and injustice In practice he acknowledged the existence of the State as a dispensation of Providence, described the coexistence of church and State as a divine ordinance, and emphasized the necessity of union between the *sacerdotium* and the *imperium*. But he always upheld the superiority of the church and claimed the right of excommunicating and deposing incapable monarchs, and of confirming the choice of their successors The question of appointment to spiritual offices—the so-called *investiture*—brought the controversy over the relation between church and State to a head By the first law (1075) the right of investiture for churches was in general terms denied to the laity In 1078 neglect of this prohibition was made punishable by excommunication, and, by a further decree of the same year, every investiture conferred by a layman was declared invalid and its acceptance pronounced liable to penalty It was, moreover, enacted that every layman should restore, under pain of excommunication, all lands of the church, held by him as fiefs from princes or clerics, and that, henceforward, the assent of the pope, the archbishop, etc, was requisite for any investiture of ecclesiastical property Finally in 1080 the forms regulating the canonical appointment to a bishopric were promulgated The election was to be conducted by the people and clergy under the auspices of a bishop nominated by the pope or metropolitan, after which the consent of the pope or archbishop was to be procured In so legislating, Gregory tried to withdraw the appointment to episcopal offices from the influence of the king If lay investiture could be abolished the king would be deprived of his control over the great possessions assigned to the church by himself and his predecessors, and he could have no security that the duties attached to those possessions would be discharged for the benefit of the empire The bishops in fact were to retain their position as princes of the empire, but the bond between them and the empire was to be dissolved they were to owe allegiance only to the pope (*see* INVESTITURE)

In the internal government of the church, Gregory wished to see all important matters of dispute referred to Rome; appeals were to be addressed to himself, and he arrogated the right of legislation, the Roman synods being merely the instruments of his will Among the methods employed to break the resistance of the higher prelates, with whom he was often in conflict, the despatch of legates proved peculiarly effective The regulation, again, that the metropolitans should apply at Rome in person for the pallium schooled them in humility This battle for papal omnipotence is connected with his championship of compulsory celibacy among the clergy and his attack on simony In 1074 Gregory required all to renounce their obedience to those bishops who showed indulgence to their clergy in the matter of celibacy In the following year he commanded the laity to accept no ministrations from married priests and deprived these clerics of their revenues His war on simony culminated in his declaration in 1078 that consecration by a simoniac was null and void

The pontificate of Gregory VII came to a melancholy close, for he died an exile in Salerno on May 25, 1085 Too much the politician, too rough in his methods, too exclusively the representative of the Roman see, he had made more enemies than friends, for in the whirlpool of secular politics the religious side of his character was never sufficiently developed to allow the vice-gerent of Christ to be heard instead of the hierarch in his official acts Nevertheless it was he who formulated the ideal of the papacy as a structure embracing all peoples He took the first step towards the codification of ecclesiastical law and the definite ratification

of the claims of the apostolic chair as corner-stones in the church's foundation. He educated the clergy and the lay world in obedience to Rome; and, finally, it was due to his efforts that the celibacy of the clergy became customary in Catholic Christianity. Gregory was canonized by Benedict XIII. in 1729.

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GREGORY VIII., antipope from 1118 to 1121, had been archbishop of Braga. Suspended by Paschal II. in 1114 on account of a dispute with the Spanish primate and papal legate, the archbishop of Toledo, he went to Rome and regained favour to such an extent that he was employed by the pope on important legations. He opposed the extreme Hildebrandine policy, and, on the refusal of Gelasius II. to concede the emperor's claim to investiture, he was proclaimed pope by Henry V. on March 8, 1118. He was excommunicated by Gelasius II. in April 1118, and by Calixtus II. at the synod of Reims (Oct. 1119). He died in exile at the convent of La Cava.

The life of Gregory VIII. by Baluzius in *Baluzii miscellanea*, vol. 1, ed. by J. D. Mansi (Lucca, 1761), is an excellent vindication.

GREGORY VIII. (*Alberto de Mora*), pope from Oct. 21 to Dec. 17, 1187, a native of Benevento and Praemonstratensian monk, successively abbot of St. Martin at Laon, cardinal-deacon of San' Adriano al foro, cardinal-priest of San Lorenzo in Lucina, and chancellor of the Roman Church, was elected to succeed Urban III. He died at Pisa while engaged in making peace between the Pisans and Genoese in order to secure their help in the new crusade which he was urging for the recovery of Jerusalem.

His letters are in Migne, *Patrol. Lat.*, vol. 202. Consult J. M. Watterich, *Pontif. Roman. vitae*, vol. 2 (Leipzig, 1862), Jaffé, *Regesta pontif. Roman.*; J. Langen, *Geschichte der romischen Kirche von Gregor VII. bis Innocenz III* (Bonn, 1893); P. Nadig, *Gregors VIII. 57tägiges Pontifikat* (Basle, 1890).

GREGORY IX. (*Ugolino Conti de Segni*), pope from March 19, 1227, to Aug. 22, 1241, was a nobleman of Anagni and probably a nephew of Innocent III. He studied at Paris and Bologna, and, having been successively archpriest of St. Peter's, papal chaplain, cardinal-deacon of Sant' Eustachio, cardinal-bishop of Ostia, first protector of the Franciscans, and papal legate in Germany under Innocent III. and Honorius III., succeeded the latter in the papacy. On Sept. 29, 1227, he excommunicated the emperor Frederick II. for continued neglect of his vows and refusal to undertake the crusade. When Frederick finally set out the following June without making submission to the pope, Gregory raised an insurrection against him in Germany, and forced him in 1230 to beg for absolution. The Romans, however, disapproved of the temporal power and exiled the pope (June 1, 1231). Hardly had this contest been brought to an end favourable to the papacy (May 1235) when Gregory came into fresh conflict with Frederick II. He again excommunicated the emperor and released his subjects from their allegiance (March 24, 1239). Frederick, on his side, invaded the Papal States and prevented the assembling of a general council convoked for Easter 1241.

Gregory systematized the Inquisition and entrusted it to the Dominicans. He supported Henry III. against the English barons, and protested against the Pragmatic Sanction of Louis IX. of France. He sent monks to Constantinople to negotiate for church unity, but without result. He permitted free study of Aristotle, and issued (1234) an important new compilation of decretals which he prescribed in the bull *Rex pacificus* should be the standard text-book in canon law at Bologna and Paris. Gregory was famed for his learning, his blameless life, and his strength of character. He died on Aug. 22, 1241, while Frederick II. was advancing against him.

For his life *see* his Letters in *Monumenta Germaniae historica* (1883); "Les Registres de Grégoire IX.," ed. L. Auvray in *Bibliothèque des écoles françaises d'Athènes et de Rome* (1890 *seq.*); A. Potthast, *Regesta pontif. Roman.* (1875) and "Registri dei Cardinali Ugolino d' Ostia et Ottaviano degli Ubaldini," ed. G. Levi in *Fonti per la storia d' Italia* (1890). *See* J. Felten, *Papst Gregor IX.* (Freiburg i. B., 1886); J. Marx, *Die Vita Gregorii IX.* (1889), P. Balan, *Storia di Gregorio IX.* (3 vols., Modena, 1872), T. Frantz, *Der grosse Kampf zwischen Kaisertum u. Papsttum zur Zeit des Hohenstaufen Friedrich II.* (1903); W. Norden, *Das Papsttum u. Byzanz* (1903), and bibliography in Herzog-Hauck's *Realencyklopadie*.

GREGORY X. (*Tebaldo Visconti*), pope from Sept. 1, 1271, to Jan. 10, 1276, was born at Piacenza in 1208, and became archdeacon of Liége. While accompanying Edward of England on the crusade, he was elected pope and was consecrated on March 27, 1271. He summoned the 14th general council at Lyons in 1274, for the purpose of considering the eastern schism, the condition of the Holy Land, and the abuses in the church. The Greeks were persuaded to consent to a union for the time being, and Rudolph of Habsburg renounced at the council all imperial rights in the States of the Church. Gregory issued the constitution determining for the first time the form of conclave at papal elections. He was on his way to Rome to crown Rudolph when he died at Arezzo on Jan. 10, 1276.

Gregory's registers were published by J. Guiraud in the *Bibliothèque des écoles françaises d'Athènes et de Rome* (1892–98).

GREGORY XI. (*Pierre Roger de Beaufort*), pope from Dec. 30, 1370, to March 27, 1378, born in Limousin in 1330, was created cardinal-deacon of Sta. Maria Nuova by his uncle, Clement VI. His efforts to establish peace between France and England and to aid the Eastern Christians against the Turks were fruitless. He introduced many reforms in the monastic orders and vigorously opposed heresy. He consulted Catherine of Siena, to whom the transference of the papal see back to Italy (Jan. 17, 1377) was almost entirely due. He issued several bulls to the archbishop of Canterbury, the king of England, and the University of Oxford, commanding an investigation of Wycliffe's doctrines. Gregory was learned and full of zeal for the church, but irresolute and guilty of nepotism.

See H. J. Tomaseth, "Die Register u. Secretare Urbans V. u. Gregors XI." in *Mitteilungen des Instituts fur osterreichische Geschichtsforschung* (1898), J. P. Kirsch, *Die Ruckkehr der Papste Urban V. u. Gregor XI. von Avignon nach Rom* (Paderborn, 1898), J. B. Christophe, *Histoire de la papauté pendant le XIVe siècle* (vol. 2, 1853).

GREGORY XII. (*Angelo Coriaro* or *Correr*), pope from Nov. 30, 1406, to July 4, 1415, was born of a noble family at Venice about 1326. Successively bishop of Castello, Latin patriarch of Constantinople, cardinal-priest of San Marco, and papal secretary, he was elected to succeed Innocent VII. under the express condition that, should the antipope Benedict XIII. at Avignon renounce his claim, he also would renounce his, so that the long schism might be terminated. As pope, he concluded a treaty with his rival at Marseilles, by which a general council was to be held at Savona in Sept. 1408, but King Ladislaus of Naples brought the negotiations to nought. Gregory had promised not to create more cardinals, and when he did so, in 1408, his former cardinals deserted him and, with the Avignon cardinals, convoked the council of Pisa, which proclaimed in July 1409 the deposition of both popes and the election of Alexander V. Gregory, still supported by Naples, Hungary, Bavaria, and by Rupert, king of the Romans, found protection with Ladislaus, and in a synod at Cividale del Friuli banned Benedict and Alexander. John XXIII., having succeeded to the claims of Alexander in 1410, concluded a treaty with Ladislaus, by which Gregory was banished from Naples on Oct. 31, 1411. The pope presented his resignation to the council of Constance on July 4, 1415, and died at Recanati on Oct. 18, 1417.

GREGORY XIII. (*Ugo Buoncompagno*), pope from 1572 to 1585, was born on Jan. 7, 1502, in Bologna, where he taught, until called to Rome (1539) by Paul III., who employed him in various offices. He was prominent in the council of Trent, 1562–63. In

1564 he was made cardinal by Pius IV., and, in the following year, sent to Spain as legate. On May 13, 1572, he was chosen pope to succeed Pius V. Having failed to rouse Spain and Venice against the Turks, Gregory attempted to form a general coalition against Protestants. He subsidized Philip II. in his wars in the Netherlands; aided the Catholic League in France; incited attacks upon Elizabeth by way of Ireland With the aid of the Jesuits, whose privileges he multiplied, he conducted a vigorous propaganda Among his noteworthy achievements are the reform of the calendar on Feb 24, 1582 (*see* CALENDAR); the improved edition of the *Corpus juris canonici*, 1582, the splendid Gregorian Chapel in St Peter's, the fountains of the Piazza Navona; the Quirinal Palace; and many other public works To meet the expenses entailed, Gregory resorted to confiscation, on the pretext of defective titles or long-standing arrearages, but with disastrous results to the public peace. Gregory died on April 10, 1585

See Maffei, *Annales Gregorii XIII.* (2 vols, 1742) and bibliography in *Cambridge Mod. Hist.* III.

GREGORY XIV (*Nicolò Sfondrato*), pope 1590–91, was born in Cremona on Feb 11, 1535, studied in Perugia and Padua, became bishop of his native place in 1560, took part in the Council of Trent, 1562–63, became a cardinal in 1583 and was elected to the papacy on Dec. 5, 1590 During his short pontificate the States of the Church suffered dire calamities, famine, epidemic and a fresh outbreak of brigandage Gregory was completely subservient to Philip II ; he aided the league, excommunicated Henry of Navarre, and threatened his adherents with the ban; but the effect of his intervention was only to rally the moderate Catholics to the support of Henry, and to hasten his conversion. Gregory died on Oct 15, 1591.

See M Facini, *Il pontificales di Gregorio XIV* (1911).

GREGORY XV (*Alessandro Ludovisi*) was born on Jan 9, 1554, in Bologna, where he taught He was made archbishop of his native place and cardinal by Paul V, whom he succeeded as pope on Feb 9, 1621. He aided the emperor in the Thirty Years' War and the king of Poland against the Turks, and endorsed the claims of Maximilian of Bavaria to the electoral dignity Gregory founded the Congregation of the Propaganda, encouraged missions, fixed the order to be observed in conclaves, and canonized Ignatius Loyola, Francis Xavier, Philip Neri and Theresa de Jesus. He died on July 8, 1623

See the extended bibliography in Herzog-Hauck, *Realencyklopädie*

GREGORY XVI. (*Bartolommeo Alberto Cappellari*), pope from 1831 to 1846, was born at Belluno on Sept 18, 1765, and entered the order of the Camaldoli Soon after the restoration of Pius VII he became vicar-general of the Camaldoli, councillor of the Inquisition, prefect of the Propaganda, examiner of bishops, and in 1825 cardinal On Feb 2, 1831, he was chosen to succeed Pius VIII After the revolution, which necessitated the calling in of Austrian troops, the French occupied Ancona in March 1832 and thus threw the Papal States into complete confusion When they withdrew in 1838, there was comparative peace for the next 13 years The embarrassed financial condition in which Gregory left the States of the Church was due to his lavish expenditure in architectural and engineering works, and his magnificent patronage of learning His pontificate was marked by the development of those ultramontane ideas which were ultimately formulated, under the presidency of his successor Pius IX., by the council of the Vatican He died on June 1, 1846

See Cardinal Wiseman, *Recollections of the Last Four Popes* (1858); J. J. Dollinger, *Kirche und Kirchen* (Munich, 1861, Eng trans 1862); C. Sylvain, *Grégoire XVI et son pontificat* (1889), A M Bernasconi, *Acta Gregorii Papae XVI*, vols 1–4 (1901 *seq*), F Neilson, *Hist of the Papacy in the 19th Century* (1906), and bibliography in Herzog-Hauck, *Realencyklopadie*, vol vii (Leipzig, 1899).

GREGORY, EDWARD JOHN (1850–1909), British painter born at Southampton, began to work at the age of 15 in the engineer's drawing office of the Peninsula and Oriental Shipping Company Afterwards he studied at South Kensington and, about 1871, he entered on a successful career as an illustrator He developed also into an admirable painter in oil and water colour He was elected associate of the Royal Academy in 1883, academician (R A) in 1898 and president of the Royal Institute of Painters in 1898 His work was distinguished by remarkable technical qualities, by exceptional firmness and decision of draughtsmanship and by unusual certainty of handling His "Marooned," a water colour, is in the National Gallery of British Art Many of his pictures were shown at Burlington House at the winter exhibition of 1909–10, after his death at Marlow on June 22, 1909 He exhibited many good portraits at the Academy but his water colours brought the highest price at a sale of his pictures at Christie's in 1905

GREGORY, ISABELLA AUGUSTA, LADY (1852–), Irish playwright and author, was born on March 5, 1852, the youngest daughter of Dudley Persse of Roxborough, Co Galway In 1881 she married Sir William Gregory, a well-known Irish M P She produced many plays, essays, volumes of folklore, versions of ancient sagas and romances concerning early Irish heroes, and did much to popularize the Anglo-Irish dialect of English as spoken in the west She translated for the Abbey Theatre several of Molière's plays into this dialect under the title of *The Kiltartan Molière* (1910) Her work as playwright and director of the Abbey Theatre, in association with W B Yeats, was extremely fruitful This theatre was opened in 1904 and Lady Gregory told its story in *Our Irish Theatre* (1914) Sir Hugh Lane, whose life she wrote, *Hugh Lane's Life and Achievement* (1920), was her nephew.

Among Lady Gregory's other works are *Cuchulain of Muirthemne* (1902), *Gods and Fighting Men* (1904), *Seven Short Plays* (1909); *The Kiltartan History Book* (1909), *Irish Folk History Plays* (1912); *The Golden Apple* (1916); *The Kiltartan Poetry Book* (1919), *The Dragon* (1920).

GREGORY, JAMES (1638–1675), Scottish mathematician and astronomer, was educated at the grammar school of Aberdeen and at Marischal college of that city In 1663 he published his treatise *Optica promota*, in which he described his great invention, the Gregorian reflecting telescope About 1665 he went to the university of Padua, where he studied for some years, and in 1667 published *Vera circuli et hyperbolae quadratura*, in which he discussed infinite convergent series for the areas of the circle and hyperbola In 1668 he published also at Padua *Geometriae pars universalis*, in which he gave a series of rules for the rectification of curves and the mensuration of their solids of revolution He was elected F R S, and was professor of mathematics successively at the universities of St Andrews (1669–74) and Edinburgh (1674–75)

GREIFENBERG, a town in the Prussian province of Pomerania, on the Rega, 45 m N E of Stettin on the railway to Kolberg Pop (1925), 8,397 It has two ancient gateways and its church of St Mary dates from the 13th century Manufactures of cement, sugar and bricks are carried on Greifenberg possessed municipal rights as early as 1262, and in the 14th and 15th centuries had a considerable shipping trade, but it decayed during the Thirty Years' War

GREIFENHAGEN, a town in the Prussian province of Pomerania, on the Reglitz, 12 m S S W of Stettin by rail Pop (1925) 8,184 Greifenhagen, built in 1230, was raised to the rank of a town and fortified about 1250 In 1679 it came into the possession of Brandenburg Its prosperity depends chiefly on agriculture and it has a considerable trade in cattle There are also felt manufactures and saw mills

GREIFSWALD, a town in the Prussian province of Pomerania, on the navigable Ryk, 3 m from its mouth on the Baltic, and 20 m S E from Stralsund by rail. Pop (1925) 26,400 Greifswald was founded about 1240 by traders from the Netherlands. In 1250 it received a town constitution and Lubeck rights from the duke of Pomerania In 1270 it joined the Hanse towns It remained in the possession of the Swedes after the peace of Westphalia. In 1713 it was desolated by the Russians, and it came into the possession of Prussia in 1815 The industries mainly consist of fish-curing, and the manufacture of surgical instruments and machinery (particularly for agriculture), and the commerce in the export of corn, wood and fish Greifswald is, however, best known to fame by reason of its university, which was founded during the year 1456, and famous for its faculty of medicine

GREIN, JACOB THOMAS (1862–), naturalized (1925) British dramatic critic, was born in Amsterdam on Oct. 11, 1862, and educated in Holland, Germany and Belgium. He was the founder of the Renaissance theatre, and of the People's theatre, Whitechapel (1923), and from 1916 has been the president of the French Players. He has been dramatic critic for several publications, notably the *Sunday Times*, the *Weekly Sketch* and the *Illustrated London News*. In 1925 he was appointed consul-general for Liberia in London. Grein began his life work of relating the theatre with contemporary culture by introducing the plays of Ibsen into England. His publications include: *Dramatic Criticism* (5 vols., 1899–1905); *A Drama of Charity and some Impressions of London Life 1885–1910* (1910); *The World of the Theatre* (1921); *The New World of the Theatre* (1924).

GREISEN (in French, *hyalomicte*), a modification of granite, consisting essentially of quartz and white mica, and characterized by the absence of felspar and biotite. In the hand specimen the rock has a silvery glittering appearance from the abundance of lamellar crystals of muscovite, but many greisens have much of the appearance of a paler granite. The commonest accessory minerals are tourmaline, topaz, apatite, fluorspar and iron oxides; a little felspar more or less altered may also be present and a brown mica which is biotite or lithionite. The tourmaline in section is brown, green, blue or colourless, and often the same crystal shows many different tints. The white mica forms mostly large plates with imperfect crystalline outlines The quartz is rich in fluid enclosures Apatite and topaz are both colourless and of irregular form.

Greisen occurs typically in belts or veins intersecting granite At the centre of each vein there is usually a fissure which may be open or filled with quartz. The greisen bands are from 1in up to 2ft. or more in thickness At their outer edges they pass gradually into the granite, for they contain felspar crystals more or less completely altered into aggregates of white mica and quartz. The transition between the two rocks is perfectly gradual, a fact which shows that the greisen has been produced by alteration of the granite. Vapours or fluids rising through the fissure have been the agents which effected the transmutation They must have contained fluorine, boron and probably also lithium, for topaz, mica and tourmaline, the new minerals of the granite, contain these elements. The alumina for these minerals is supplied by the biotite and felspar of the granite, but it is noteworthy that albite is not replaced by the soda white mica, paragonite. The change is pneumatolytic, induced by the vapours set free by the granite magma when it cools. Probably the rock was at a relatively high temperature at the time. A similar type of alteration, the development of white mica, quartz and tourmaline, is found sometimes in sedimentary rocks around granite masses

Greisen is closely connected with schorl rock both in its mineralogical composition and in its mode of origin The latter is a pneumatolytic product consisting of quartz and tourmaline, and often contains white mica, thus passing by all stages into greisen. Both of these rocks frequently carry small percentages of tin oxide (cassiterite) and may be worked as ores of tin, and the central filling of the fissure often contains much wolfram, as in Cornwall, where they are common—as also in Saxony, Tasmania and other centres of tin-mining Many other greisens occur in which no tin is found The analyses show the composition

	SiO_2	Al_2O_3	Fe_2O_3	FeO	CaO
Granite	70 17	15 07	88	1 79	1 13
Greisen	69 42	15 65	1 25	3 30	63

	MgO	K_2O	Na_2O	F1	B_2O_3
Granite	1 11	5·73	2 69	15	tr
Greisen	1 02	4 06	·27	3 36	59

of Cornish granite and greisen They make it clear that there has been an introduction of fluorine and boron and a diminution in the alkalis during the transformation of the granitic rock into the greisen (J. S F)

GREIZ, a town of Germany in the republic of Thuringia, on the right bank of the White Elster, near the borders of Saxony, and 66 m. by rail south from Leipzig. Pop. (1925) 37,094. Greiz (formerly *Grewcz*) is apparently a town of Slav origin. From the 12th century it was governed by *advocati* (*Vögte*), but in 1236 it came into the possession of Gera, and in 1550 of the younger line of the house of Plauen. It was ravaged by fire in 1494 and in 1802 The old town is on the right bank and the new town on the left bank of the river. The principal buildings are the old château on a rocky hill overlooking the town, and the old town church dating from 1225 The industries include dyeing and the manufacture of machinery, woollen goods (for which it is famous), shawls and paper.

GRENADA, the southernmost of the Windward Islands, British West Indies. It lies between 11° 58′ and 12° 15′ N and between 61° 35′ and 61° 50′ W, being 140 m. S W of Barbados and 85 m N. by W. of Trinidad. In shape oval, it is 21 m long, 12 m broad at its maximum and has an area of 133 sq m. It owes much of its beauty to a well-wooded range of mountains traversing the island from N. to S. and throwing off from the centre spurs which form picturesque and fertile valleys The highest point is Mount Catharine (2,750 ft.). Lower ground in the south-east and north-west is devoted to cultivation and cattle raising The island is of volcanic origin with raised limestone beaches in the extreme north Red and grey sandstones, hornblende and argillaceous schist are found in the mountains, porphyry and basaltic rocks also occur, sulphur and fuller's earth are worked. In the centre, at the height of 1,740 ft above the sea, is the Grand Etang, a circular lake, 13 acres in extent, occupying the site of an ancient crater Near it is a large sanatorium. In the north-east is a larger lake, Lake Antoine, also occupying a crater, almost at the sea level. The island is watered by several short rivers, mainly on the east and south, there are numerous fresh water springs, as well as hot chalybeate and sulphurous springs. The south-eastern coast is much indented with bays The climate is good, the temperature equable and epidemic diseases are rare In the low country the average yearly temperature is 82° F, but it is cooler in the heights The rainfall is very heavy, in some parts 200 in a year The rainy season lasts from May to December, but refreshing showers frequently occur during other parts of the year. The average annual rainfall at St. George is 79·07 in , and at Grand Etang 164 in Excellent climate and good sea-bathing have made Grenada a health resort. Good roads and byeways intersect it in every direction The soil is extraordinarily fertile, producing cocoa and spices, especially nutmegs. The staple exports, sent chiefly to Great Britain, are cocoa, nutmegs and mace and cotton Barbados gets most of its firewood from Grenada Sugar is still grown, and rum and molasses are made for local consumption

Elementary education is chiefly in the hands of the various denominations with government grants-in-aid There are, however, a few government secular schools and government-aided secondary schools for girls and a grammar school for boys The board of education is nominated by the government, and small fees are charged in all schools. The governor of the Windward Islands resides in Grenada and is administrator of it The legislative council has 7 *ex-officio* members, including the governor, and 7 crown nominees English is universally spoken, but the negroes use a French *patois*, which, however, is gradually dying out Only 2% of the inhabitants are white, the rest being negroes and mulattoes with a few East Indians The capital, St George, in the south-west, is built upon a lava peninsula jutting into the sea and forming one side of its land-locked harbour. It is surrounded by an amphitheatre of hills, up the sides of which climb the red-brick houses of the town At the extremity of the peninsula is Fort St George, with a saluting battery. The ridge connecting Fort St. George with Hospital Hill is tunnelled to give access to the two parts of the town lying on either side The population in 1921 was 4,629 There are four other towns—on the west coast Gouyave, or Charlotte Town, and 4 m. N. of it Victoria; on the north coast Sauteurs, and Grenville at the head of a wide bay on the east They are all in frequent communication

with the capital by steamer. The population of the entire colony in 1921 was 66,302

History.—Grenada was discovered in 1498 by Columbus, who named it Conception. Neither the Spanish nor the British, to whom it was granted in 1627, settled on the island The governor of Martinique, du Parquet, purchased it in 1650, and the French were well received by the Caribs, whom they afterwards exterminated with great cruelty. In 1665 Grenada passed into the hands of the French West India Company, and was administered by it until its dissolution in 1674, when the island passed to the French Crown Cocoa, coffee and cotton were introduced in 1714 During the wars between Great Britain and France, Grenada capitulated to the British forces in 1762, and was formally ceded next year by the Treaty of Paris. The French, under Count d'Estaing, recaptured the island in 1779, but it was restored to Great Britain by the Treaty of Versailles in 1783 A rebellion against the British rule, instigated and assisted by the French, occurred in 1795, but was quelled by Sir Ralph Abercromby in the following year. The emancipation of the slaves took place in 1837, and by 1877 it was deemed necessary to introduce East Indian labour Grenada, with cocoa as its staple, grown principally by peasant landholders, did not experience similar depression to that which overtook the sugar-growing islands of the West Indies

See *Grenada Handbook.*

GRENADES, from the French word for a pomegranate, because of a resemblance in shape to the fruit. A grenade is a small metal missile, usually filled with high explosive, which may be thrown by hand or projected with the aid of a rifle Grenades may also be charged with poison gas and incendiary or smoke-producing compositions, but the essential features of the various kinds remain the same Gunpowder grenades, made of wood, bronze and other materials, were used in the 16th century, but the term was also used to imply an explosive shell fired from a gun, this has survived to modern times in the German *Granate* Hand missiles were employed after about 1660, by special troops called "grenadiers" (*q v*), and were in common use during the wars of the 17th and 18th centuries They became obsolete in the 19th century but were revived later in a high explosive form at the siege of Port Arthur in 1904 and in the trench fighting of the World War Grenades are described as percussion or time

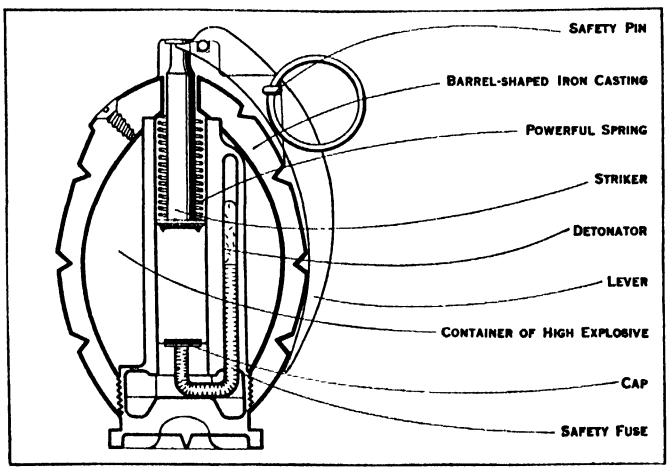

FIG. 1.—SECTION OF MILLS GRENADE AS USED BY BRITISH TROOPS IN THE WORLD WAR THIS TYPE WAS PARTICULARLY SAFE TO HANDLE, THE 5-SECOND SAFETY FUSE GIVING TIME TO TAKE COVER IN CASE OF ACCIDENTAL DROPPING

grenades, according as to whether they explode on impact or after a definite time interval

Hand Grenades.—At the commencement of the World War, the limited supply of grenades in the British army was of the percussion type, in which a needle in the head of the grenade is by direct impact caused to fire the detonator, a head-on fall being ensured by means of tail streamers At a later date, an all-ways fuse was suggested which would fire the grenade in whatever position it alighted The main disadvantage of the percussion type is the danger of it exploding if accidentally dropped after being made "live" prior to throwing by the withdrawal of the safety pin or other safety device. These considerations led to the adoption of time grenades as being safer in action and allowing time in case of accident for the bomber to get clear or throw away the grenade Furthermore, time grenades are more easily improvised than percussion ones, and during the period of severe shortage of munitions in the World War, many such grenades were constructed locally out of any handy receptacle For this purpose a short projecting length (usually 5sec) of safety fuse terminating in a detonator (for high explosive fillings) within the grenade was employed Various friction or strike and cap combinations were used to ignite the fuse before throwing

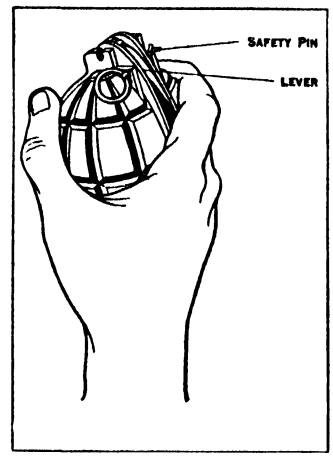

FIG 2.—THE CORRECT METHOD OF HOLDING A MILLS GRENADE
When the safety pin has been withdrawn, pressure of the forefinger holds lever to grenade until released in throwing

The principle of the time grenade is represented in its greatest perfection in the Mills grenade (*see* fig 1), invented during the war, of which enormous quantities were supplied to the British forces It consists of a barrel-shaped iron casting, externally grooved in segments to ensure good fragmentation, and of a size to be conveniently clasped in the hand, weighing 1 lb 8 oz and containing 2½ to 3 oz of high explosive, amatol or ammonal in powder form is convenient The essential principle is that the ignition of the time arrangement (the safety fuse) is caused mechanically, as soon as the grenade is thrown This is effected by the release of a striker actuated by a powerful spring which until then is restrained by a lever On withdrawing the safety pin, this lever is still held to the grenade by the thrower's fingers (*see* fig 2), but on the grenade leaving his hand, the loose lever flies off and a cap is struck which ignites the 5sec length of safety fuse, which in turn fires the detonator and explodes the grenade

Rifle Grenades.—Previous to the World War rifle grenades had been designed in order to obtain an increase of range beyond the restricted limits of hand throwing These grenades were of the percussion type with a steel tail rod, which was inserted about 10in into the muzzle of the ordinary service rifle and propelled by the gases from a blank cartridge, which impinges on the tail rod The rodded rifle grenade, however, was not only unhandy, but tended to cause damage to the rifle This led to the introduction by the French of the discharger-cup or *tromblon*, a short cylindrical cup attached to the muzzle of the rifle The grenade is placed in this cup and propelled from it by the gases from a blank cartridge fired in the rifle, acting on the base of the grenade The Mills grenade can be adapted for firing from a discharger-cup by the addition of a gas check plate, which is screwed into the base, the side of the discharger-cup holds the loose lever in position until the grenade is projected clear, when it flies off and sets the grenade in action In this way rifle and hand grenades can be made practically interchangeable, thus simplifying both supply and transport in the field

Future Design.—The tendency of future design is in the direction of percussion grenades, which are considered to be more effective than time ones, chiefly in that no time is given in which to get clear or to throw back the grenade before it explodes, in the event of the time fuse being too long in its burning The chief difficulty to surmount is so to design the grenade that it is safe if dropped vertically by accident, but is made "live" in the space of a short flight Other essential conditions are to act in any position of impact or fall after throwing, to be interchangeable with trifling adjustment as a hand or rifle grenade, to be weatherproof and mudproof and to be simple in manufacture and use

BIBLIOGRAPHY.—G M Ainslie, *Hand Grenades* (1917), G Dyson, *Grenade Fighting* (New York, 1917) *See* also the official *Text Book on Service Ammunition*

GRENADIER, originally a soldier whose special duty it was to throw hand-grenades. The latter were in use for a considerable time before any special organization was given to the troops who were to use them.

The grenadier companies were formed always of the most powerful men in the regiment and, when the grenade ceased to be used, they maintained their existence as the "crack" companies of their battalions, taking the right of the line on parade and wearing the distinctive grenadier headdress This system was almost universal, and the typical infantry regiment of the 18th and early 19th century had a grenadier and a light company besides its "line" companies In the British and other armies these *élite* companies were frequently taken from their regiments and combined in grenadier and light infantry battalions for special service, and Napoleon carried this practice still further in the French army by organizing brigades and divisions of grenadiers (and correspondingly of *voltigeurs*) Indeed the companies thus detached from the line practically never returned to it, and this was attended with serious evils, for the battalion at the outbreak of war lost perhaps a quarter of its best men, the average men only remaining with the line. This special organization of grenadiers and light companies lasted in the British army until about 1858. In the Prussian service the grenadiers became permanent and independent battalions about 1740, and the gradual adoption of the four-company battalion by Prussia and other nations tended still further to place the grenadiers by themselves and apart from the line Thus in various continental armies the title of "grenadiers" is borne by line regiments, indistinguishable, except for details of uniform and as a *corps d'élite*, from the rest. In the British Army the title survives in the Grenadier Guards. (*See* GUARDS) The title "grenadier" was, however, revived in its original sense during the World War, when every infantry battalion had sub-units composed of men trained in and primarily used for throwing or firing grenades

GRENADINES, a chain of islets (about 600) in the Windward Islands, West Indies They stretch for 60 m. from N.E. to S W between St Vincent and Grenada Some are a few square miles in extent, others are merely rocky hummocks For purposes of administration they are divided between St Vincent and Grenada Bequia, the chief island in the St Vincent group, is long and narrow Area 6 sq m Owing to lack of water it is only slightly cultivated, but game is plentiful Admiralty bay, on the west side, is a safe and commodious harbour Carriacou, attached to Grenada, is the largest of the group, 7 m long, 2 m wide and 13 sq m. in extent A ridge of hills, rising to an altitude of 700 ft , runs from N E to S W There are two good harbours on the west coast, Hillsborough bay on which stands Hillsborough, the chief town, and Tyrell bay, farther south The island is thickly populated, the negro peasantry occupying small lots and working on the *métayage* system (*q v*). Cotton and cattle are the chief exports. Pop of the group, mostly on Carriacou, about 7,000

GRENCHEN (1,606 ft) a town in the canton of Solothurn, Switzerland, at the south foot of the Jura Pop 10,400, the majority German-speaking Protestants It is a centre of the watch-making industry, and stands on the Solothurn-Biel and Moutier-Biel railways

GRENFELL, GEORGE (1849–1906), English Baptist missionary and explorer of the Congo, was born at Sancreed, near Penzance, on Aug 21, 1849, and educated at Birmingham After some years in a business firm, Grenfell entered the Baptist college, Bristol (1873), and in 1874 was sent by the Baptist missionary society to the Cameroons, with Alfred Saker, where for some years he explored the rivers inland In Jan 1878 he joined the Rev T J Comber in exploring the Lower Congo In 1884 he made an independent survey of the Congo up to the Equator, at a point 18° long E From 1884 to 1887 he made five further voyages in a river steamer, built under his own supervision, and the results of his journeys were published by the Royal Geographical Society (1886), from whom he received the founder's medal In 1891 he acted as Belgian plenipotentiary in the Portuguese negotiations for the settlement of the frontier of the Lunda. In 1900 he began to explore the Aruwimi river, and by Nov 1902 had reached Mawambi. He was responsible in 1903 for a commission of enquiry sent by King Leopold to enquire into the Belgian methods of administration, which Grenfell had begun to distrust, but their report was unsatisfactory. Grenfell died at Basoko on July 1, 1906.

See W. H Bentley, *Life on the Congo* (introd by G. Grenfell, 1887); H. H Johnston, *George Grenfell and the Congo,* 2 vols. (1908), G. Hawker, *Life of George Grenfell* (1909); S. J. Dickins, *Grenfell of the Congo* (1910).

GRENFELL, JULIAN HENRY FRANCIS (1888–1915), British soldier and poet, was born in London on March 30, 1888 In 1910 he joined the 1st (Royal) Dragoons and in 1911 was transferred to S. Africa with his regiment. He fought with great courage and distinction in the World War, and died in hospital in Boulogne of a head wound, on May 13, 1915.

Except for his poem "Into Battle," which appeared in the *Times* on the day of the announcement of his death, and which is considered to rank among the finest modern war poems, his poetry is the embodiment of a zest for life and a love of nature. His poems include "To a Black Greyhound," "Hymn to the Fighting Boar," and "The Hills," reprinted in several anthologies.

GRENFELL, SIR WILFRED THOMASON, K.C.M G., M D (1865–), British medical missionary, was born on Feb 28, 1865 at Parkgate, Cheshire He was educated at Marlborough and Oxford, where he took the degree of M D , and studied medicine at the London Hospital under Sir Frederick Treves. At his suggestion Grenfell, in 1889, joined the Royal National Mission for Deep Sea Fishermen and for three years cruised with it in the North Sea as medical missionary In 1892 he went to Labrador as first medical missionary and there did great work, building hospitals, establishing homes and missions for the inhabitants, and organizing industrial schemes Besides the work he did locally in Labrador and northern Newfoundland, culminating in the opening by King George of the Seamen's institute at St. John's in 1912, Grenfell lectured in Canada, America and England in order to raise funds, and the mission expanded rapidly until, in 1912, its English, American and Canadian branches were united by the formation in New York of the International Grenfell Association, of which Grenfell became superintendent. During the early part of the World War he was attached as major to the Harvard Surgical Unit in France He was a K C M G in 1927

Grenfell's publications include *Vikings of Today* (1895), *The Harvest of the Sea* (1905), *Labrador: the Country and its People* (1909, re-issued 1913 and 1922 with additional chapters), *Adrift on an Ice-Pan* (1910), *A Labrador Doctor* (1920, abridged 1925), *Northern Neighbours* (1923), *Religion in Everyday Life* (1926)

See B J Mathews, *Wilfred Grenfell, the Master Mariner* (1924) and F L. Waldo, *Grenfell Knight-Errant of the North* (Phila , 1924).

GRENOBLE, the ancient capital of the Dauphiné in south-east France, and of the Isère department, 75 m by rail from Lyons Pop (1926) 78,652. It is one of the most strongly fortified cities in Europe Built at a height of 702 ft the greater part of the town rises on the left bank of the Isère The newer part has wide thoroughfares and modern buildings The original town (of but small extent) was built on the right bank of the Isère at the southern foot of the Mont Rachais, which is now covered by a succession of fortresses 885 ft above the town

Grenoble is the seat of a bishopric, founded in the 4th century. It was formerly a suffragan of Vienne and is now in the ecclesiastical province of Lyons The most remarkable building is the late 15th century Palais de Justice, on the site of the old palace of the Parlement of the Dauphiné. Opposite is the church of St. André (13th century), formerly the chapel of the dauphins of the Viennois The cathedral church of Notre Dame is a building, dating in part from the 11th century The church of St Laurent is the oldest in the city (11th century) and has a crypt dating from Merovingian times The town library has a rich collection of mss (7,000) and printed books (250,000 vols) which in great part belonged till 1793 to the monastery of the Grande Chartreuse. There is a natural history museum which contains numerous geological specimens from the districts of the Dauphiné and Savoy. The university and a hospital founded

in the 15th century are notable institutions.

The staple industry is the manufacture of kid gloves, most of the so-called *gants Jouvin* being made here There are about 80 glove factories. Other articles produced are artificial cements, liqueurs, linen goods, copper goods, paper peltry, leather goods, oriental goods, straw hats and carved furniture.

Grenoble occupies the site of Cularo, a village of the Allobroges, fortified by Diocletian and Maximian at the end of the 3rd century. Its present name is a corruption of Gratianopolis, in honour of Gratian (4th century). After passing under the power of the Burgundians (*c* 440) and the Franks (532) it became part of the kingdom of Provence (879–1032). On the break-up of that kingdom a long struggle for supremacy ensued between the bishops of the city and the counts of Albon, the latter winning in the 12th century, taking the title of Dauphins of the Viennois in the 13th century. In 1349 Grenoble was ceded with the rest of the Dauphiné to France, but retained its municipal privileges. In 1562 it was sacked by the Protestants, but in 1572 the firmness of its governor saved it from a repetition of the Massacre of St. Bartholomew. In 1590 Lesdiguières (1543–1626) took the town in the name of Henry IV. and constructed its fortifications, quays, etc. In 1788 the attempt of the king to weaken the power of the parlement of Grenoble roused the people to arms, and the "day of the tiles" (June 7, 1788) is memorable for the defeat of the royal forces. In 1790, on the formation of the department of the Isère, Grenoble became its capital. Grenoble was formerly much subject to floods, especially from the Drac. One of the worst took place in 1219, while that of 1778 was known as the *déluge de la Saint Crépin.*

GRENVILLE, SIR BEVIL (1596–1643), Royalist soldier in the English Civil War (*see* GREAT REBELLION), was educated at Exeter college, Oxford As member of Parliament, first for Cornwall, then for Launceston, Grenville supported Sir John Eliot and the opposition, and his intimacy with Eliot was lifelong In 1639, however, he appears as a royalist going to the Scottish War in the train of Charles I. The reasons of this change of front are unknown, but Grenville's honour was above suspicion, and he must have entirely convinced himself that he was doing right At any rate he was a very valuable recruit to the royalist cause, being "the most generally loved man in Cornwall." Under the command of Sir Ralph Hopton, Sir Bevil fought at Bradock Down, and at Stratton (May 16, 1643), where the earl of Stamford was routed by the Cornishmen, he led one of the storming parties which captured Chudleigh's lines (*Clarendon,* vii 89). Grenville was killed at the head of the Cornish infantry as it reached the top of the hill on July 5, 1643, at Lansdowne, near Bath, where a monument to him has been erected.

See Lloyd, *Memoirs of Excellent Personages* (1668); S. R. Gardiner, *History of the English Civil War* (vol. i *passim*).

GRENVILLE, GEORGE (1712–70), English statesman, second son of Richard Grenville and Hester Temple, afterwards Countess Temple, was born on Oct 14, 1712, educated at Eton and at Christ Church, Oxford, and called to the bar in 1735 He entered parliament in 1741 as member for Buckingham, and continued to represent that borough till his death In December 1744 he became a lord of the admiralty in the Pelham administration He allied himself with his brother Richard and with William Pitt in forcing their chief to give them promotion by obstructing business In June 1747 he became a lord of the treasury, and in 1754 treasurer of the navy and privy councillor As treasurer of the navy in 1758 he introduced and carried a bill which established an improved system of paying the wages of seamen He remained in office in 1761, when his brother Lord Temple and his brother-in-law Pitt resigned upon the question of the war with Spain, and was leader of the House of Commons under the Bute administration In May 1762 he was appointed secretary of state, and in October first lord of the admiralty; and in April 1763 he became first lord of the treasury and chancellor of the exchequer His administration saw the prosecution of Wilkes and the passing of the American Stamp act, which led to the first symptoms of alienation between America and the mother country. Grenville was disliked by George III, and when the marquis of Rockingham was induced to form a ministry in July 1765, he was dismissed. He never again held office, and died on Nov 13, 1770.

BIBLIOGRAPHY.—*The Grenville Papers, being the Correspondence of Richard Grenville, Earl Temple, K G, and the Right Hon. George Grenville, their Friends and Contemporaries,* were published at London in 1852, and afford the chief authority for his life But *see* also H Walpole's *Memoirs of the Reign of George II* (1845), Lord Stanhope's *History of England* (1858); Lecky's *History of England* (1885); and E D. Adams, *The Influence of Grenville on Pitt's Foreign Policy* (Washington, 1904).

GRENVILLE or **GREYNVILE, SIR RICHARD** (*c.* 1541–1591), British naval commander, was born of an old Cornish family about 1541 His grandfather, Sir Richard, had been marshal of Calais in the time of Henry VIII, and his father commanded and was lost in the "Mary Rose" in 1545 In 1585 he commanded for his cousin, Sir Walter Raleigh, the fleet of seven vessels carrying colonists to Roanoke island in the present North Carolina, and captured a Spanish vessel on his way back. In 1586 he carried provisions to Roanoke, and, finding the colony deserted, left a few men to maintain possession During the two years before the Armada (1588) he was engaged in organizing the defence of western England In 1591, Lord Thomas Howard was sent to intercept the homeward-bound treasure-fleet of Spain, with Grenville as second in command on board the "Revenge," a ship of 500 tons which had been commanded by Drake against the Armada in 1588 At the end of August, Howard with 16 ships lay at anchor to the north of Flores in the Azores On the 31st he received news from a pinnace, sent by the earl of Cumberland, who was then off the Portugal coast, that a Spanish fleet of 53 vessels was then bearing up to the Azores to meet the treasure-ships Being hopelessly outmatched, Howard gave orders to weigh anchor and stand out to sea But, by some misunderstanding, the "Revenge" was delayed, and cut off from her consorts by the Spaniards Grenville resolved to try to break through the middle of the Spanish line His ship was becalmed under the lee of a huge galleon, and after a hand-to-hand fight lasting through fifteen hours against fifteen Spanish ships and a force of five thousand men, the "Revenge" with her hundred and fifty men was captured Grenville himself was carried on board the Spanish flag-ship "San Pablo," and died a few days later His exploit is commemorated in Tennyson's ballad of "The Revenge"

GRENVILLE (or GRANVILLE), SIR RICHARD, BART, cr. 1630 (1600–1658), English Royalist, grandson of the famous seaman of the same name, entered the army, and served under Buckingham at Cadiz and in the La Rochelle expedition. He was ruined by lawsuits with his wife and her relations, and imprisoned He escaped to Germany, returning to England to join the king's army against the Scots in 1633 From 1641 to 1643 he served in Ireland, but on his return to England was re-arrested and forced to join the Parliamentary army But he joined Charles at Oxford and served in the west of England Many charges of abuse of power, misappropriation of war funds and insubordination (especially to Goring and Hopton) were made against him, and in Jan 1646 he was arrested He then went to Holland, and was with Charles II in exile until he had to leave the court after bringing accusations against Edward Hyde, afterwards earl of Clarendon He died in 1658 and was buried at Ghent

Grenville wrote a partisan account of affairs in the west of England —printed in T. Carte's *Original Letters* (1739)—to which Clarendon drew up an answer, the bulk being afterwards incorporated in his *History* In 1654 Grenville wrote his *Single Defence against all Aspersions of all Malignant Persons* This is printed in the *Works* of George Granville, Lord Lansdowne (1736), where Lansdowne's *Vindication* of his kinsman, Sir Richard, against Clarendon's charges is also found *See* also Clarendon, *History of the Rebellion,* edit by W D. Macray (Oxford, 1888), and R. Granville, *The King's General in the West* (1908).

GRENVILLE, THOMAS (1755–1846), English bibliophile, was born on Dec 31, 1755. He was, with one interval, a member of parliament from 1780 to 1818, and for a few months during 1806 and 1807 president of the board of control and first lord of the admiralty He is more famous as a book-collector than

as a statesman; he bequeathed his large and valuable library to the British Museum, where it is still preserved under his name

He died in London on Dec 17, 1846

A catalogue of the Grenville library was published by H. J. Payne and H. Foss, *Bibliotheca Grenvilliana* (3 vols., 1842–48).

GRENVILLE, WILLIAM WYNDHAM GRENVILLE, BARON (1759–1834), English statesman, youngest son of George Grenville, was born on Oct. 25, 1759, and educated at Eton and Christ Church, Oxford In Feb 1782 Grenville was elected member for the borough of Buckingham, and in the following September he became secretary to his brother, Earl Temple, lord lieutenant of Ireland He left office in June 1783, but in December he became paymaster-general of the forces under William Pitt, and in 1786 vice-president of the committee of trade In 1787 he was sent on a mission to The Hague and Versailles with reference to the affairs of Holland In Jan 1789 he was chosen speaker of the House of Commons, but vacated the chair in the same year on being appointed secretary of State for the home department, about the same time he resigned his other offices, but he became president of the board of control, and in November 1790 was created a peer as Baron Grenville In 1791 he was transferred to the foreign office, retaining his post at the board of control until 1793 Although his ability was appreciated by Pitt, the two often differed on important matters In Feb 1801 he resigned office with Pitt because George III would not consent to the introduction of any measure of Roman Catholic relief, and in opposition he gradually separated himself from his former leader When Pitt returned to power in 1804 Grenville refused to join the ministry unless his political ally, Fox, was also admitted thereto; this was impossible and he remained out of office until Feb 1806, when, after Pitt's death, he became the nominal head of a coalition Government Though unfortunate in its conduct of foreign affairs, this ministry deserves to be remembered for its passage of the act abolishing the slave trade (1807). Its influence, however, was weakened by the death of Fox, and in consequence of a minute drawn up by Grenville and some of his colleagues the king demanded from his ministers an assurance that in future they would not urge upon him any measures for the relief of Roman Catholics They refused to give this assurance and in March 1807 they resigned

Lord Grenville never held office again, although requested to do so on several occasions He continued to take part in public life, supported Roman Catholic emancipation, and, during the remaining years of his active political career, which ended in 1823, he generally voted with the Whigs He died on Jan 12, 1834

See the *Dropmore MSS* for Grenville's correspondence, and the report on this publication by the Historical Manuscripts Commission

GRENZMARK (Grenzmark Posen-West Preussen), province of the republic of Prussia, composed of what remains to Germany of the former provinces of Posen and West Prussia It consists of two separate parts lying along the Polish frontier, one north of the Netze and the other mainly south of the Warthe The area of the northern is 2,232 sq miles (pop 1925, 247,427), and of the southern 759 sq miles (pop, 1925, 89,492), their density per square mile being respectively 110 8 and 117 9 They are bounded on the west by Pomerania, Brandenburg (which separates them) and Silesia The province is a low plateau, highest in the north, covered with glacial and related deposits, and dotted with small lakes The temperature ranges annually from a January average of 30° F to a July average of 64° F, while the average annual rainfall is about 20 inches The province is agricultural and pastoral, the chief crops being cereals and potatoes, and the industries are brewing and the manufacture of agricultural machinery and starch A little tobacco is grown and manufactured, while there is some trade in timber and leather

GRESHAM, SIR THOMAS (1519–1579), London merchant, the founder of the Royal Exchange, was descended from an old Norfolk family, and was the son of Sir Richard Gresham, a London merchant knighted by Henry VIII He went to Caius college, Cambridge, and was apprenticed for eight years to his uncle, Sir John Gresham In 1543 he was admitted a member of the Mercers' Company, and went to the Low Countries, where he lived for some years, carrying on business and acting as an agent for Henry VIII. In 1551 owing to the mismanagement of Sir William Dansell, "king's merchant," Gresham was called in to advise the English Government. He was allowed to apply his own methods, many of them quite arbitrary and unfair, for raising the value of the pound sterling on the "bourse" of Antwerp, and in a few years nearly all Edward VI 's debts were discharged Except for a short period during Mary's reign, he remained financial agent of the crown until he was obliged to leave Antwerp on March 19, 1567, on the outbreak of the war in the Low Countries He was at the time on embassy to the duchess of Parma at Brussels. He continued his business as merchant and financial agent of the Government, though living in London Elizabeth kept Lady Mary Grey a prisoner in his house from June 1569 to the end of 1572

In 1565 Gresham proposed to the court of aldermen of London to build at his own expense a bourse of exchange, if they would purchase a suitable piece of ground He reimbursed himself by letting out the upper part of the building as shops He died on Nov 21, 1579 The bulk of his property was bequeathed to his widow with the stipulation that after her decease his residence in Bishopsgate street, and the rents accruing from the Royal Exchange should be vested in the hands of the corporation of London and the Mercers' Company for the purpose of instituting a college in which seven professors should lecture on astronomy, geometry, physic, law, divinity, rhetoric and music The lectures were given in the original building from 1597 until 1768 when it was converted into an excise office The Royal Exchange was then used for them until the present building was erected in 1843

A notice of Gresham is contained in Fuller's *Worthies* and Ward's *Gresham Professors;* but the fullest account of him, as well as of the history of the Exchange and Gresham College is that by J M Burgon in his *Life and Times of Sir Thomas Gresham* (2 vols, 1839) *See* also a *Brief Memoir of Sir Thomas Gresham* (1833); *The Life of Sir Thomas Gresham, Founder of the Royal Exchange* (1845), and F R Salter, *Sir Thomas Gresham, 1518–1579* (1925).

GRESHAM, WALTER QUINTON (1832–1895), American statesman and jurist, was born near Lanesville, Ind , on March 17, 1832 He spent two years in an academy at Corydon, Ind , and one year at the Indiana State university at Bloomington, then studied law, and in 1854 was admitted to the bar He was active as a campaign speaker for the republican ticket in 1856, and in 1860 was elected to the Indiana house of representatives In 1861 he became colonel of volunteer infantry, in 1862 he commanded a brigade, and in 1863 he was appointed brigadier-general of volunteers In 1864 he commanded a division in Sherman's Atlanta campaign, and before Atlanta, on July 20, he received a wound which forced him to retire from active service, and left him lame for life In 1865 he was breveted major-general of volunteers After the war he practised law at New Albany, Ind , and in 1869 was appointed by President Grant U S district judge for Indiana In April, 1883, he succeeded Timothy O Howe (1816–83) as postmaster-general in President Arthur's cabinet, taking an active part in the suppression of the Louisiana lottery, and in Sept 1884, succeeded Charles J Folger as secretary of the treasury In the following month he resigned to accept an appointment as U S circuit judge Gresham was a candidate for the republican presidential nomination in 1884 and 1888 Gradually, however, he grew out of sympathy with the republican leaders and policy, and in 1892 advocated the election of the democratic candidate, Grover Cleveland, for the presidency From March 7, 1893, until his death at Washington on May 28, 1895, he was secretary of State in President Cleveland's cabinet.

GRESHAM'S LAW, in economics, the name suggested in 1857 by H. D Macleod for the principle of currency which may be briefly summarized—"bad money drives out good." Macleod gave it this name, which has been universally adopted, under the impression that the principle was first explained by Sir Thomas Gresham in 1558. In reality it had been well set forth by earlier economic writers, notably Oresme and Copernicus. Macleod states the law in these terms: the worst form of currency in circulation regulates the value of the whole currency and drives all other forms of currency out of circulation. Gresham's law applies

where there is under-weight or debased coin in circulation with full-weight coin of the same metal; where there are two metals in circulation, and one is undervalued as compared with the other, and where inconvertible paper money is put into circulation side by side with a metallic currency. *See* further BIMETALLISM; MONEY.

GRESSET, JEAN BAPTISTE LOUIS (1709–1777), French poet and dramatist, was born at Amiens His poem *Vert Vert* (1734) is his main title to fame, though in his later years he regretted the frivolity which enabled him to produce this delightful work. Gresset, who had taken novice's orders in the Society of Jesus at 16, found himself famous He left Rouen, went up to Paris, where he found refuge in the same garret which had sheltered him when a boy at the Collège Louis le Grand, and there wrote *La Chartreuse* (1734), *Carême impromptu,* and *Lutrin vivant* (1735). Complaints were made to the Jesuit fathers of the alleged licentiousness of his verses, the real cause of complaint being the ridicule which *Vert Vert* seemed to throw upon the whole race of nuns and the anti-clerical tendency of the other poems Gresset was expelled the order He wrote for the theatre *Edouard III,* a tragedy (1740); *Sidnei* (1745), a comedy; and *Le Méchant* (1747), esteemed by Brunetière the best verse comedy of the French 18th century theatre, not excepting even the *Métromane* of Alexis Piron Gresset was admitted to the Academy in 1748. Then, still young, he retired to Amiens, where his relapse from the discipline of the church became the subject of the deepest remorse He died at Amiens on June 16, 1777

The best edition of his poems is A A. Rénouard's (1811) *See* Jules Wogue, *J B L Gresset* (1894)

GRETCHANINOV, ALEXANDER TIKHONOVICH (1864–), Russian composer, was born in Moscow on Oct 26, 1864 He was first a pupil of Safonov at Moscow conservatorium and afterwards entered Petersburg conservatorium, where he studied theory and composition under Rimsky-Korsakov He is known principally as a composer of songs but has also written two operas, *Dobrinya Nikitich* and *Sister Beatrice;* incidental music to plays, a string quartet and an unpublished symphony His opera *Sister Beatrice* gave offence by its representation of the Virgin and had to be withdrawn His vocal music includes: Songs, opp 1, 5, 7, 15, 20, "musical picture" for bass solo, chorus and orch.; and 12 choruses, opp 4, 10, 11, 12, 16

GRETNA, a city of south-eastern Louisiana, U S A , on the Mississippi river, opposite New Orleans; the capital of Jefferson parish It is served by the Missouri Pacific, the Southern Pacific, and the Texas and Pacific railways, and by the industrial belt line which makes connections between all the roads entering New Orleans The population was 7,197 in 1920 (27% negro) and was estimated locally at 15,000 in 1928 There are large oil refineries and other industrial plants The city was incorporated in 1913

GRETNA GREEN, village and parish, southeast Dumfriesshire, Scotland, about 8 m E of Annan, 9 m N N W of Carlisle, and ¾ m from the river Sark, here the dividing-line between England and Scotland, with a station on the L M S R The L N E R has a station at Gretna on the English side of the Border Up till 1754, when Lord Hardwicke's act abolishing clandestine marriages came into force, the ceremony had commonly been performed in the Fleet prison in London After that date runaway couples were compelled to seek the hospitality of Scotland where it sufficed for them to declare their wish to marry in the presence of witnesses At Gretna Green, the Scottish border-village, the ceremony was usually performed by the blacksmith, but the tollkeeper, ferryman or in fact any person might officiate, and the toll-house, the inn, or, after 1826, Gretna hall was the scene of many such weddings As many as 200 couples were married at the toll-house in a year The traffic was practically ended in 1856, when the law required one of the contracting parties to reside in Scotland three weeks previous to the event

During the World War a temporary manufacturing township for the provision of cordite was created on a tract of land some 10 m long and from 1 to 2 m wide, with Gretna Green in its centre. The buildings fell largely into two groups, one at Dornoch to the W , and one, about 7 m E , at Mossband and Longtown. The whole undertaking cost over £9,000,000, and employed at one time 24,700 persons It was sold in 1924, although Labour members of Parliament made efforts to secure its use as a national peace-time factory

GRÉTRY, ANDRÉ ERNEST MODESTE (1741–1813), Belgian operatic composer, was born at Liége on Feb 8, 1741, his father being a poor musician He was a choir boy at the church of St Denis In 1753 he became a pupil of Leclerc and later of Renekin and Moreau But of greater importance was the practical tuition he received by attending the performance of an Italian opera company Here he heard the operas of Galuppi, Pergolesi and other masters, and determined to complete his own studies in Italy He spent five years at the Collège de Liége at Rome, where he worked under Casali He made his first success in *La Vendemmiatrice,* an Italian intermezzo or operetta, composed for the Alberti theatre in Rome Study of the score of one of Monsigny's operas, decided Grétry to devote himself to French comic opera and he returned to Paris with this intention, though at first he had a hard struggle Then he had the good luck to obtain a libretto (*Le Huron*), from Marmontel, which he set to music in less than six weeks, the performance of the work in August 1768 met with unparalleled success Two other operas, *Lucile* and *Le Tableau parlant,* soon followed, and thenceforth Grétry's position as the leading composer of comic opera was safely established Altogether he composed some fifty operas His masterpieces are *Zémire et Azor* (1771), *L'Amant jaloux* (1778), *L'Épreuve villageoise* (1784), and *Richard Coeur de Lion* (1784) In the last-named occurs the famous song, *O Richard, ô mon roi, l'univers t'abandonne,* which was sung at the banquet—"fatal as that of Thyestes," remarks Carlyle—given by the bodyguard to the officers of the Versailles garrison on October 3, 1789 Grétry was not uninfluenced by the great events he witnessed, but *La Rosière républicaine* and *La Fête de la raison* have none of the sincerity of *Richard Coeur de Lion* He died on Sept 24, 1813

See Michael Brenet, *Vie de Grétry* (Paris, 1884), Joach. le Breton, *Notice historique sur la vie et les ouvrages de Grétry* (Paris, 1814); A Grétry (his nephew), *Grétry en famille* (Paris, 1814), Felix van Hulst, *Grétry* (Liége, 1842), L D S, *Notice biographique sur Grétry* (Bruxelles, 1869). A full bibliography of Grétry's works is given in the art by L de la Laurencie in the *Encyclopédie de la Musique et Dictionnaire du Conservatoire. France XVIIe and XVIIIe Siècles* The works themselves, both musical and literary, have been published complete in a carefully prepared edition issued at the instance of the Belgian Government.

GREUZE, JEAN BAPTISTE (1725–1805), French painter, was born at Tournus, in Burgundy, on Aug 21, 1725, and is generally said to have formed his own talent, this is, however, true only in the most limited sense, for at an early age his inclinations, though thwarted by his father, were encouraged by a Lyonnese artist named Grandon, who enjoyed during his lifetime considerable reputation as a portrait-painter Grandon not only persuaded the father of Greuze to give way to his son's wishes, and permit the lad to accompany him as his pupil to Lyons, but, when at a later date he himself left Lyons for Paris he carried young Greuze with him Settled in Paris, Greuze worked from the living model in the school of the Royal Academy, but did not attract the attention of his teachers, and when he produced his first picture, "Le Père de famille expliquant la Bible à ses enfants," considerable doubt was felt and shown as to his share in its production By other and more remarkable works of the same class Greuze soon established his claims beyond contest, and won for himself the notice and support of the well-known connoisseur La Live de Jully, the brother-in-law of Madame d'Épinay In 1755 Greuze exhibited his "Aveugle trompé," upon which, presented by Pigalle the sculptor, he was immediately *agréé* by the Academy Towards the close of the same year he left France for Italy, probably in order to silence those who taxed him with ignorance of "great models of style," but the Italian subjects which formed the entirety of his contributions to the Salon of 1757 showed that he had been put on a false track, and he speedily returned to the source of his first inspiration In 1759, 1761 ("L'Accordée de village"—Louvre), and 1763 Greuze exhibited with ever-increasing success, in 1765

he reached the zenith of his powers and reputation. In that year he was represented by no fewer than 13 works, amongst which may be cited "La Jeune Fille qui pleure son oiseau mort," "La Bonne Mère," "Le Mauvais fils puni" (Louvre) and "La Malédiction paternelle" (Louvre). The Academy took occasion to press Greuze for his diploma picture, the execution of which had been long delayed, and forbade him to exhibit on their walls until he had complied with their regulations *"J'ai vu la lettre,"* says Diderot, *"qui est un modèle d'honnêteté et d'estime; j'ai vu la réponse de Greuze, qui est un modèle de vanité et d'impertinence: il fallait appuyer cela d'un chef d'oeuvre, et c'est ce que Greuze n'a pas fait"* Greuze wished to be received as a historical painter, and produced a work to vindicate his right to despise his qualifications as a *peintre de genre.* This unfortunate canvas—"Sevère et Caracalla" (Louvre)—was exhibited in 1769 side by side with Greuze's portrait of Jeaurat (Louvre) and his admirable "Petite Fille au chien noir." The Academicians received their new member with all due honours, but at the close of the ceremonies the director addressed Greuze in these words—*"Monsieur, l'Académie vous a reçu, mais c'est comme peintre de genre; elle a eu égard à vos anciennes productions, qui sont excellentes, et elle a fermé les yeux sur celle-ci, qui n'est digne ni d'elle ni de vous."* Greuze, greatly incensed, quarrelled with his *confrères,* and ceased to exhibit until, in 1804, the revolution had thrown open the doors of the Academy to all the world In the following year, on March 4, 1805, he died in the Louvre in great poverty.

The brilliant reputation which Greuze acquired seems to have been due to the nature of his subjects. He gave expression in art to that return to nature which inspired Rousseau's attacks upon an artificial civilization. The touch of melodramatic exaggeration in his work finds an apology in the firm and brilliant play of line, in the freshness and vigour of the flesh tints, in the enticing softness of expression (often obtained by almost an abuse of *méplats*), by the alluring air of health and youth, by the sensuous attractions, in short, with which Greuze invests his lessons of bourgeois morality. As Diderot said of "La Bonne Mère," *"ca prêche la population"* One of Greuze's pupils, Madame Le Doux, imitated with success the manner of her master, his daughter and granddaughter, Madame de Valori, also inherited some traditions of his talent. Madame de Valori published in 1813 a comédie-vaudeville, *Greuze, ou l'accordée de village,* to which she prefixed a notice of her grandfather's life and works, and the *Salons* of Diderot also contain, besides many other particulars, the story at full length of Greuze's quarrel with the Academy Four of the most distinguished engravers of that date, Massard père, Flipart, Gaillard and Levasseur, were specially entrusted by Greuze with the reproduction of his subjects, but there are also excellent prints by other engravers, notably by Cars and Le Bas

See also Normand, *J. B. Greuze* (1892), C Mauclair, *J B Greuze, sa vie, son oeuvre, son époque,* avec une introduction de Henri Mavell, Catal rais par Jean Martin (1906); A E. Macklin, *Greuze* (Masterpieces in colour, 1907).

GREVILLE, CHARLES CAVENDISH FULKE (1794–1865), English diarist, a great-grandson by his father of the 5th earl of Warwick, and son of Lady Charlotte Bentinck, daughter of the duke of Portland, formerly a leader of the Whig party, and first minister of the Crown, was born on April 2, 1794 Much of his childhood was spent at his grandfather's house at Bulstrode. He was one of the pages of George III, and was educated at Eton and at Christ Church, Oxford, but he left the university early, having been appointed private secretary to Earl Bathurst before he was 20. The interest of the duke of Portland had secured for him the secretaryship of the island of Jamaica, which was a sinecure office, the duties being performed by a deputy, and the reversion of the clerkship of the council Greville entered upon the discharge of the duties of clerk of the council in ordinary in 1821, and continued to perform them for nearly 40 years He therefore served under three successive sovereigns,—George IV., William IV. and Victoria,—and although no political or confidential functions are attached to that office, it is one which brings a man into habitual intercourse with the chiefs of all the parties in the State.

Greville took an occasional part in the transactions of his day, and was much consulted in the affairs of private life. Until 1855 when he sold his stud he was an active member of the turf, and he trained successively with Lord George Bentinck and with the duke of Portland His fame is entirely due to the posthumous publication of a portion of a Journal or Diary which it was his practice to keep during the greater part of his life. These papers were given by him to his friend Henry Reeve a short time before his death (Jan. 18, 1865), with an injunction that they should be published, as far as was feasible, at not too remote a period after the writer's death. The journals of the reigns of George IV. and William IV. (extending from 1820 to 1837) were accordingly so published in obedience to his directions about ten years after that event. Five large editions were sold in little more than a year, and the demand in America was as great as in England These journals were a faithful record of the impressions made on the mind of a competent observer, at the time, by the events he witnessed and the persons with whom he associated.

Greville records not so much public events as the private causes which led to them, and perhaps no English memoir-writer has left behind him a more valuable contribution to the history of the 19th century Greville published anonymously, in 1845, a volume on the *Past and Present Policy of England to Ireland,* in which he advocated the payment of the Roman Catholic clergy; and he was also the author of several pamphlets on the events of his day.

His brother, HENRY GREVILLE (1801–1872), attaché to the British embassy in Paris from 1834 to 1844, also kept a diary, of which part was published by Viscountess Enfield, *Leaves from the Diary of Henry Greville* (1883–84)

See the preface and notes to the *Greville Memoirs* by Henry Reeve The memoirs appeared in three sets—one from 1817 to 1837 (1875, 3 vols), and two for the period from 1837 to 1860, three volumes in 1885 and two in 1887 When the first series appeared in 1875 some passages caused extreme offence. The copies issued were as far as possible recalled and passages suppressed A new edition, containing some hitherto unpublished material from the ms. was prepared by P W. Wilson in 1927

GRÉVIN, JACQUES (*c.* 1539–1570), French dramatist, was born at Clermont and studied medicine at the University of Paris He became a disciple of Ronsard, and was one of the band of dramatists who sought to introduce the classical drama in France The comedies of Grévin show considerable affinity with the farces and *sotties* that preceded them His first play, *La Maubertine,* was lost, and formed the basis of a new comedy, *La Trésorière,* first performed at the college of Beauvais in 1558, though it had been originally composed at the desire of Henry II to celebrate the marriage of Claude, duchess of Lorraine In 1560 followed the tragedy of *Jules César,* imitated from the Latin of Muret, and a comedy, *Les Ebahis,* the most important but also the most indecent of his works Grévin became in 1561 physician and counsellor to Margaret of Savoy, and died at her court in Turin in 1570

The *Théâtre* of Jacques Grévin was printed in 1562, and in the *Ancien Théâtre français,* vol iv. (1855–56). *See* L Pinvert, *Jacques Grévin* (1899).

GRÉVY, FRANÇOIS PAUL JULES (1813–1891), French statesman, president of the republic, was born at Mont-sous-Vaudrey, Jura, on Aug 15, 1813 An advocate by profession, and a strong republican, he was deputy for Jura to the constituent assembly (1848) Foreseeing the election of Louis Bonaparte as president, he proposed to vest the executive power in the president of the council, elected and removable by the assembly, *i.e.*, the suppression of the office of president of the republic He was, consequently, excluded from public life until 1868, when he took a prominent place in the Republican Party Grévy was president of the national assembly (Feb 16, 1871, to April 2, 1873), president of the chamber of deputies (1876–79), and on the resignation of Marshal MacMahon, president of the republic (Jan 30, 1879) He was an excellent president, but, unfortunately, after accepting (Dec 18, 1885) a second term of office, a serious scandal arose by the exposure of the traffic in the decorations of the Legion of Honour carried on by his son-in-law, Daniel Wilson

Grévy was not directly implicated, and did not fully realize his situation. Resignation was forced on him (Dec. 2, 1887). He died at his native place on Sept. 9, 1891.

See his *Discours politiques et judiciaires* (2 vols., 1888), edit. L. Delabrousse. Also A Barbou, *Jules Grévy* (1879), and E Zevort, *La présidence de Jules Grévy* (1898).

GREW, NEHEMIAH (1641–1712), English plant anatomist and physiologist, son of Obadiah Grew (1607–1688), Nonconformist vicar of St Michael's, Coventry, was born in Warwickshire. He graduated at Cambridge in 1661, and took his M.D at Leyden in 1671. He then settled in London as a practitioner. In 1672 he published his *Anatomy of Vegetables Begun* and in 1673 his *Idea of a Phytological History* Four years later he became secretary of the Royal Society. In 1682 appeared his famous *Anatomy of Plants* with seven appended papers on chemistry. Grew died in London on March 25, 1712

See L. C Miall, *The Early Naturalists* (1912)

GREY, ALBERT HENRY GEORGE, 4TH EARL (1851–1917), British administrator, the son of General Charles Grey, Queen Victoria's private secretary, and grandson of the 2nd earl, the prime minister, was born on Nov 20, 1851; he was educated at Harrow and at Trinity college, Cambridge, where he graduated with a first class in law and history in 1873 As his uncle, the 3rd earl, had no children, Albert Grey was the heir-presumptive to the earldom He sat in parliament as a Liberal, first for South Northumberland, and then for the Tyneside Division, from 1880 to 1886 He was an enthusiastic social reformer, and a wholehearted imperialist He was one of the 93 dissentient Liberals who by voting against the Liberal Government decided the fate of the Home Rule bill of 1886 He lost his seat in the ensuing general election and did not reappear in parliament till he succeeded his uncle in the earldom in 1894. The interval had been largely filled with travel—chiefly along the by-ways of the British empire He was appointed in 1895, after the Jameson raid, administrator of Rhodesia in succession to Dr. Jameson There he became a close friend and ardent admirer of Cecil Rhodes, and on returning to England, he joined, in 1899, the board of the Chartered Company

He went as governor-general to Canada in 1904, and his term of office was twice prolonged, until Oct 1911 After his return to public life in England, he devoted himself to propaganda in favour of imperial federation and proportional representation He showed much interest in agriculture and endeavoured to assist licensing reform by the foundation of the Public House Trust He died at Howick, Northumberland, on Aug 29, 1917, leaving, by his wife Alice Holford, a son who succeeded him in the earldom

See Harold Beebie, *Albert, fourth Earl Grey, a last word* (1917).

GREY, CHARLES GREY, 2ND EARL (1764–1845), English statesman, eldest surviving son of General Sir Charles Grey, afterwards 1st Earl Grey, was born at Fallodon, near Alnwick, on March 13, 1764 General Grey (1729–1807), who was a younger son of the house of Grey of Howick, had already begun a career of active service which, like the political career of his son, covered nearly half a century At the peace of Amiens, he was rewarded with a peerage, as Baron Grey of Alnwick, being created in 1806 Earl Grey and Viscount Howick His elder brother, Sir Henry Grey of Howick, the head of the family, had supported the government in parliament

Young Grey was returned for Northumberland in 1786, and came forward as a vigorous assailant of the government of Pitt He was hailed by the opposition, and associated with Fox, Burke and Sheridan as a manager in the Hastings impeachment Grey became the trusted lieutenant of Fox, whom he was destined to succeed in the leadership of the party As time went on, some differences arose between the two men on the conduct of the war, but there was never any open breach, and their personal relations remained those of close friendship. Grey was a pioneer of parliamentary reform. He joined the "Society of Friends of the People" for promoting the reform of the franchise, he presented their petition to parliament, and in 1793 he moved the reference of this petition to a parliamentary committee Fox did nothing to discourage this activity, but he did not support it. At a later date Grey passed some rather bitter criticism on the "Society." But at the time he had no doubts on the opportuneness of the agitation. But Pitt suppressed the movement with a strong hand Grey moved the impeachment of Pitt, and he next promoted the equally foolish "Secession" Since the parliament did not properly represent the nation, and refused to reform itself or to impeach the minister, the opposition announced their intention of "seceding," or systematically absenting themselves from parliament. This movement was originated by Grey, Lauderdale and the duke of Bedford. Pitt easily defeated the secession manoeuvre, and Grey himself reappeared to protest against the Act of Union with Ireland, moved by his interest in Irish affairs

When Pitt died in 1806 the Broad-bottom ministry was formed under Fox, with Grey, now Lord Howick, as first lord of the Admiralty On Fox's death Grenville became premier, and Grey foreign secretary, and leader of the House of Commons When the cabinet proposed to concede a portion of the Catholic claims, George demanded of them an undertaking never to propose similar measures again This was refused, and the Grenville-Grey cabinet retired in March 1807 In the same year Grey's father died, and Grey went to the Upper House Opposition united Grey and Grenville for a time, but the parties finally split on foreign policy When Napoleon returned from Elba in 1815, Grenville followed the traditions of Pitt, and supported the ministry in at once renewing hostilities Grey followed those of Fox, and maintained the right of France to choose her own governors, and the impossibility of checking the reaction in the emperor's favour. Grenville and Grey gradually drifted apart Grey was in a small minority in opposing the suspension of the Habeas Corpus Act in 1817, and the part taken by Grey in opposing the bill for Queen Caroline's divorce, though it won for him the respect of the nation, sealed the exclusion of himself and his few friends from office during the king's life. When in 1827 Grey came forth to denounce the ministry of Canning, he declared that he stood alone in the political world His words were soon justified, for when Lord Goderich resigned, the remnant which had hitherto supported Grey, hastened to support the ministry of the duke of Wellington

In 1827 Grey seemed to stand forth the solitary and powerless relic of an extinct party In 1830 we find that party restored to its old numbers and activity, supreme in parliament, popular in the nation, and Lord Grey at its head The duke of Wellington's foolish declaration against parliamentary reform suddenly deprived him of the confidence of the country, and a coalition of the Whigs and Canningites became inevitable Grey was sent for by William IV on Nov 16, 1830, and formed a coalition cabinet, pledged to reform The question of the place to be offered to the indispensable Brougham nearly wrecked his cabinet-making, but the king in the end consented to Brougham's taking the chancellorship Grey then appointed a committee of four to study the question and prepare a moderate measure of reform Grey himself was an old-fashioned Whig, and, when he took office, did not foresee how far he would go in reform But now, faced with a formidable agitation, he saved the country from revolution by driving through a bold measure of reform. In his youth he had assailed Pitt's administration because Pitt's administration threatened with extinction the political monopoly of that landed interest to which he belonged In his old age, on the contrary, unable to check the progress of the wave, he swam with it, and headed the movement which compelled that landed interest to surrender its monopoly.

The second reading (March 22, 1831) of the first Reform Bill was carried in the Commons by a majority of one On April 22 parliament was dissolved. The second reading was carried in the new parliament (July 8) by a majority of 136. When the bill had at length passed the Commons after months of debate, it was Grey's task to introduce it to the Lords It was rejected (Oct. 8) by a majority of 41 Grey had the prudence and courage to remain in office, with the intention of introducing a third Reform Bill in the next session. The last months of 1831 were the beginning of a political crisis such as England had not seen

since 1688. The two extreme parties, the Ultra-Radicals and the Ultra-Tories, were ready for civil war. Between them stood the ministry and the majority of intelligent peace-loving Englishmen. The second reading in the Commons was passed in December by a majority of 162. On April 9 Grey moved the second reading in the Lords. A sufficient number of the opposition temporized; and the second reading was allowed to pass by a majority of nine. Their intention was to mutilate the bill in committee. On May 7, Lyndhurst secured a motion to postpone certain clauses by a majority of 35 against the Goverment. Grey now reluctantly asked the king, by a unanimous minute from the cabinet, to give authority for the creation of peers to swamp the opposition. He himself disliked the step, but the younger members of his cabinet were insistent But William IV, at first favourable to reform, was alienated by the violent state of opinion He rejected the proposal of his ministers, and accepted their resignation, May 9, 1832. The duke of Wellington undertook the hopeless task, in which Peel declined to join, of constructing a ministry which should pass a restricted or sham Reform Bill After a week of the profoundest agitation throughout the country, the king, beaten and mortified, was forced to send for Grey and Brougham. He now angrily and reluctantly yielded to the creation of peers. The threat was sufficient, the necessary number of peers abstained, and the bill became law.

Grey took but little part in directing the legislation of the reformed parliament. Never anxious for power, he had executed the arduous task of 1831–1832 rather as a matter of duty than of inclination, and he found an opportunity of retiring over the renewal of the Irish "coercion" bill. It became clear in the discussion on the bill that Lord Althorp, the leader of the House of Commons, was privately opposed to retaining those clauses which it was his duty to push through the house Lord Althorp resigned, and Grey, who was now seventy, resigned also His voluntary withdrawal enabled Lord Althorp to return to his post and to proceed with the bill in its milder form Grey was succeeded by Lord Melbourne, but no other change was made in the cabinet

During most of his remaining years Grey continued to live in retirement at Howick, where he died on July 17, 1845, in his eighty-second year.

See Gen C. Grey, *Charles 2nd earl Grey. Some Account of his Life and Opinions* (1861); *Correspondence of Earl Grey and William IV.* (2 vols, 1867), ed Henry, 3rd earl Grey, Le Strange, *Correspondence of Princess Lieven and Earl Grey 1824–34* (1890), and memoirs of the period, *see* also G. M Trevelyan, *Lord Grey of the Reform Bill* (1920).

GREY, HENRY GREY, 3RD EARL (1802–1894), English statesman, was born on Dec 28, 1802, the son of the 2nd Earl Grey, prime minister at the time of the Reform Bill of 1832 As Viscount Howick, he sat in the House of Commons, first for Winchelsea, and then for Northumberland He was under-secretary for the colonies in his father's ministry in 1830, and then laid the foundation of his great knowledge of and interest in colonial affairs. He belonged to the more advanced party of colonial reformers, sharing the views of Edward Gibbon Wakefield on questions of land and emigration, and he resigned in 1834 from dissatisfaction that slave emancipation was made gradual instead of immediate. In 1835 he entered Lord Melbourne's cabinet as secretary at war, but in 1839 he again resigned, disapproving of the more advanced views of some of his colleagues He became colonial secretary in 1846, and the six years of his administration effected a revolution in the relations between England and her colonies Grey was the first minister to proclaim that the colonies were to be governed for their own benefit and not for the mother-country's, the first systematically to accord them self-government so far as then seemed possible; the first to introduce free trade into their relations with Great Britain and Ireland The concession by which colonies were allowed to tax imports from the mother-country *ad libitum* was not his; he protested against it, but was overruled In the West Indies he suppressed, if he could not overcome, discontent; in Ceylon he put down rebellion; in New Zealand he suspended the constitution he had himself accorded, and yielded everything into the masterful hands of Sir George Grey. The least successful part of his administration was his treatment of the convict question at the Cape of Good Hope, which seemed an exception to his rule that the colonies were to be governed for their own benefit and in accordance with their own wishes, and subjected him to a humiliating defeat. After his retirement he wrote a history and defence of his colonial policy in the form of letters to Lord John Russell, a dry but instructive book (*Colonial Policy of Lord John Russell's Administration,* 1853). He resigned with his colleagues in 1852 and never again held office.

During the remainder of his long life he exercised a vigilant criticism on public affairs. His principal parliamentary appearances were when he moved for a committee on Irish affairs in 1866, and when in 1878 he passionately opposed the policy of the Beaconsfield cabinet in India. He died on Oct. 9, 1894.

GREY, SIR GEORGE (1812–1898), British colonial governor and statesman, only son of Lieutenant-Colonel Grey of the 30th Foot, was born in Lisbon on April 14, 1812, eight days after the death of his father at the storming of Badajoz He passed through Sandhurst with credit, and received his commission in 1829. His lieutenancy was dated 1833, and his captaincy 1839, in which year he sold out and left the army. In 1836 the Royal Geographical Society accepted his offer to explore the north-west region of West Australia, and accordingly he landed at Hanover Bay at the end of 1837. The surrounding country he found broken and difficult, and his hardships were aggravated by the tropical heat and his ignorance of the continent In a skirmish with the natives, in which he was speared near the hip, he showed great courage, and put the assailants to flight, shooting the chief, who had wounded him After a brave endeavour to continue his journey his wound forced him to retreat to the coast, whence he sailed to Mauritius to recruit. Next year he again essayed exploration, this time on the coast to the north and south of Shark's Bay He had three whale-boats and an ample supply of provisions, but by a series of disasters his stores were spoilt by storms, his boats wrecked in the surf, and the party had to tramp on foot from Gantheaume Bay to Perth, where Grey, in the end, walked in alone, so changed by suffering that friends did not know him. In 1839 he was appointed governor-resident at Albany, and during his stay there married Harriett, daughter of Admiral Spencer, and also prepared for publication an account, in two volumes, of his expeditions

In 1840 he returned to England, to be immediately appointed by Lord John Russell to succeed Colonel Gawler as governor of South Australia Reaching the colony in May 1841, he found it in the depths of a depression caused by mismanagement and insane land speculation By rigorously reducing public expenditure, and forcing the settlers to quit the town and betake themselves to tilling their lands, and with the opportune help of valuable copper discoveries, Grey helped the infant colony to emerge from the slough In 1845, when the little settlements in New Zealand were involved in a native war, he was sent to save them The Maori chiefs made their submission. The governor gained the veneration of the Maori tribes, in whose welfare he took a close personal interest, and of whose legends and myths he made a valuable and scholarly collection, published in New Zealand in 1855 and reprinted thirty years afterwards Grey presently became involved in harassing disputes with the colonists, who organized an active agitation for autonomy In the end a constitution, partly framed by Grey himself, was granted them, and Grey, after eight years of despotic but successful rule, was transferred to Cape Colony

In South Africa Grey thwarted a formidable Kaffir rebellion in the Eastern Provinces, and pushed on the work of settlement by bringing out men from the German Legion and providing them with homes. He gained the respect of the British, the confidence of the Boers, the admiration and the trust of the natives. The Dutch of the Free State and the Basuto chose him as arbitrator of their quarrels. When the news of the Indian Mutiny reached Cape Town he strained every nerve to help Lord Canning, despatching men, horses, stores and £60,000 in specie to Bombay. He persuaded a detachment, then on its way round the Cape as a reinforcement for Lord Elgin in China, to divert its voyage to Calcutta. Finally, in 1859, Grey almost reached what would have

been the culminating point of his career by federating South Africa. Persuaded by him, the Orange Free State passed resolutions in favour of this great step, and their action was welcomed by Cape Town. But the colonial office disapproved of the change, and when Grey attempted to persevere with it Sir Edward Bulwer Lytton recalled him A change of ministry during his voyage to England displaced Sir Edward Bulwer Lytton But though the duke of Newcastle reinstated Grey, it was with instructions to let federation drop

In 1861 the colonial office sent him as governor to New Zealand, where an inglorious native war in Taranaki had just been succeeded by an armed truce Grey did his best to avert war, but it came in 1863, and spread from province to province Ten thousand regulars and as many colonial riflemen were employed to put it down The imperial troops were badly handled, and Grey, losing patience, became involved in bitter disputes with their commanders As an example to the former he himself attacked and captured Weraroa, the strongest of the Maori stockades, with a handful of militia, a feat which delighted the colonists, but made him as much disliked at the war office as he now was at Downing Street Moreover, Grey had no longer real control over the islands New Zealand had become a self-governing colony, and though he vindicated the colonists generally when libellous imputations of cruelty and land-grabbing were freely made against them in London, he crossed swords with his ministers when the latter confiscated three million acres of tribal land belonging to the insurgent Maori Yet a condition of something like tranquillity had been reached in 1867, when he received a curt intimation from the duke of Buckingham that he was about to be superseded The colonists bade farewell to him in 1868 in an outburst of gratitude and sympathy, but his career as a colonial governor was at an end Returning to England, he delivered many able speeches advocating what later came to be termed Imperialism, and stood for Newark

Discouraged, however, by the official Liberals, he withdrew and turned again to New Zealand In 1872 he was given a pension of £1,000 a year, and settled down on the island of Kawau, not far from Auckland, which he bought, and where he passed his leisure in planting, gardening and collecting books In 1875, on the invitation of the Auckland settlers, he became superintendent of their province, and entered the New Zealand House of Representatives He became premier of New Zealand in 1877 Manhood suffrage, triennial parliaments, a land-tax, the purchase of large estates and the popular election of the governor, were leading points of his policy All these reforms, except the last, he lived to see carried, none of them were passed by him For the fifteen years after the fall of his ministry in 1879 he remained a solitary and pathetic figure in the New Zealand parliament, respectfully treated, courteously listened to, but never again invited to lead In 1894, he left New Zealand, and made his home in London, where he died on Sept 20, 1898

Lives of Sir George Grey have been written by W L and L Rees (1892), Professor G C Henderson (1907) and J Collier (1909)

(W P Re , X)

GREY, LADY JANE (1537–1554), for 9 days queen of England, was the great-granddaughter of Henry VII She was the daughter of Henry Grey, marquess of Dorset by his wife, Lady Frances Brandon, daughter of Princess Mary of England by her second marriage with Charles Brandon, duke of Suffolk

She was born at Bradgate, Leicestershire about 1537 Her parents bestowed more than ordinary care upon her education, and she became the marvel of the age for her acquirements She spoke and wrote Greek and Latin with an accuracy that satisfied even such critics as Ascham and her tutor Dr Aylmer, afterwards bishop of London She also acquired some knowledge of at least three Oriental tongues, Hebrew, Chaldee and Arabic. In his *Schoolmaster* Ascham records her devotion to her studies and the harshness she experienced from her parents Learning was her solace; in reading Demosthenes and Plato she found a refuge from domestic unhappiness At nine years old Thomas, Lord Seymour, obtained her wardship, and induced her parents to let her stay with him, even after the death of his wife, Queen Catherine Parr, by promising to marry her to his nephew, King Edward VI Lord Seymour, however, was attainted of high treason and beheaded in 1549. Jane returned to her studies at Bradgate. But the duke of Somerset was beheaded three years after his brother and, the dukedom of Suffolk having become extinct by the deaths of Charles Brandon and his two sons, the title was conferred upon the marquess of Dorset, Jane's father Jane was now constantly at court Northumberland, who was all-powerful, endeavoured to secure his position by family alliances. His fourth son, Lord Guilford Dudley, was accordingly wedded to Lady Jane Grey about the end of May 1553 The bride went to live with her husband's parents, whom she disliked, and the misery of her marriage brought on a severe illness The match had the full approval of Edward VI , who was now persuaded by Northumberland to break through his father's will and make a new settlement in favour of Lady Jane of the crown by deed The document was witnessed by the signatures of all the council and of all but one of the judges; but the judges were obtained only with difficulty by threats and intimidation

Edward VI died on July 6, 1553, and it was announced to Lady Jane that she was queen She was sixteen years of age The news was a most unwelcome surprise, she fainted and for some time resisted all persuasions to accept the fatal dignity, but she yielded The better to mature their plans the cabal had kept the king's death secret for some days; Queen Jane's proclamation was issued on the 10th Mary, however, had received early intimation of her brother's death, and, retiring from Hunsdon into Norfolk, gathered round her the nobility and commons of those parts The army with which Northumberland went to oppose her began to melt away The earl of Oxford had declared for Queen Mary, and as the council procured a meeting at Baynard's Castle, revoked their former acts as done under coercion, and caused the lord mayor to proclaim Queen Mary, which he did (July 19) amid the shouts of the citizens The duke of Suffolk told his daughter that she must lay aside her royal dignity; she replied that she relinquished most willingly a crown that she had only accepted out of obedience to him and her mother, and her nine days' reign was over

Lady Jane and her father were committed to the Tower, but Suffolk procured a pardon Lady Jane, her husband Dudley and others were arraigned for high treason at the Guildhall (Nov. 14) She pleaded guilty, and was sentenced to death The execution of the sentence was delayed, but the participation of her father the duke of Suffolk in the Wyat rebellion sealed her fate She and her husband were beheaded on Feb 12, 1554, her husband on Tower Hill, and herself within the Tower an hour afterwards, amidst universal sympathy and compassion

See Ascham's *Schoolmaster;* Burnet's *History of the Reformation;* Howard's *Lady Jane Grey,* Nicolas's *Literary Remains of Lady Jane Grey;* Tytler's *England under Edward VI and Mary; The Chronicles of Queen Jane,* ed J G Nichols, *The Accession of Queen Mary* (Guaras's narrative), ed R Garnett (1892), Foxe's *Acts and Monuments*

Contemporary authorities are *The Chronicle of Queen Jane and of Two Years of Queen Mary,* by a "resident of the Tower of London," Harl ms 194, Brit Mus (ed J G Nichols 1850); *Historia delle cose in materia del duca di Nortomberland* (Venice, 1508), compiled by G R Rosso from the despatches of the Venetian ambassador, the letters and works attributed to Lady Jane in the appendix to Michelangelo Florio, *Historia de la Vita e de la morte de . Giovanna Graia* (1607), and Sir H Nicolas, *The Literary Remains of Lady Jane Grey* (1825) *See* also A Strickland, *Tudor Princesses* (1868), and references under MARY, QUEEN OF ENGLAND.

GREY DE WILTON and **GREY DE RUTHYN.** The first Baron Grey de Wilton was Reginald de Grey, who was summoned to parliament as a baron in 1295 and who died in 1308 Reginald's son John, the 2nd baron (1268–1323), was one of the lords ordainers in 1310 The later barons Grey de Wilton were descended from John's eldest son Henry (d 1342), while a younger son Roger (d 1353) was the ancestor of the barons Grey de Ruthyn

WILLIAM, 13TH LORD GREY DE WILTON (d 1562), who succeeded to the title on the death of his brother Richard, about 1520, fought in France during the concluding years of Henry VIII 's reign, and was one of the leaders of the victorious English army at the battle of Pinkie in 1547 He was then employed on the Scottish marches and in Scotland, and in 1549 he was engaged in sup-

pressing the rebellion in Oxfordshire and in the west of England; in 1551 he was imprisoned as a friend of the fallen protector, the duke of Somerset, and he was concerned in the attempt made by John Dudley, duke of Northumberland, to place Lady Jane Grey on the English throne in 1553. He was pardoned by Queen Mary and was entrusted with the defence of Guînes; in January 1558 he was forced to surrender the town and for some time he remained a prisoner in France Under Elizabeth, Grey was again employed on the Scottish border, and besieged Leith in May 1560. He died at Cheshunt, Hertfordshire, on Dec 25, 1562

See his son Arthur's *Commentary of the Services and Charges of William, Lord Grey of Wilton, K.G*, edited by Sir P. de M. Grey Egerton (Camden Society, 1847).

Grey's elder son ARTHUR, 14TH LORD GREY DE WILTON (1536–1593), was during early life with his father in France and in Scotland, he fought at the battle of St. Quentin and helped to defend Guînes and to assault Leith In July 1580 he was appointed lord deputy of Ireland, and after an initial defeat in Wicklow was successful in reducing many of the rebels to a temporary submission. He must be held responsible for the massacre of 600 Italians and Spaniards at Smerwick in November 1580. Grey frequently implored the queen to recall him, and in August 1582 he was allowed to return to England (*see* E Spenser, *View of the State of Ireland,* edited by H. Morley, 1890, and R. Bagwell, *Ireland under the Tudors,* vol. iii, 1890). While in Ireland Grey was served as secretary by Edmund Spenser and he figures as Artegall in book v. of the *Faerie Queene* Grey was one of the commissioners who tried Mary queen of Scots, and he took part in the preparations for the defence of England against the Spaniards in 1588 His account of the defence of Guînes was used by Holinshed in his *Chronicles.*

GREY OF FALLODON, EDWARD GREY, 1ST VISCOUNT (1862–), English statesman, was educated at Winchester and at Balliol College, Oxford, and succeeded his grandfather, the 2nd baronet, at the age of 20 Sir Edward Grey entered the House of Commons as Liberal member for Berwick-on-Tweed in 1885, but he was best known as a country gentleman with a taste for sport, and as amateur champion tennis-player His interest in politics was rather languid, but he was a disciple of Lord Rosebery, and in the 1892–95 Liberal ministry he was under-secretary for foreign affairs In this position he earned a reputation as a politician of thorough straightforwardness and grit, and as one who would maintain British interests independently of party, and he shared with Asquith the reputation of being the ablest of the Imperialists who followed Lord Rosebery Though outside foreign affairs he played but a small part in the period of Liberal opposition between 1895 and 1905, he retained public confidence as one who was indispensable to a Liberal administration When Campbell-Bannerman's cabinet was formed in Dec 1905 he became foreign minister

Grey had previously announced that the Liberal Government would maintain Lord Lansdowne's policy of an *entente* with France and an alliance with Japan, and during the general election of Jan. 1906 he was asked by France, who was being pressed by Germany about Morocco, whether, in case of a Franco-German war, she could reckon on British assistance in arms He replied that he could promise nothing which would not be fully endorsed by public opinion, but that, if war were forced on France through the *entente* respecting Morocco, he believed British public opinion would rally to her support. The French Government then suggested conversations between military experts.

After consulting the prime minister, the chancellor of the exchequer and the war minister, he agreed, on the understanding that such conversations should in no way bind the British Government. The Algeciras conference on Morocco followed in the spring of 1906, and the constant support which, on his instructions, the British representatives accorded to the French, helped to produce a satisfactory result and to strengthen the Anglo-French *entente.* In 1907 he came to an understanding with Russia. He concluded a convention with her about Persia, by which the integrity of that country was to be maintained, but Britain recognized that Russia had rights and interests in the northern zone and Russia recognized that Britain had rights and interests in the southern zone. In the same year he forwarded Anglo-American friendship by sending James Bryce to Washington as British ambassador; and concluded a convention with Spain binding the Powers to maintain the *status quo* in the Strait of Gibraltar and neighbouring waters.

In 1908—the year in which Asquith, an intimate friend of Grey, became Prime Minister—the European situation was considerably modified by the assertion in October by Prince Ferdinand of the independence of Bulgaria and his assumption of the title of king, and the simultaneous annexation by Austria-Hungary of Bosnia and Hercegovina, which she had administered under the treaty of Berlin These strokes of policy moved the indignation of both the Russian people and the Russian Government; but the German Emperor announced that he would stand by his Austrian ally in "shining armour"; and Grey, though he protested against the infraction of the public law of Europe, was naturally unable to promise Russia anything more than diplomatic support The action of the Central Powers confirmed him in the view that it was they who might be the principal danger to European peace; but he was able to keep on friendly terms with them

The labours of the foreign office, coupled with membership of the House of Commons, left him little leisure for forwarding the general policy of the Government. Nevertheless, as occasion arose, he defended all the principal controversial measures His main preoccupation, however, was British relations with Germany, who gave dramatic notice of her dissatisfaction with the spread of French aims and influence in Morocco by dispatching, at the beginning of July 1911, the gunboat "Panther" to the north-west African coast at Agadir, to protect, it was alleged, German interests In view of this further attempt to test, and if possible loosen, the *entente,* he issued a warning through the mouth of Lloyd George speaking at the Mansion House, that Britain intended at all hazards to maintain her place among the Powers The warning sufficed to make Germany lower her tone, and subsequently Grey explained to Parliament that the foreign policy of the Government was a continuation of Lord Lansdowne's and had got rid of the constant trouble with France and Russia; that British friendship with these Powers, far from constituting a hostile encirclement of Germany, afforded a guarantee that neither would pursue an aggressive policy towards her, but that, when a nation had the biggest army and was increasing its already big navy, it was natural that other Powers should be apprehensive

While a section of Radicals and Labour men were suspicious of Grey's policy, public opinion in general (including the Conservative opposition) supported him and was pleased when in the following year his able services were marked by the very unusual distinction, for a commoner, of the Order of the Garter In the beginning of 1912 he was a party to sending Lord Haldane on an informal mission to Berlin to reassure the emperor and his Government as to the pacific intentions of Britain and to probe the intentions of Germany The Cabinet formally notified the German Government that Britain would neither make, nor join in, any unprovoked attack on Germany But nothing would content the German Government but an absolute pledge by Britain of neutrality if Germany were engaged in war—a pledge which Grey naturally could not give Largely in consequence of this ominous rebuff, he exchanged letters on Nov 22, 1912 with the French ambassador, agreeing that, if either Britain or France had grave reason to expect an attack by a third power or a menace to the general peace, both governments would consult whether they should co-operate and what measures they should take in common. Still he found himself able to work in general harmony with the German Government in the efforts of the Powers, in conference in London, to preserve general peace, in spite of the Balkan wars of 1912–13, ending in the ill-omened Treaty of Bucharest.

In this matter the diplomacy of Germany had appeared so reasonable that he was taken aback by her unyielding attitude in the negotiations arising out of the Austro-Serbian dispute. As soon as he heard of the Austrian ultimatum delivered at Belgrade on July 23, 1914, he realized at once that Russia could not allow

Serbia to be crushed, and exerted himself in the most strenuous fashion to save Europe from the threatened catastrophe. Acting generally in conjunction with France and Russia, one or both, but in face of a lukewarm or hostile Germany, he urged upon Austria the extension of the alarmingly short time-limit of 48 hours; he proposed indefatigably various schemes for conciliation and conference; he pressed upon Serbia the necessity of going as far as possible to meet Austria. In fact, Serbia accepted almost the whole of the Austrian demands; but Austria would be content with nothing less than complete submission, and on the expiry of the time-limit declared war on Serbia. On July 29 Germany, asserting that war was inevitable if Russia attacked Austria, endeavoured to purchase the neutrality of England by undertaking, if England remained neutral, to make no territorial acquisitions at the expense of France—an undertaking which did not extend to the French colonies—and by promising to respect Belgian integrity, after the War, if Belgium had not sided against Germany. Grey next day absolutely refused to make any bargain of the sort at the expense of France and Belgium. In view of the apparent threat to Belgium, he asked France and Germany whether they were prepared to respect Belgian neutrality provided it was not violated, and he asked Belgium whether she would remain neutral France and Belgium both replied affirmatively, while Germany temporized. Hopeful negotiations which had been begun directly between Russia and Austria were wrecked by a German ultimatum to Russia to countermand her mobilization; and on Monday, Aug. 3, Germany declared war on France.

The moment for decision had come for Great Britain Russia had asked her to declare herself against Germany and so give the German general staff pause; France had asked her to co-operate as Germany was about to invade French territory The cabinet had hitherto been divided, a strong section pressing for the preservation of neutrality, and so Grey had been unable to reply favourably to either Russia or France But now Germany had declared war on France and was apparently about to disregard the neutrality of Belgium The Opposition, through Bonar Law, tendered support for active measures to aid France and Russia; and Grey with a Cabinet rallying, with few exceptions, to his view, was able to make an appeal in the House of Commons on Aug 3 for public and parliamentary support to a policy of action The speech finally decided a wavering public opinion; with the exception of some Radicals and extremist Labour men, all parties, including the Irish Nationalists, accepted the necessity of war Grey demanded next day that Germany should respect the neutrality of Belgium, and, on the German refusal, England went to war

One of Grey's first tasks was to turn the association of the Powers fighting Germany and Austria into an alliance, which bound its members to fight in common, and make peace in common. In the course of the negotiations for this purpose he did not hesitate to guarantee the support of Great Britain for the attainment of long-cherished national objects, provided that these did not conflict with the aims of liberation and self-development common to the Allies the most striking case being the promise, after Turkey entered the war on the side of the Central Powers, that Russia should have Constantinople Much of his time and attention was occupied by difficult questions arising out of the blockade of Germany and the consequent interference with the trade of neutrals Public opinion in Great Britain constantly complained that the blockade was not enforced with sufficient strictness; while the United States, as the principal neutral, harassed the British Government by repeated notes, denouncing the methods of the British navy as unnecessarily prejudicial to American trade and contrary to international law He was perhaps more successful in his answers to the Americans than in his justification to the British public; and a large body of opinion in America accepted his explanations as reasonable.

The tenure of the Foreign Office by a statesman so high-minded, sincere and experienced as Grey was everywhere regarded as such a valuable asset for Great Britain that it appeared only natural and fitting for Asquith, when contemplating the formation of a coalition government in May 1915, to lay down, as one of the essential conditions, that there should be no change in the office of Foreign Secretary. No one could refute with such authority the intermittent assertions of the German chancellor that it was England and not Germany that was responsible both for the origin and for the continuance of the war. When the pacifists called for negotiations in May 1916, he showed that when the Germans professed a readiness for peace it was only for a peace on the basis that Germany had won and the Allies were beaten; but the Allies were not beaten, and the first step towards peace would be taken when Germany began to recognize the fact. Credit must be given to Grey for facilitating, in the early summer of 1915, the entry of Italy—till May 3 a member of the Triple Alliance—into the War against the Central Powers. It was, however, a bitter disappointment to him that his grave warnings failed to prevent Bulgaria, in the autumn of the same year, from taking the field against the Allies Allied troops were sent to Salonika, and he offered Cyprus to Greece in order to induce her to carry out her treaty obligations and go to Serbia's aid against Bulgaria But on this issue King Constantine won the support of his people against Venezelos and Serbia was crushed before help could reach her

In July 1916 an affection of the eyes, which had been giving him increasing trouble, made it advisable that he should have as much relief from work as possible, and he accepted a peerage. When a few months later, in December, his friend and chief, Asquith, was succeeded in the premiership by Lloyd George, failing eyesight and political comradeship both united to determine him to bring his 11 years' tenure of the Foreign Office to a close He had served for a longer consecutive period than any predecessor, and in his official methods he carried out his own precept —that foreign policy required not striking effects nor bold strokes but careful steering

After his resignation Lord Grey took little or no part in public life for several years Though he never regained normal vision, rest and quiet gradually worked a decided improvement in his eyesight But, with the exception of a three months' mission in 1919 to the United States to deal with questions arising out of the peace, he did not definitely emerge from his retirement till 1922 It was the time of the decadence of the coalition government and Lord Grey urged that it was not trusted and should come to an end, which happened within a few months; he was also anxious to resuscitate the Liberal party. In foreign affairs he pressed for the re-establishment of good relations with France, and for the arrangement of an inclusive peace pact, beginning with France When such a pact was concluded at Locarno in 1925 he welcomed it warmly But the cause to which he devoted most of his energy was that of the League of Nations. He was especially anxious that Germany should be included as a member at the earliest possible date, and maintained that this should be the only business of the spring meeting of the League in 1926, which unfortunately separated without effecting it In Aug. 1928 Lord Grey was elected Chancellor of Oxford University.

Much of his time in these years was taken up in the compilation of a straightforward narrative and vindication of his course in foreign policy, which was published in 1925 under the title *Twenty-five Years, 1892–1916* He had published in 1899 another volume on *Fly-Fishing*, his favourite recreation In 1885 he married Dorothy, daughter of Shallcross F. Widdrington, of Newton Hall, Northumberland. She was killed in a carriage accident in 1906, and in 1922 Lord Grey married, as his second wife, Pamela, sister of George Wyndham, and widow of the 1st Lord Glenconner, a woman of wide sympathies, interested in many charities, who died on Oct 19, 1928 (G E B)

See Viscount Grey, *Twenty-Five Years, 1892–1916*, 2 vol (1925), H Lutz, *Lord Grey und der Weltkrieg* (1927. Eng trans by E W Dickes, 1928).

GREYHOUND RACING. Greyhound racing was first introduced as an artificial form of the old-time sport of coursing, but it has nothing in common with it except that the same sort of dog is used for both In racing, a dummy hare, propelled mechanically round a set track, is used as a quarry, which the dogs never catch—except by accident

First Developments.—Greyhound racing first attained prominence in the United States of America after the World War, but there is evidence that it had its inception in England. There are on record particulars of a meeting which took place in a field near the Welsh Harp, Hendon, in 1876, for the purpose of demonstrating a form of greyhound racing almost exactly similar in principle to the modern form. The dogs were raced after an artificial hare which was drawn, by means of a windlass, along a rail laid in the grass over a straight track of 400 yards But the innovation received insufficient encouragement to keep it alive. It seems that public ideas of sport at that time were not satisfied by the mere racing of greyhounds, for when a year or two later enclosed coursing was introduced the objection was raised that it was more like racing than coursing, and it soon died out Coursing men realized that sheer racing is inimical to the traditional principles of the sport.

After nearly 50 years, owners of greyhounds in general viewed with marked disfavour the efforts to establish greyhound racing in England. Its success in America prompted an American company to send over representatives with a view to beginning operations in England, but they failed to secure sufficient support. As greyhound racing became popular in America, another effort was made to introduce it into England, and this time the result was the formation of a private company called the Greyhound Racing Association, which opened a large racing track at Manchester in July 1926. Greyhound owners viewed the scheme askance, and so few of them could be induced to enter dogs for the races that the Association was obliged itself to buy dogs to fill the entries for the first few meetings. But the racing and the opportunities it afforded for betting made an immediate appeal to the public of Manchester, and large numbers of spectators were attracted Once it had been demonstrated that there was money in greyhound racing, a general rush ensued among speculators all over the country to form companies and secure sites for the laying out of tracks Between the beginning of January and the end of Sept 1927, as many as 68 such companies were registered At a few places public opinion ranged itself against what was regarded as a mere money-making spectacle; but most of the companies found a ready patronage, and enormous crowds flocked to some of the bigger centres Moreover, the apparent success of greyhound racing quickly found a reflection among enterprising speculators in many other countries. It soon became established in Australia, and projects for laying out tracks were started as far afield as India, Egypt and China. In Belgium a primitive form of racing, in which the greyhounds ran over a straight track, at the end of which their owners stood calling them, as in whippet racing, gained some popularity during the World War, and it spread to some extent to France; but this was eclipsed by "mechanical hare" racing when its success became evident in England

The Methods of Racing.—It is not necessary to look very far to understand the success of greyhound racing The greyhound itself is a dog of beautiful lines, and there is an undoubted thrill in seeing him at full stretch in close competition with others But it is to be observed at any meeting that the majority of spectators are much less interested in this aspect of the racing than in the actual result of the races and the money that is to be won and lost in betting This, combined with the fact that most meetings are held in the evening, when working people have leisure to attend, has been a large influence in attracting spectators Moreover, greyhound racing provided something entirely new to the public, both in conception and presentation The methods adopted on the tracks of the Greyhound Racing Association may be taken as an example, for upon them most of the other tracks have been modelled The arena resembles an up-to-date football ground, oval in shape, with accommodation for spectators provided all round it in grand stands or open terraced banking The actual track, which is usually of grass, is brilliantly illuminated at night by means of powerful electric lights, while the rest of the ground is in semi-darkness during the races The dummy hare runs round the outside edge of the track, propelled by concealed mechanism, which is controlled by an official stationed in the top of a tower, from which he can regulate its speed according to the pace of the dogs. At the end of the race the hare is switched into a tunnel, which is closed to the dogs by means of a trap-door.

Usually not more than six dogs compete in each race. Each dog wears a racing coat bearing a distinctive number and colour, and at the start the dogs are placed in separate divisions of a starting box, from which they can see the hare begin a circuit of the course. As the hare flashes past the box the dogs are released simultaneously by the raising of the front of the box. For the fair running of the races a good deal depends on the control of the speed of the hare. If the leading dog is allowed to gain too much on it, he may be induced to swing out after it at the bends in the track, and thus lose ground, while the dogs in the rear, seeing it farther round the bend, may keep close to the inside edge and gain an advantage. It is inevitable that there should be occasionally jostling round the bends, which sometimes leads to fighting, and, although a form of muzzle is worn by each dog, fighting has been an unpleasant feature (1928) of several meetings.

Races are usually of either 500 yards or 525 yards, and at the same distances races over hurdles are also run; and the times of the winners are recorded to hundredths of seconds The speed of greyhounds has always been an interesting matter of discussion and speculation, but opportunities for making comparative records of it have seldom occurred before the introduction of racing In order to provide as close races as possible between dogs of different calibre, the Greyhound Racing Association adopted a system of grading competitors on the form shown in trials or actual racing, and entering them for races only against dogs of more or less equal merit The times recorded have shown that the fastest greyhounds run over 525 yards flat at an average speed of more than 35 miles an hour, and over hurdles at an average speed of more than 33 miles an hour

Controlling Bodies.—With the rapid extension of greyhound racing and the multiplication of companies formed to participate in it, the question of establishing an authoritative controlling body arose Many people imagined that greyhound racing could at once assume a status equal to that of the great British sports, overlooking the fundamental difference that exists between a sport that is pursued for the sake of sport by the main body of its adherents and a form of entertainment introduced purely for the profit of its promoters The Greyhound Racing Association very early in its career sought the recognition and co-operation of the National Coursing Club, which at once decided that "the activities of the Greyhound Racing Association have nothing to do with the sport of coursing as legislated for by the Rules of the National Coursing Club" Nevertheless, the Association made one of its rules that no dog should be allowed to race on its track unless the dog had been registered in the National Coursing Club's *Greyhound Stud Book,* and the Association continued to seek the good will and support of the prominent coursing men and clubs With so many rival companies in the field, efforts to concentrate the control of greyhound racing as a whole in one body proved unavailing, and eventually the Greyhound Racing Association vested control of racing on its tracks in an independent committee consisting of Lord Chesham (chairman), the Earl of Westmorland, and Captain H E de Trafford, with Major C L C Clarke as honorary secretary This committee was empowered to draw up rules, to issue licences to stewards and trainers, and in effect to control the actual racing and organization of meetings on the Association's tracks Meanwhile, a group of rival companies joined in forming a controlling body, called the Canine and Greyhound Racing Control Board, for their tracks Before long, steps were again taken to found a single controlling body, and early in 1928 the representatives of the chief tracks met and formed the National Greyhound Racing Club The constitution of the club was designed to be similar to that of the Jockey Club, and Captain E. A V Stanley, Lieut.-Gen Sir Edward Bethune and Major D. B Corbet were appointed stewards, with Lord Chesham, Lord Loch and Captain Arthur Hope members of a standing committee.

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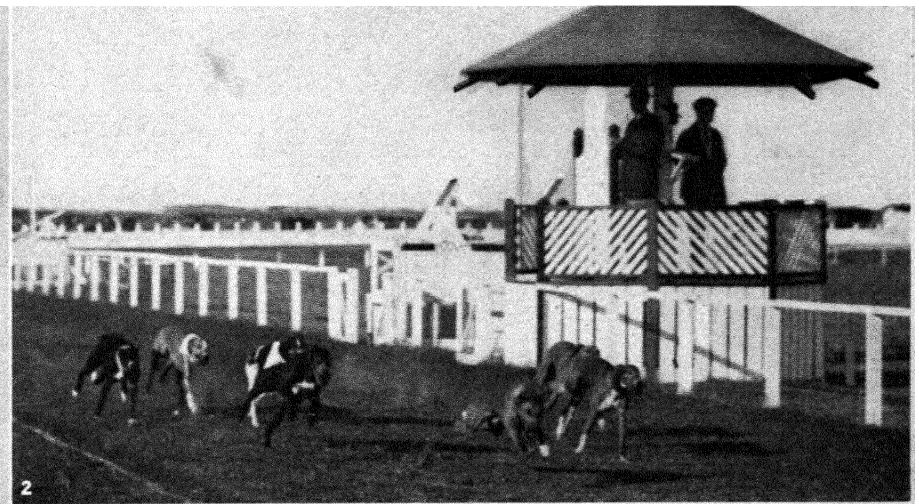





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GREYHOUND RACING IN ENGLAND AND AMERICA

1. Greyhounds at the Moorvale Kennels, Denham, Bucks, just released from the starting box. A mechanical hare is timed to flash past as the door swings open
2. A race at Hiahlea, Florida, U.S.A. Ordinarily six greyhounds run the course of 500–525 yds. The track is usually of grass
3. Dogs chasing mechanical hare, in the foreground. The hare, which runs around the outside edge of the track, is propelled by a concealed mechanism; its speed is controlled by an official stationed in a tower
4. "Speedball," one of the fastest American dogs, leading in a race at Hiahlea, Florida. Each dog, as shown above, wears a muzzle as a safeguard against fighting on the curves. The fastest greyhounds attain a speed of 35 miles an hour

The United States.—The sport of racing greyhounds has never gained wide popularity in the United States. Attempts have been made to introduce it in various places, but only in Florida and California have these ventures met with any particular success. Probably the first attempt to introduce the sport was made in Colorado in the '90s.. The dogs were raced by the Bartel brothers, of Denver, who invested generously in good racing dogs imported from England. For a time, coursing was popular in the Rocky Mountain States. From there, the interest spread to California. For many years, dog racing was conducted in the outskirts of San Francisco. In a measure it was successful, but after a while it dawned upon the public that the man who owned the track owned the competing dogs and both the handicapper and starter were in his employ. There had been betting on the events The dogs ran after live hares, and these victims furnished the only honest part of the combination

It was not until the mechanical hare had been perfected and brought into use that Florida became the scene of greyhound racing The mechanical hare appeased the humanitarians who objected to the use of live victims for the races. The sport flourished a bit with this objection removed but again there began to be suspicions of tampering with the dogs. It was probably because of such suspicions that attempts to introduce the sport at both Atlantic City and Newark resulted in large financial losses for the promoters The only way in which greyhound racing can be successful in the United States is to have it run along the lines followed by the horse racing interests or the greyhound racing supporters in England (F. F D)

GREYLAG: *see* GOOSE

GREYMOUTH, a seaport of New Zealand, the principal port on the west coast of South island, in Grey county It stands on the small estuary of the Grey or Mawhera river, has a good harbour, and railway communication with Hokitika, Reefton and Christchurch The district is both auriferous and coal-bearing The coal-mines have attendant industries in coke, bricks and fireclay. The timber, wool and flax trade is also well developed

GREYTOWN or SAN JUAN DEL NORTE, a port of Nicaragua on the Caribbean sea, at the mouth of the northern channel of the delta of the San Juan river, close to the Costa Rican border Pop about 600 Greytown was at one time the chief port of Nicaragua on the Caribbean, and between 1850 and 1870, when the route across Nicaragua was the most comfortable and luxurious line of travel between eastern United States and California, was the terminus of the Atlantic steamers and the starting point of the river boats which carried travellers up the San Juan river, and across Lake Nicaragua, whence they took a 12 mile stage ride to the Pacific port of San Juan del Sur, to continue their journey to San Francisco Bluefields was also, during the period of the British protectorate over the Mosquito coast, the leading port and the chief residence of the English; the name by which the town is still known, Greytown, is the English designation, the official Nicaraguan name being San Juan del Norte The loss of its prime position as a port is due to the shifting sands of the San Juan river, which have now virtually closed the northern delta entrance and left the Costa Rican and border channels the chief means of entry and exit to the river In 1850, the channel at Greytown was 25 ft deep, but by 1875 it had decreased to 5 ft, eliminating the site as a port of entry for sea-going vessels

The harbour of San Juan del Norte was discovered by Columbus, and was linked with the traffic into Nicaragua by Capt Diego Machua, who in 1529 sailed down the San Juan river from the lake. In 1796, San Juan was made a port of entry by Spanish royal charter, and new defences were built just prior to the Independence, in 1821 The British seized the port in 1848, by virtue of their protectorate over the Mosquito coast, and held it until 1860, when, following the Treaty of Managua, the territory was turned over to Nicaragua.

GREYWACKE or **GRAUWACKE** (a German word signifying a grey earthy rock), a term, formerly more generally used by British geologists than at the present day, for impure, composite gritty rocks belonging to the Palaeozoic systems They correspond to the sandstones, grits and finer-grained conglomerates and breccias of the later periods Attempts have been made to limit the term to those rocks formed from the disintegration of basic igneous and pyroclastic rocks, as distinct from arkose, sandstone, etc., which are formed from acid rocks. In view of the various denotations of the term greywacke, its use in geological literature seems now undesirable. The greywackes are mostly grey or brown dull-coloured sandy rocks containing a great variety of minerals (such as quartz, felspar, calcite, iron oxides, garnet, epidote, etc) and rock-fragments (felsite, chert, slate, gneiss, quartzite, etc.) (P. G. H. B.)

GRIBEAUVAL, JEAN BAPTISTE DE (1715–1789), French artillery general, was born at Amiens on Sept 15, 1715. He entered the French royal artillery in 1732, and in 1752 became captain of a company of miners. He was lent to the Austrian army on the outbreak of the Seven Years' War, and served as a general officer of artillery After his return to France he was made inspector of artillery, but he had to wait until 1776 before he became first inspector and was able to carry out the reforms in the artillery arm which are his chief title to fame. *See* ARTILLERY; and for full details Gribeauval's own *Table des constructions des principaux attirails de l'artillerie . . . de M de Gribeauval,* and the *règlement* for the French artillery issued in 1776

See Hennébert, *Gribeauval, lieutenant-général des armées du roy* (1896)

GRIBOYEDOV, ALEXANDER SERGEYEVICH (1795–1829), Russian dramatic author, was born on Jan 4, 1795 at Moscow, where he studied at the university from 1806 to 1812 He then obtained a commission in a hussar regiment, but resigned it in 1816 Next year he entered the civil service, and in 1818 was appointed secretary of the Russian legation in Persia, whence he was transferred to Georgia He had commenced writing early, and had produced on the stage at St Petersburg (Leningrad) in 1816 a comedy in verse, translated from the French, called *The Young Spouses,* which was followed by other pieces of the same kind But neither these nor the essays and verses which he wrote would have been long remembered but for the immense success gained by his comedy in verse, *Goré ot uma,* or *The Mischief of Being Clever* (Eng trans by B Pares, 1925). A satire upon Russian society, or, as a high official styled it, "A pasquinade on Moscow," its plot is slight, its merits consisting in its accurate representation of certain social and official types—such as Famousov, the lover of old abuses, the hater of reforms; his secretary, Molchanin, servile fawner upon all in office; the aristocratic young liberal and Anglomaniac, Repetilov, contrasted with whom is the hero of the piece, Tchatsky, the ironical satirist, just returned from the west of Europe, who exposes and ridicules the weaknesses of the rest, his words echoing that outcry of the young generation of 1820 which reached its climax in the military insurrection of 1825, and was then sternly silenced by Nicholas Griboyedov wrote this play during his stay at Tiflis (where he had come, on leave, in 1821) as diplomatic secretary to General Ermolov *Goré ot uma* is undoubtedly one of the great comedies of European literature He spent the summer of 1823 in Russia, completed his play and took it to St Petersburg There it was rejected by the censorship Many copies were made and privately circulated, and Griboyedov read it to literary circles in St Petersburg and Moscow, but the first edition was only printed in 1833, four years after his death Only once did he see it on the stage, when it was acted by the officers of the garrison at Erivan He returned to Georgia to General Ermolov's headquarters, in 1825, and after the revolt of Dec 14 was arrested as a notorious liberal and sent to St. Petersburg, where he succeeded in exculpating himself He returned to serve with his relative Count Paskievitch-Erivansky during a campaign against Persia, negotiated the peace of Turkmanchai (Feb. 20, 1828) and took the treaty to St. Petersburg. He considered devoting himself to literature and commenced a romantic drama, *A Georgian Night* But he was suddenly sent to Persia as minister-plenipotentiary to supervise the execution of the treaty Soon after his arrival at Tehran the Russian embassy was stormed on account of the refuge given there to Russian subjects from Persian harems

Griboyedov was killed during this attack (Feb 11, 1829)

GRID, in a vacuum tube such as is used in electrical communication is an electrode having openings through which the electron stream, between cathode and anode, may pass. The relative potential of the grid controls the current flowing between the anode and the cathode

GRID LEAK, is a resistor, usually of very high resistance, used in association with a condenser and connected directly or indirectly between the cathode and the grid of a vacuum tube in a radio receiving set

GRIEG, EDVARD HAGERUP (1843–1907), Norwegian composer, was born on June 15, 1843, in Bergen, where his father, Alexander Grieg, was English consul The Grieg (formerly Greig) family were of Scottish origin, the composer's grandfather having emigrated after Culloden His mother, Gesine Hagerup, belonged however to a pure Norwegian peasant family; and it is from her that Grieg appears to have derived his musical talent. She began to give her son lessons on the pianoforte when he was six and his first composition, "Variations on a German melody," was written at the age of nine. In the autumn of 1858, at the recommendation of Ole Bull (*q.v*), young Grieg entered the Leipzig Conservatorium, where he came under the influence of the Mendelssohn and Schumann romantic school From Leipzig he went, in 1863, to Copenhagen (Oslo) where he studied for a short time with Gade and Emil Hartmann, both composers representing a sentimental strain of Scandinavian temperament, from which Grieg emancipated himself in favour of the harder inspiration of Richard Nordraak "The scales fell from my eyes," said Grieg afterward of his acquaintance with Nordraak "For the first time I learned through him to know the northern folk tunes and my own nature. We made a pact to combat the effeminate Gade-Mendelssohn mixture of Scandinavianism, and boldly entered upon the new path along which the northern school at present pursues its course." A kind of crusade in favour of Norwegian national music resulted, and in the winter of 1864–1865 Grieg founded the Copenhagen concert-society Euterpe for the production of the works of young Norwegian composers During the winters of 1865–1866 and 1869–1870 Grieg was in Rome where he met Liszt, who played his piano concerto at sight from the ms and gave it his enthusiastic approbation In the autumn of 1866 he settled in Christiania In 1872 the Royal Musical Academy of Sweden made him a member; in 1874 the Norwegian Storthing granted him an annual stipend of 1,600 kronen. In 1888 he played his pianoforte concerto and conducted his "two melodies for strings" at a Philharmonic concert in London, and visited England again in 1891, 1894 and 1896. He died at Bergen on Sept. 4, 1907

As a composer Grieg's strength lies in his strong nationalistic colouring, in his exquisite lyrical feeling and in his command of the picturesque and romantic, as exemplified in his lovely and world-famous music to Ibsen's *Peer Gynt,* or in the suite for stringed orchestra, *Aus Holbergs Zeit,* and hardly less so in the equally beautiful and well-known piano concerto As regards his songs they may be said to be generally the more spontaneous the more closely they conform to the simple model of the *Volkslied.* Yet the much sung *Ich liebe dich* is a song of a different kind, which has hardly ever been surpassed for the perfection with which it depicts a strong momentary emotion, while such other familiar examples as *Solvejg's Lied* and *Ein Schwann* are equally beautiful and characteristic Bulow called Grieg the "Chopin of the North," and the phrase may pass though the range of appeal and the quality of the inspiration in Chopin are of course far greater, nor has the national movement inaugurated by Grieg shown promise of great development He may be regarded rather as the pioneer of a musical mission which was perfectly carried out by himself alone

See La Mara, *Edvard Grieg* (Leipzig, 1898), Henry T Finck, *Edvard Grieg* (1906) and *Grieg and his Music* (1919), R H. Stein, *Grieg* (1921).

GRIERSON, SIR JAMES MONCRIEFF (1859–1914), British soldier, was born at Glasgow on Jan 27, 1859, and joined the Royal Artillery in 1877 Noted from the outset as an exceptionally keen student of his profession, from 1896 to 1900 he was military attaché at Berlin As a colonel he was with Lord Roberts during the advance from Bloemfontein into the Transvaal; but he was then transferred to China to act as British military representative on the staff of Count Waldersee, commander-in-chief of the Allied forces against the Boxers. In 1904 he was appointed director of military operations. He commanded the 1st Division at Aldershot from 1906–10, and was in 1912 put in charge of the Eastern command. On the outbreak of the World War Sir J. Grierson was selected for the command of the II Army Corps. He proceeded to France, but died suddenly on Aug. 17, 1914.

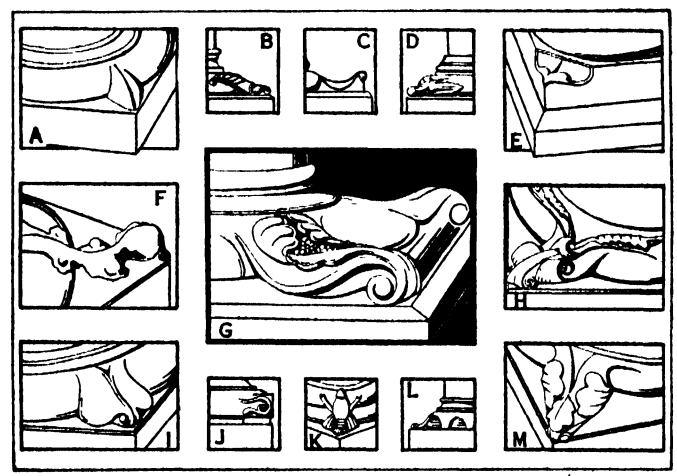
See D. S. Macdiarmid, *Life of Sir James Moncrieff Grierson* (1923).

GRIESBACH, JOHANN JAKOB (1745–1812), German biblical critic, was born at Butzbach on Jan. 4, 1745, and was educated at Frankfort-on-the-Main, at Tubingen, Leipzig and Halle, where he became professor in 1773 Two years later he was translated to Jena, where he died, March 24, 1812

Griesbach's fame rests upon his New Testament criticism. His critical edition of the New Testament, which appeared at Halle (3 vols, 1774–75, partial 3rd ed 1827), was based on the Elzevir edition

GRIESBACH, a watering-place in the grand duchy of Baden, in the valley of the Rench, 1,800 ft above the sea, 6 m west of Freudenstadt in Wurttemberg It is celebrated for its saline chalybeate waters, which were used as early as the 16th century. Pop (1925) 862 From 1665 to 1805 Griesbach was part of the bishopric of Strassburg

GRIFFE, in architecture, a small ornament, generally triangular, which fills the space between the round torus of a column base and the square corner of the plinth below; sometimes known



A, C, D E, F, G, H, I, M FROM VIOLLET LE DUC, "DICTIONNAIRE RAISONNÉ DE L ARCHITECTURE FRANCAISE"

A 11TH CENTURY BASE, B ROMANESQUE GRIFFE, C CATHEDRALE DE LAON D CATHEDRALE DE CARCASSONNE, E CATHEDRALE DE TROYES, F CATHEDRALE DE SENS, G CATHEDRALE DE STROSSBURG, H EGLISE COLLEGEALE DE POISSY I CATHEDRALE DE PARIS, J ST REMY RHEIMS, K CISTERCIAN MONASTERY, MAULBRONN, L ABBEY DES DAMES, M. EGLISE ABBATIALE DE VEZELAY

as a spur The use of the griffe is particularly characteristic of the later Romanesque period, it usually takes the form of a group of leaves or a single curling leaf Grotesque animals are occasionally found

GRIFFENFELDT, PEDER, COUNT (*Peder Schumacher*) (1635–99), Danish statesman, was born at Copenhagen on Aug 24, 1635, of a wealthy trading family He was a precocious child, and received an excellent education In 1654 Schumacher was sent abroad to complete his studies From Germany he proceeded to the Netherlands, staying at Leiden, Utrecht and Amsterdam, and passing in 1657 to Queen's college, Oxford, where he lived three years In the autumn of 1660 Schumacher visited Paris, shortly after Mazarin's death, when the young Louis XIV first seized the reins of power Schumacher seems to have been profoundly impressed by the administrative superiority of a strong centralized monarchy; and, in politics, as in manners, France ever afterwards was his model The last year of his travels was spent in Spain, where he obtained a thorough knowledge of the Castilian language and literature On his return to Copen-

hagen, in 1662, Schumacher found the monarchy established on the ruins of the aristocracy He secured the protection of Kristoffer Gabel, the king's confidant, and in 1663 was appointed the royal librarian. A romantic friendship with the king's bastard, Count Ulric Frederick Gyldenlove, consolidated his position. In 1665 Schumacher obtained his first political post as the king's secretary, and the same year composed the memorable *Kongelov* (*see* DENMARK, *History*).

On the death of Frederick III. (Feb 9, 1670) Schumacher was the most trusted of all the royal counsellors He alone was aware of the existence of the new throne of walrus ivory embellished with three silver life-size lions, and of the new regalia, both of which treasures he had, by the king's command, concealed in a vault beneath the royal castle. Frederick III had also confided to him a sealed packet containing the *Kongelov,* which was to be delivered to his successor alone. Schumacher had been recommended to his son by Frederick III. on his deathbed When, on Feb. 9, 1670, Schumacher delivered the *Kongelov* to Christian V, the king bade all those about him withdraw, and after being closeted a good hour with Schumacher, appointed him his "Obergeheimesekreter." His promotion was rapid In July, 1670, he was ennobled under the name of Griffenfeldt, in November, 1673, he was created a count, a knight of the Elephant and, finally, imperial chancellor. In the course of the next few months he gathered into his hands every branch of the government

On May 25, 1671, the dignities of count and baron were introduced into Denmark "to give lustre to the court"; a few months later the order of the Danebrog was instituted as a fresh means of winning adherents by marks of favour. Griffenfeldt was the originator of these new institutions. To him monarchy was the ideal form of government. But he had also a political object. Griffenfeldt saw that, in future, the first at court would be the first everywhere. He promoted trade and industry by the revival of the *Kammer Kollegium,* or board of trade, and the abolition of some of the most harmful monopolies Both the higher and the provincial administrations were reformed and centralized, and the positions and duties of the magistrates, who now also received fixed salaries, were exactly defined. In the last three years of his administration, Griffenfeldt gave himself entirely to the conduct of the foreign policy of Denmark He aimed at restoring Denmark to the rank of a great power by carefully nursing her resources, and in the meantime securing and enriching her by alliances, which would bring in large subsidies while imposing a minimum of obligations. This policy demanded first, peace, especially peace with Denmark's most dangerous neighbour, Sweden, and, secondly, a sound financial basis, which he expected the wealth of France to supply. Next, Denmark was to beware of making enemies of France and Sweden at the same time. An alliance, on fairly equal terms, between the three powers, would, in these circumstances, be the consummation of Griffenfeldt's "system"; an alliance with France to the exclusion of Sweden would be the next best policy, but an alliance between France and Sweden, without the admission of Denmark, was to be avoided at all hazards. But, despite Griffenfeldt's open protests and subterraneous counter-mining, war was actually declared against Sweden in 1675, and his subsequent policy seemed so obscure and hazardous that his enemies found an opportunity to destroy him

On March 11, 1676, Griffenfeldt was arrested in the king's name and conducted to the citadel, a prisoner of state. On May 3 he was tried by an extraordinary tribunal of 10 dignitaries, and conducted his own defence on a variety of charges. For 46 days before his trial he had been closely confined in a dungeon without lights, books or writing materials. Every legal assistance was illegally denied him Nevertheless he proved more than a match for his accusers. But he was condemned to degradation and decapitation. The primary offence of the ex-chancellor was the taking of bribes, which no twisting of the law could convert into a capital offence, while the charge of treason had not been substantiated Griffenfeldt was pardoned on the scaffold, his sentence being commuted to life-long imprisonment. Denmark's greatest statesman lingered out his life for 22 years in a lonely state-prison, first in the fortress of Copenhagen, and finally at Munkholm on Trondhjem fjord. He died at Trondhjem on March 12, 1699.

See *Danmark's Riges Historie,* vol v. (1897–1905); Jörgenson, *Peter Schumacher-Griffenfeldt* (1893–94), O Vaupell, *Rigskansler Grev Griffenfeldt* (1880–82), Bain, *Scandinavia,* cap x (Cambridge, 1905); K. Fabricius, *Griffenfeldt* (1910), and *Kongeloven* (1920).

(R. N. B.; X.)

GRIFFIN (O'GRIOBTA, O'GREEVA), **GERALD** (1803–1840), Irish novelist and dramatic writer, was born at Limerick Having written a tragedy, *Aguire,* which was highly praised by his friends, he set out in 1823 for London with the purpose of "revolutionizing the dramatic taste of the time by writing for the stage." In spite of the recommendations of John Banim, he had a hard struggle *The Noyades,* an opera entirely in recitative, was produced at the English Opera House in 1826; and the success of *Holland Tide Tales* (1827) led to *Tales of the Munster Festivals* (3 vols, 1827), which were still more popular. In 1829 appeared his fine novel, *The Collegians,* afterwards successfully adapted for the stage by Dion Boucicault under the title of *The Colleen Bawn.* He followed up this success with other novels, and a number of lyrics touched with his native melancholy But he became doubtful as to the moral influence of his writings, and sought admission into a society of the Christian Brothers at Dublin, in Sept 1838, under the name of Brother Joseph He died at Cork of typhus fever on June 12, 1840 Before adopting the monastic habit he burned all his manuscripts; but *Gisippus,* a tragedy which he had composed before he was 20, accidentally escaped destruction, and in 1842 was put on the Drury Lane stage by Macready with great success

The collected works of Gerald Griffin were published in 1842–43 in eight volumes, with a *Life* by his brother William Griffin, M D, an edition of his *Poetical and Dramatic Works* (1895) by C G Duffy, and a selection of his lyrics, with a notice by George Sigerson, is included in the *Treasury of Irish Poetry,* edit by Stopford A Brooke and T. W Rolleston (1900).

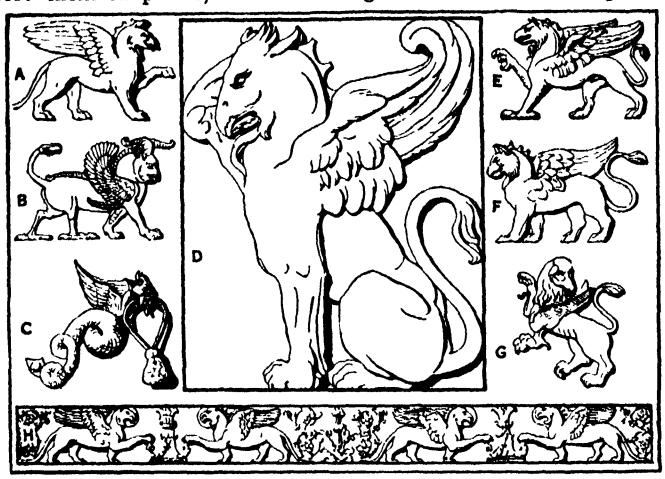
GRIFFIN, SIR LEPEL HENRY (1838–1908), Anglo-Indian administrator, was born at Watford, Herts, on July 20, 1838 He was educated at Brighton and Harrow, and in 1859 entered the Indian civil service, being appointed assistant commissioner in the Punjab on Nov 17, 1860, and permanent chief secretary of the Punjab in Nov 1878 In the later part of the Afghan War, Griffin was chosen to superintend the negotiations at Kabul, where he was only responsible to the military commander Sir Frederick (Earl) Roberts. Griffin carried the negotiations to a successful conclusion, establishing friendly relations with Abdur Rahman, whom he helped to set on the Afghan throne. Griffin was made C S I in 1879 and K C S I in 1881. In Feb. 1881 he became agent to the governor-general in central India, where he remained until his retirement in Jan 1889. After his retirement Griffin became chairman of the Imperial Bank of Persia, and from 1894 until his death he was chairman of the East India Association He died in London on March 9, 1908

His works include *Punjab Chiefs* (Lahore 1865), *The Law of Inheritance to Sikh Chiefships previous to the Annexation* (Lahore, 1869); *The Rajas of the Punjab* (Lahore 1870; 2nd ed London 1873); *The Great Republic* (a criticism of the U S.A. 1884); *Famous Monuments of Central India* (1886); and *Ranjit Singh* (Rulers of India series, 1892)

GRIFFIN, a city of Georgia, U S A, 43m S of Atlanta; the county seat of Spalding county It is on Federal highway 41, and is served by the Central of Georgia and the Southern railways The population was 8,240 in 1920 (32% negroes) Its manufacturing industries include cotton mills with an aggregate of about 5,000 looms and 140,000 spindles in 1928 A United States agricultural experiment station and test-farm is on the outskirts of the city Griffin was founded in 1840 and chartered as a city in 1846

GRIFFIN, GRIFFON or **GRYPHON,** in the natural history of the ancients, the name of a rapacious creature represented with four legs, wings and a beak—the fore part resembling an eagle and the hinder a lion In addition, some writers describe the tail as a serpent (from Fr *griffon,* Lat *gryphus,* Gr γρύψ) This animal, which was supposed to watch over gold mines and hidden treasures, and to be the enemy of the horse, was consecrated to the Sun; and the ancient painters represented the chariot of the

Sun as drawn by griffins According to Spanheim, those of Jupiter and Nemesis were similarly provided. The griffin of Scripture is probably the osprey, and the name is now given to a species of vulture The griffin was said to inhabit Asiatic Scythia, where gold and precious stones were abundant, and when strangers approached to gather these the creatures leapt upon them and tore them in pieces, thus chastising human avarice and greed.



FROM (A,D,E,F) MEYERS, "HANDBOOK OF ORNAMENT" (B) HAMLIN, "HISTORY OF ORNAMENT" (CENTURY CO), (H) D ESPOUY, FRAGMENTS ANTIQUES'

GRIFFIN

A, Greek. B, Syrian. C, on the bronze door of cathedral at Troia D, French Renaissance. E, Roman. F, Renaissance G, from cathedral of Monreale, Sicily H, Frieze from temple of Antoninus and Faustina, Rome

The one-eyed Arimaspi waged constant war with them, according to Herodotus. Sir John de Mandeville, in his *Travels*, described a griffin as eight times larger than a lion

The griffin is frequently seen as a charge in heraldry (*q v*)

GRIFFITH, ARTHUR (1872–1922), Irish politician, was born in Dublin on March 31, 1872 and began his working life as a printer When the Irish party was divided over the Parnell case, Griffith, like Dublin artisans in general, sided with Parnell and against the clergy But the rancorous quarrels which then disfigured Irish politics disgusted young men and led them to despair of success along constitutional lines. New organizations came into existence in Dublin, the most important being the Gaelic League for the revival of the Irish language Griffith joined this movement, but his main activities were with the Celtic Literary Society, the leading figure of which was William Rooney Over and above all these minor groups there existed the Irish Republican Brotherhood or Fenian Society, of which Griffith became a member He went to South Africa in 1896, owing to lack of employment in Dublin, but home-sickness brought him back to Ireland in 1898 In 1899 *The United Irishman*, a weekly paper, was established

Early Writings and Aims.—At first Rooney counted for more in the new movement than Griffith, for he possessed that personal magnetism in which Griffith was lacking, yet after his death in 1901, the paper strengthened rather than weakened No such journalism had appeared in Dublin since the time of Young Ireland It was savagely political; but its politics had an idealism which was foreign to the agrarian revolution Griffith cared passionately for the things of the mind, his own writing had the beauty of trenchant steel, and he welcomed contributions from the best writers in Ireland, W B Yeats, "A E" and the rest No contributor expected to be paid, for all knew that Griffith himself lived on a pittance

Griffith's aim was both destructive and constructive He sought first to divert his countrymen from the attempt to win self-government through parliamentary action at Westminster, and secondly to persuade them to work for it in their own country Although all his intimate associates were Fenians, he recognized that the majority of Irish Nationalists did not think separation from Britain possible. He therefore resigned membership of the I R B, and aimed at winning over the separatists to work for a parliament in Ireland united to that of England only by the link of the Crown. As a means to this end, he proposed passive resistance and an appeal to moral force. Payment of taxes was to be refused. Members elected to parliament were to absent themselves from Westminster, and to sit in Ireland as a council and govern only by the assent of the nation. Tribunals were to be set up to which cases should be brought

Rise of Sinn Féin.—This policy was first publicly announced at a meeting in Dublin in Oct. 1902 The body which met called itself Cumann na nGaedheal or "Society of the Geals" But the name chosen to represent their policy was Sinn Féin, "Ourselves" —Irish words which in their proverbial use mean roughly "Stand together" The name was soon transferred from the policy to its adherents. Candidates were put forward at municipal elections and by 1906 there were 14 Sinn Féiners on the Dublin corporation But Griffith's propaganda was mainly confined to the capital; and in 1907 a member of the Irish party, who resigning his seat, stood for re-election as a Sinn Féiner, was defeated.

The new policy at first did not make much headway. Resistance to taxation proved difficult because all taxation except income tax was indirect, and a large proportion of income tax payers were unionists The only effective forces were the personality and the pen of Arthur Griffith His paper changed its name in 1906 when damages for libel were awarded against the *United Irishman* That journal disappeared, and re-emerged as *Sinn Féin* In 1907, when the Parliamentary party had suffered a reverse, *Sinn Féin* appeared as a daily paper, but this experiment soon had to be abandoned, and after another bankruptcy *Eire* became its name Griffith wrote no books. but he published in 1905 a pamphlet called *The Resurrection of Hungary* which described how an almost vanished language had been restored to national use, and how the elected deputies of an ancient nation, through a policy of abstention from the Austrian Assembly, gained full freedom under a dual monarchy

The Volunteer Movement.—Griffith, during these years, taught the rising generation to despise and distrust not only the methods but the character of those who were then leading the main national movement and he was not too scrupulous in his modes of attack. Yet when it became clear in 1911 that a Home Rule Bill was seriously intended, he announced his intention not to hamper Redmond But the measure proposed was wholly unlike his ideal and he condemned it root and branch, his most furious opposition being directed against that partition of Ireland which he was later constrained to accept In the shaping of events, neither he nor his paper counted for much till the growth of the Ulster Volunteers revived the hopes of the physical force party Griffith supported the counter-organization of the Irish Volunteers by word and deed He was one of those who received the rifles landed at Howth in July 1914 At the outbreak of the World War the Volunteers split, nine-tenths of them adhering to Redmond in support of the British cause but the remainder, active and determined, remained in Ireland; and Griffith's paper was their main organ The censorship attacked it, but instead of *Eire,* there came out *Scissors and Paste,* a journal consisting of extracts from war news arranged to give an impression very unfavourable to the Allies It was only one of many journals Griffith had founded a school, a "mosquito press" and had set the example of tenacity and courage

The Easter Rising.—The Easter Rising of 1916 was a surprise to the majority of Irishmen Griffith took no part in it, and thereby lost influence with the extremists But the British authorities remedied this by putting him into Frongoch, the detention camp in Wales, which became a crowded academy of Sinn Féin Yet when, in July 1917, the prisoners were released, de Valera was chosen as their leader Griffith proposed this election at the convention of Sinn Féin, while he himself returned to his desk, re-issuing his paper as *Nationality;* this also was suppressed and re-appeared as *Eire Og.* He was again put in gaol in 1918 At the general election after the armistice, Sinn Féin swept the board outside Ulster, and Griffith's policy was put into force The elected members (such as were not in prison) assembled as Daíl Eireann, the Irish parliament But, going beyond Griffith's plan, they declared for an Irish republic, electing de Valera as president and Griffith as vice-president Both these men were then prison-

ers; but after some months the president escaped and Griffith was liberated.

Griffith as Leader.—During de Valera's absence in America, from June 1919 to the close of 1920, Griffith acted as head of the "Irish Republic." His policy now was carried out in its entirety. The elected bodies, county councils and municipalities refused to take orders from the British authorities in Dublin Castle; Sinn Féin courts were set up and functioned with notable success; income tax was withheld But these forms of passive resistance were effective only because active resistance was in progress Griffith neither launched nor controlled the guerilla war, to the pressure of which England finally yielded During that struggle, power rested with Collins and other young men Yet Griffith had still a great part to play. When the truce was proclaimed and negotiations were opened in July 1921, de Valera refused to accept the responsibility of abating the full separatist demand Griffith thereupon undertook the leadership of the delegation which finally secured the inclusion in the treaty of the substance of Sinn Féin's original demand

Many of those who supported him would not accept the full consequences of the treaty, and when Mr de Valera resigned, Griffith was elected president, not of the Free State, but of the republic, and the army continued to be in theory the republican army To meet the difficulty, Griffith set up a provisional government with Michael Collins as chairman to carry on till a general election should have ratified the treaty. This resulted in an illogical division of authority, and as months passed Griffith's public utterances as president were often contradicted by the action or inaction of the provisional government During the final discussions with the British government in June 1922, concerning the treaty, he interviewed the leading Irish unionists and pledged himself to secure them full representation in the public life of the Free State. His conception of Ireland was less narrowly Gaelic than that of Sinn Féin in general After the elections on June 16, when a plain verdict was given for acceptance of the treaty, the government was at last forced to take action against the mutinous section of the army Civil war began on June 27 In July the main bodies of the Irregulars were everywhere decisively beaten, and on Aug. 11 a force sent round by sea occupied Cork, the last important town to be regained On the morning of Aug 12 Griffith fell dead suddenly on the way to his office in Dublin The strain had killed him, and the completion of his life work was left to a younger generation Essentially he must rank as a publicist, an educator, an inspirer of action Few men in history have accomplished more for their country than he by his unpaid pen (S G)

GRIFFITH, SIR RICHARD JOHN (1784–1878), Irish geologist, was born in Dublin on Sept 20, 1784 In 1809 he was appointed by the Irish commissioners to inquire into the nature and extent of the bogs in Ireland, and the means of improving them In 1812 he was elected professor of geology and mining engineer to the Royal Dublin Society He made a geological map of Ireland, and in 1825 executed the boundary survey of Ireland, the object of which was to ascertain and mark the boundaries of every county, barony, parish and townland in preparation for the ordnance survey This work was finished in 1844 He was also called upon to assist in preparing a bill for the general valuation of Ireland, the act was passed in 1826, and Griffith acted as commissioner of valuation, 1868 On "Griffith's valuation" the local and public assessments were made New and improved editions of his geological map were published in 1835, 1839 and 1855 For this great work and his other services to science he was awarded the Wollaston medal by the Geological Society in 1854. In 1850 he was made chairman of the Irish Board of Works, and in 1858 he was created a baronet He died in Dublin on Sept 22, 1878

Among his many geological works the following may be mentioned *Outline of the Geology of Ireland* (1838), *Notice respecting the Fossils of the Mountain Limestone of Ireland, as compared with those of Great Britain, and also with the Devonian System* (1842) *See* memoirs in *Quart. Journ Geol. Soc.* xxxv. 39; and *Geol Mag*, 1878, p. 524, with bibliography.

GRIFFITH, SIR SAMUEL WALKER (1845–1920), Australian lawyer and statesman, was born at Merthyr Tydfil on June 21, 1845, the son of the Rev Edward Griffith, afterwards of Brisbane He was educated at the university of Sydney In 1867 he was called to the bar in Queensland, New South Wales and Victoria He became Q C in 1876. He entered the legislative assembly of Queensland (1872). After holding a series of high offices he became (1903) the first chief justice of the Australian Commonwealth, and held that office until 1919 He was the chief bulwark of the Conservative cause in Australia and his clear intellect, never influenced by passion and rarely by sympathy, has left a deep stamp on Australian life He published *The Queensland Criminal Code*, and a translation of Dante's *Divina Commedia* (1912). He died at Brisbane on Aug 9, 1920

GRIFFITHS, JOHN WILLIS (1809–1882), American naval architect, was born in New York city on Oct 6, 1809 He was apprenticed to his father's trade of shipwright, and at the age of 19 laid the lines of the frigate "Macedonia" In 1835 he suggested the ram for the bow of warships, in 1836 published a series of articles embodying his ideas on shipbuilding in the *Advocate*, at Portsmouth, Va; in 1842 gave a series of lectures on naval architecture in New York city and elsewhere, the first notable discourses on the subject to be given in the United States In the same year he opened a free school for instruction in shipbuilding. In 1841, he proposed departures from the accepted standards in ship construction, exhibiting a model at the American Institute in February of that year, and in 1843 began the construction of a ship embodying his proposals for William H Aspinwall, a New York-China merchant This ship, christened the "Rainbow" and launched in 1845, was the first renowned clipper, and introduced a new era in shipbuilding

Continuing his experiments, Griffiths invented, in 1848, iron keelsons for wooden ships, and in 1851 exhibited a steamboat model at the World's Exhibition in London, which attracted wide attention Three years later he built for William Norris of Philadelphia, a steamer which made the record for speed between Havana and New Orleans He became co-editor and associate proprietor of the *Nautical Magazine* and *Naval Journal* in 1856, but upon his appointment by the U S Government as special naval constructor in 1858, the magazine ceased publication He then built the U S gunboat "Pawnee" incorporating several new features, including twin screws and a drop bilge, which was one of the widest and lightest draught vessels of similar displacement ever built Then followed a series of inventions· bilge keels to prevent rolling in 1863, a timber bending machine which he used with success in the "New Era," Boston, 1870, and triple screws for great speed in 1866 He was engaged by the U S Government in 1871–72 to erect timber bending machinery, and in 1872 built the "Enterprise" for the Government at Portsmouth, N H His timber bending machines were awarded two prizes at the Centennial Exposition in Philadelphia in 1876 In 1879–82, he was engaged in editorial work on the *American Ship*, a New York city weekly journal He died in Brooklyn, N Y, on April 29, 1882

His *Treatise on Marine and Naval Architecture* (2 vol 1850) was republished in England, and brought him recognition from many maritime nations His other published works include *The Shipbuilder's Manual* (2 vol., 1853); *The Progressive Shipbuilder* (2 vol, 1875–76).

GRIGNARD REAGENTS. Magnesium is unique amongst the chemical elements in the application which it finds in synthetic organic chemistry by virtue of its power of dissolving readily in solutions of many organic compounds which contain chlorine, bromine, or iodine as a constituent atom in their molecules Thus, if magnesium is added to methyl iodide dissolved in pure dry ether, a vigorous ebullition soon develops, and after a short time the magnesium completely disappears The solution obtained is termed a Grignard reagent, so named after its discoverer V Grignard who first carried out this reaction in 1900 In the previous year P Barbier had found that magnesium may be used to bring about the synthesis of the organic compound dimethylheptenol, and this suggested the above experiment to Grignard Magnesium will dissolve in ethereal solutions of a wide range of substances which are constituted similarly to methyl iodide (alkyl and aryl halides and substituted derivatives of these), but all halogen compounds of this class do not react with equal facility In all cases success in the preparation of these reagents depends on the use of

pure materials; the presence of water must be carefully avoided, or immediate decomposition of the reagents will be brought about

Grignard reagents have proved of the greatest utility in organic chemistry as a means of effecting the syntheses of an extensive variety of substances. The preparation of the Grignard reagent methyl magnesium iodide, and the synthesis of phenylmethylcarbinol by means of this afford a typical illustration of the manner in which these reagents are prepared and used. Methyl iodide dissolved in ether is slowly added to magnesium covered with ether. Reaction soon commences and is carefully regulated by efficient cooling When this stage of the reaction is complete, benzaldehyde dissolved in ether is added drop by drop to the well-cooled and vigorously stirred solution Each drop causes a hissing sound on striking the Grignard solution and an additive compound between the reagent and benzaldehyde shortly begins to separate Decomposition of this by means of water and dilute acid yields phenylmethylcarbinol dissolved in the ethereal layer, from which it is separated, after drying, by distillation As benzaldehyde and methyl magnesium iodide can react to give products other than phenylmethylcarbinol (viz , benzyl alcohol, acetophenone, phenyl styryl ketone, dibenzoylmethane, and $\alpha\alpha'$- diphenyldiethyl ether), it is necessary in the experiment above described to adhere to exact conditions with regard to quantities and details of working.

Symbolically the preparation of phenylmethylcarbinol is represented as follows

(1) Preparation of reagent: $CH_3I+Mg \rightarrow CH_3{\cdot}MgI$

(2) Formation of additive compound.

$$C_6H_5{\cdot}CH=O+CH_3{\cdot}MgI \rightarrow C_6H_5{\cdot}CH\begin{matrix}<^{OMgI}\\ _{CH_3}\end{matrix}$$

(3) Decomposition of additive compound

$$C_6H_5{\cdot}CH\begin{matrix}<^{OMgI}\\ _{CH_3}\end{matrix}+H_2O \rightarrow C_6H_5{\cdot}CH\begin{matrix}<^{OH}\\ _{CH_3}\end{matrix}+Mg\begin{matrix}<^{I}\\ _{OH}\end{matrix}$$

Although the Grignard reagent is represented as $CH_3{\cdot}MgI$ in (1), each molecule is actually combined with some of the solvent ether Thus by evaporation of the ethereal solution under specified conditions, a compound of the composition $CH_3MgI\ (C_2H_5)_2O$ may be obtained, but the exact structure of this remains a matter for varied opinion By heating more strongly, CH_3MgI may be prepared. The ethereal solution is, however, employed for synthetic purposes, and the equation is represented as above, since the products formed by the use of Grignard reagents may be accurately accounted for whilst ignoring the combined ether of the reagent

The reaction given is one of a general type, namely, the reaction between Grignard reagents and compounds containing the carbonyl grouping ($>C=O$) By such reactions, alcohols, unsaturated hydrocarbons, and acids may be readily prepared Frequently in addition to the carbonyl group a second grouping may also undergo reaction as in the formation of tertiary alcohols from esters. Many reactions of types quite different from these are known, however, and the examples here cited provide only the most fragmentary indication of the application of Grignard reagents; for detailed summaries of original investigations *see* Alex. McKenzie, *British Association Report*, 1907, p 273; Henry Wren, "Organo-metallic Compounds of Zinc and Magnesium" (1913), Chemical Society (London), *Annual Reports*, 1915, vol xii , p 97; 1925, vol. xxii , p. 121. (A. M. W)

GRIGOROVICH, DMITRI VASILIEVICH (1822–1900), Russian writer, was born on March 31, 1822, at Simbirsk He began his career as an artist, but in 1846–47 made his mark in literature by stories of peasant life, *The Village*, and *Anton Goremyka* In these he attempted a description of village life from the village point of view; but the importance of the books lies rather in the idea than in actual performance After 1860 he gave up fiction except for occasional magazine stories His real service to Russian literature was his instant appreciation of Dostoievsky and Chekhov. He died on Jan. 3, 1900, at St. Petersburg (Leningrad).

GRILLE, a French term for an enclosure in either iron or bronze; there is no equivalent in English, "grating" applying more to a horizontal frame of bars over a sunken area, and "grate" to the iron bars of an open fireplace. The finest examples of the grille are those known as the *rejas,* which in Spanish churches form the enclosures of chapels, such as the *reja* in the Capilla Real at Granada in wrought iron partly gilt (1522). Similar grilles are employed to protect the ground-floor windows of mansions not only in Spain but in Italy and Germany The finest grilles in Italy are the enclosures of the tombs of the Della Scalas at Verona (end of 13th century), in Germany the grille of the cenotaph of Maximilian at Innsbruck (early 16th century) and in France those which enclose the Place Stanislaus, the Place de la Carrière and the churches of Nancy, which were wrought by Jean Lamour in the middle of the 18th century. Generally, however, throughout Germany the wrought iron grilles are fine examples of forging, and they are employed for the enclosures of the numerous fountains, in the tympana of gateways, and for the protection of windows.

GRILLPARZER, FRANZ (1791–1872), the greatest dramatic poet of Austria, was born in Vienna, on Jan. 15, 1791 His father, severe, pedantic, a staunch upholder of the liberal traditions of the reign of Joseph II , was an advocate of some standing; his mother, a nervous, finely-strung woman, belonged to the well-known musical family of Sonnleithner After a desultory education, Grillparzer entered in 1807 the University of Vienna as a student of jurisprudence; but two years later his father died, leaving the family in straitened circumstances, and Franz, the eldest son, was obliged to turn to private tutoring He became a clerk in the Lower Austrian revenue administration, and in 1818 poet to the Hofburgtheater, and a clerk in the *Hofkammer* (exchequer), in 1832 he became director of the archives of that department, and in 1856 retired from the civil service.

In 1817 the first representation of his tragedy *Die Ahnfrau* made him famous, but before this he had written a long tragedy, in iambics, *Blanca von Castilien* (1807–09), which was obviously modelled on Schiller's *Don Carlos;* also the dramatic fragments *Spartacus* and *Alfred der Grosse* (1809) *Die Ahnfrau* is a gruesome "fate-tragedy" in the trochaic measure of the Spanish drama, already made popular by Adolf Mullner in his *Schuld,* but Grillparzer's work is a play of real poetry, and reveals an instinct for dramatic as opposed to merely theatrical effect, which distinguishes it from other "fate-dramas" of the day *Die Ahnfrau* was followed by *Sappho* (1818), a drama in the classic spirit of Goethe's *Tasso* In 1821 appeared *Das goldene Vliess,* a trilogy which had been interrupted in 1819 by the death of the poet's mother—in a fit of depression she had taken her own life—and a subsequent visit to Italy Opening with a powerful dramatic prelude in one act, *Der Gastfreund,* Grillparzer depicts in *Die Argonauten* Jason's adventures in his quest for the Fleece; while *Medea,* a tragedy of noble classic proportions, contains the culminating events of the story The theme is similar to that of *Sappho,* but the scale on which it is represented is larger, it is again the tragedy of the heart's desire, the conflict of the simple happy life with that sinister power—be it genius, or ambition—which upsets the equilibrium of life The end is bitter disillusionment, the only consolation renunciation

For his historical tragedy *König Ottokars Gluck und Ende* (1823, but owing to difficulties with the censor, not performed until 1825), Grillparzer chose one of the most picturesque events in Austrian domestic history, the conflict of Ottokar of Bohemia with Rudolph von Habsburg He reproduced the motley world of the old chronicler, without losing sight of the exigencies of the theatre; the fall of Ottokar is but another text from which the poet preached the futility of endeavour and the vanity of worldly greatness A second historical tragedy, *Ein treuer Diener seines Herrn* (1826, performed 1828), attempts to embody a more heroic gospel; but the subject—the superhuman self-effacement of Bankbanus before Duke Otto of Meran—proved too uncompromising an illustration of Kant's categorical imperative of duty to be palatable in the theatre

With these historical tragedies began the darkest ten years in the poet's life They brought him into conflict with the Austrian censor—a conflict which grated on Grillparzer's sensitive soul, and was aggravated by his position as a civil servant, in 1826 he paid a visit to Goethe in Weimar, and was able to compare the enlightened conditions which prevailed in the little Saxon duchy with the intellectual thraldom of Vienna In the winter of 1820–21 he had met for the first time Katharina Fröhlich (1801–79), and

the acquaintance rapidly ripened into love on both sides; but whether owing to a presentiment of mutual incompatibility, or merely owing to Grillparzer's conviction that life had no happiness in store for him, he shrank from marriage. Whatever the cause may have been, the poet was plunged into an abyss of misery and despair to which his diary bears heart-rending witness; his sufferings found poetic expression in the fine cycle of poems bearing the significant title *Tristia ex Ponto* (1835).

To these years we owe the completion of two of Grillparzer's greatest dramas, *Des Meeres und der Liebe Wellen* (1831) and *Der Traum, ein Leben* (1834). In the former tragedy, a dramatization of the story of Hero and Leander, he returned to the Hellenic world of *Sappho*, and produced what is perhaps the finest of all German love-tragedies His mastery of dramatic technique is here combined with a ripeness of poetic expression and with an insight into motive which suggests the modern psychological drama of Hebbel and Ibsen; the old Greek love-story of Musaeus is, moreover, endowed with something of that ineffable poetic grace which the poet had borrowed from the great Spanish poets, Lope de Vega and Calderon. *Der Traum, ein Leben*, Grillparzer's technical masterpiece, is in form perhaps even more Spanish; it is also more of what Goethe called a "confession" The aspirations of Rustan, an ambitious young peasant, are shadowed forth in the hero's dream, which takes up nearly three acts of the play; ultimately Rustan awakens from his nightmare to realize the truth of Grillparzer's own pessimistic doctrine that all earthly ambitions and aspirations are vanity, the only true happiness is contentment with one's lot, "des Innern stiller Frieden und die schuldbefreite Brust." *Der Traum, ein Leben* was the first of Grillparzer's dramas which did not end tragically, and in 1838 he produced his only comedy, *Weh' dem, der lugt*

But *Weh' dem, der lugt*, in spite of its humour of situation, its sparkling dialogue and the originality of its idea—namely, that the hero gains his end by invariably telling the truth, where his enemies as invariably expect him to be lying—was too strange to meet with approval in its day Its failure was a blow to the poet, who turned his back for ever on the German theatre. In 1836 Grillparzer paid a visit to Paris and London, in 1843 to Athens and Constantinople Then came the Revolution which struck off the intellectual fetters under which Grillparzer and his contemporaries had groaned in Austria, but the liberation came too late for him Honours were heaped upon him, he was made a member of the Academy of Sciences, Heinrich Laube, as director of the Burgtheater, reinstated his plays on the repertory, he was in 1861 elected to the Austrian *Herrenhaus;* his 80th birthday was a national festival, and when he died in Vienna, on Jan. 21, 1872, the mourning of the Austrian people was universal With the exception of a beautiful fragment, *Esther* (1861), Grillparzer published no more dramatic poetry after the fiasco of *Weh' dem, der lugt*, but at his death three completed tragedies were found among his papers Of these, *Die Judin von Toledo*, an admirable adaptation from the Spanish, has won a permanent place in the German classical repertory, *Ein Bruderzwist im Hause Habsburg* is a powerful historical tragedy and *Libussa* is perhaps the ripest, as it is certainly the deepest, of all Grillparzer's dramas

Although Grillparzer was essentially a dramatist, his lyric poetry is in the intensity of its personal note hardly inferior to Lenau's As a prose writer, he has left one powerful short story, *Der arme Spielmann* (1848), and a volume of critical studies on the Spanish drama, which shows how completely he had succeeded in identifying himself with the Spanish point of view

Grillparzer's brooding, unbalanced temperament, his lack of will-power, his pessimistic renunciation and the bitterness which his self-imposed martyrdom produced in him, made him peculiarly adapted to express the mood of Austria in the epoch of intellectual thraldom that lay between the Napoleonic wars and the Revolution of 1848; his poetry reflects exactly the spirit of his people under the Metternich régime, and there is a deep truth behind the description of *Der Traum, ein Leben* as the Austrian *Faust* His fame was in accordance with the general tenor of his life; even in Austria a true understanding for his genius was late in coming, and not until the centenary of 1891 did the German-speaking world realize that it possessed in him a dramatic poet of the first rank; in other words, that Grillparzer was no mere "Epigone" of the classic period, but a poet who, by a rare assimilation of the strength of the Greeks, the imaginative depth of German classicism and the delicacy and grace of the Spaniards, had opened up new paths for the higher dramatic poetry of Europe

Grillparzer's *Samtliche Werke* are edited by A Sauer, in 20 vols (5th ed , Stuttgart, 1892–94) , also, since the expiry of the copyright in 1901, innumerable cheap reprints *Briefe und Tagebucher*, edit by C Glossy and A Sauer (2 vols , Stuttgart, 1903) *Jahrbuch der Grillparzer-Gesellschaft*, edit. by K Glossy (the publication of the Grillparzer Society) (Vienna, 1891 ff) *See* also H Laube, *Franz Grillparzers Lebensgeschichte* (Stuttgart, 1884) , J Volkelt, *Franz Grillparzer als Dichter des Tragischen* (Nordlingen, 1888) , E Reich, *Franz Grillparzers Dramen* (Dresden, 1894) ; A Ehrhard, *Franz Grillparzer* (Paris, 1900, German trans. by M Necker, Munich, 1902) ; H Sittenberger, *Grillparzer, sein Leben und Wirken* (1904) , Gustav Pollak, *F Grillparzer and the Austrian Drama* (1907) , F E. Gruber, *Franz Grillparzer und seine Buhnenwerke* (1922) Of Grillparzer's works, translations have appeared in English of *Sappho* (1820, by J. Bramsen; 1846, by E B Lee; 1855, by L. C Cumming, 1876, by E. Frothingham) ; and of *Medea* (1879, by F. W. Thurstan and J A Wittmann) Byron's warm admiration of *Sappho* (*Letters and Journals*, v. 171) is well known, while Carlyle's criticism, in his essay on *German Playwrights* (1829), is interesting as expressing the generally accepted estimate of Grillparzer in the first half of the 19th century *See* the bibliography in K Goedeke's *Grundriss zur Geschichte der deutschen Dichtung*, 2nd ed., vol viii. (1905). (J G R)

GRIMALD or **GRIMOALD, NICHOLAS** (1519–1562), English poet, was born in Huntingdonshire, the son probably of Giovanni Baptista Grimaldi, who had been a clerk in the service of Empson and Dudley in the reign of Henry VII He studied both at Cambridge and Oxford In 1547 he was lecturing on rhetoric at Christ Church, and shortly afterwards became chaplain to Bishop Ridley, who, when he was in prison, desired Grimald to translate Laurentius Valla's book against the alleged *Donation of Constantine*, and the *De gestis Basiliensis Concilii* of Aeneas Sylvius (Pius II) His connection with Ridley brought him under suspicion, and he was imprisoned in the Marshalsea. It is said that he escaped the penalties of heresy by recanting his errors Grimald contributed to the original edition (June 1557) of *Songes and Sonettes* (commonly known as *Tottel's Miscellany*), 40 poems, only ten of which were retained in the second edition published in the next month He translated (1553) Cicero's *De officus* as *Marcus Tullius Ciceroes thre bokes of duties* (2nd ed , 1556) Two Latin tragedies also are extant; *Archipropheta sive Johannes Baptista*, printed at Cologne in 1548, probably performed at Oxford the year before, and *Christus redivivus* (Cologne, 1543), edited by Prof J M Hart (for the Modern Language Association of America, 1886, separately issued 1899) As a poet Grimald is memorable as the earliest follower of Surrey in the production of blank verse He writes sometimes simply enough, as in the lines on his own childhood addressed to his mother, but in general his style is artificial

See C H Herford, *Studies in the Literary Relations of England and Germany* (pp 113–119, 1886), *A Catalogue of printed books . . by writers bearing the name of Grimaldi* (ed A B Grimaldi), printed 1883; and Arber's reprint of *Tottel's Miscellany*.

GRIMALDI, GIOVANNI FRANCESCO (1606–1680), Italian architect, painter and engraver, was born at Bologna He studied art under the Caracci and under Albani In 1626 he went to Rome and was appointed architect to Pope Paul V , and was also patronized by succeeding popes In 1649 he was invited to France by Cardinal Mazarin, and for about two years was employed on the decoration of the Palais Mazarin (now the Bibliothéque Nationale) and of other buildings. Returning to Rome in 1651 he was made president of the Academy of St Luke, and in that city he died on Nov 28, 1680. Paintings by Grimaldi are preserved in the Quirinal and Vatican palaces, in the church of S. Martino a'Monti and in the Borghese and Doria Galleries

GRIMALDI, JOSEPH (1779–1837), most celebrated of English clowns, was born in London on Dec 18, 1779, the son of an Italian actor. When less than two years old he was brought upon Drury Lane stage, at the age of three he appeared at Sadler's Wells, and he did not retire until 1828 As the clown of

pantomime he was considered without an equal, his greatest success being in *Mother Goose*, at Covent Garden (1806 and often revived) Grimaldi died on May 31, 1837. His *Memoirs* (2 vols, 1838), were edited by Charles Dickens.

GRIMKÉ, SARAH MOORE, and **ANGELINA EMILY** (1792–1873) and (1805–1879), American reformers, born in Charleston (S C)—Sarah on Nov. 6, 1792, and Angelina on Feb 20, 1805 In 1821 Sarah, then visiting Philadelphia, became a Quaker, so, too, did Angelina, who joined her in 1829 Both sisters were strong abolitionists In 1836 they came to New York Angelina then published her *Appeal to the Christian Women of the South*, and at the end of that year Sarah wrote an *Epistle to the Clergy of the Southern States*. In the same year, at the invitation of the American Anti-slavery Society, Angelina, accompanied by Sarah, began giving talks on slavery, first in private and then in public While the sisters were in Massachusetts the General Association of Congregational Ministers of Massachusetts issued a letter calling on the clergy to close their churches to women exhorters Garrison denounced the attack on the Grimké sisters and Whittier ridiculed it in his poem, "The Pastoral Letter" Angelina pointedly answered *Miss Beecher on the Slave Question* (1837) in letters in the *Liberator*. Sarah, who had never forgotten that her studies had been curtailed because she was a girl, contributed to the Boston *Spectator* papers on "The Province of Woman" and published *Letters on the Condition of Women and the Equality of the Sexes* (1838), the real beginning of the "woman's rights" movement in America, and at the time a cause of anxiety to Whittier and others, who urged upon the sisters the prior importance of the anti-slavery cause In 1838 Angelina married Theodore Dwight Weld (1803–95). She and her husband, accompanied by Sarah, resided at Fort Lee (N J), from 1838 to 1840, then at Belleville (N J) They conducted a school for black and white alike at Eagleswood, near Perth Amboy Sarah died on Dec. 23, 1873, and Angelina on Oct 26, 1879 *See* Catherine H Birney, *The Grimké Sisters* (1885)

GRIMM, FRIEDRICH MELCHIOR, Baron von (1723–1807), French author, the son of a German pastor, was born at Ratisbon on Dec 26, 1723 He studied at Leipzig, where he came under the influence of Gottsched and J A Ernesti, and was afterwards attached to the household of Count Schonberg In 1748 he accompanied August Heinrich, Count Friesen, to Paris as secretary, and he is said by Rousseau to have acted for some time as reader to Frederick, the young hereditary prince of Saxe-Gotha In 1753 Grimm, following the example of the abbé Raynal, began a literary correspondence with various German sovereigns Raynal's letters, *Nouvelles littéraires*, ceased early in 1755, and, with the aid of friends (especially Diderot and Mme d'Épinay) during his temporary absences from France, he carried on the correspondence, which consisted of two letters a month, until 1773, eventually counting among his subscribers Catherine II of Russia, Stanislas Poniatowski, king of Poland, and many princes of the smaller German States It was probably in 1754 that Grimm was introduced by Rousseau to Mme d'Épinay, with whom he soon formed a *liaison* which led to an irreconcilable rupture between him and Rousseau, the latter in his resentment giving in his *Confessions* a wholly mendacious portrait of Grimm's character In 1755, Grimm became *secrétaire des commandements* to the duke of Orleans, and in this capacity accompanied Marshal d'Estrées on the campaign of Westphalia in 1756–57 He was named envoy of the town of Frankfort at the court of France in 1759, but was deprived of his office for criticizing the comte de Broglie in a despatch intercepted by Louis XV. He was made a baron of the Holy Roman Empire in 1775

His introduction to Catherine II took place at St Petersburg in 1773, at the marriage of Wilhelmine to the tsarevich Paul He became minister of Saxe-Gotha at the court of France in 1776, but in 1777 he again left Paris on a visit to St Petersburg, where he remained for nearly a year in daily intercourse with Catherine He acted as Paris agent for the empress in the purchase of works of art, and executed many confidential commissions for her In 1783 and the following years he lost his two most intimate friends, Mme d'Épinay and Diderot In 1792 he emigrated, and in the next year settled in Gotha, where his poverty was relieved by Catherine, who in 1796 appointed him minister of Russia at Hamburg. On the death of Catherine he took refuge with Mme. d'Épinay's granddaughter, Émilie de Belsunce, comtesse de Bueil. He died at Gotha on Dec. 19, 1807.

The correspondence of Grimm was not divulged during his lifetime It embraces nearly the whole period from 1750 to 1790, but the volumes from 1773 were chiefly the work of his secretary, Jakob Heinrich Meister At first he contented himself with giving views on literature and art and indicating very slightly the contents of the principal new books; but gradually his criticisms became more extended and trenchant, and he touched on nearly every subject—political, literary, artistic, social and religious—which interested contemporary Paris

Grimm's *Correspondance littéraire, philosophique et critique . . . , depuis 1753 jusqu'en 1769*, was edited, with many excisions, by J B A Suard and published at Paris in 1812, in 6 vols, 8vo, *deuxième partie, de 1771 à 1782*, in 1812 in 5 vols, 8vo; and *troisième partie, pendant une partie des années 1775 et 1776, et pendant les années 1782 à 1790 inclusivement*, in 1813 in 5 vols 8vo A supplementary volume appeared in 1814, the whole was collected and published by M Jules Taschereau, with the assistance of A Chaudé, in a new edition (Paris, 1829, 15 vols 8vo); the *Correspondance inédite, et recueil de lettres, poésies, morceaux, et fragments retranchés par la censure impériale en 1812 et 1813* was published in 1829 The standard edition is that of M Tourneux (16 vols, 1877–82) Grimm's *Mémoire historique sur l'origine et les suites de mon attachement pour l'impératrice Catherine II jusqu' au décès de sa majesté impériale*, and Catherine's correspondence with Grimm (1774–96) were published by J Grot in 1880, in the *Collection* of the Russian Imperial Historical Society She treats him very familiarly, and calls him Héraclite, Georges Dandin, etc At the time of the Revolution she begged him to destroy her letters, but he refused, and after his death they were returned to St Petersburg Grimm's side of the correspondence, however, is only partially preserved He signs himself "Pleureur" Some of his letters, besides the official correspondence, are included in the edition of M Tourneux, others are contained in the *Erinnerungen einer Urgrossmutter* of K von Bechtolsheim, edited (Berlin, 1902) by Count C Oberndorff *See* also Mme. d'Épinay's *Mémoires*, Rousseau's *Confessions*, E Scherer, *Melchior Grimm* (1887), Sainte-Beuve, *Causeries du lundi*, vol VII, and K A Georges, *Friedrich Melchior Grimm* (Hanover and Leipzig, 1904).

GRIMM, JACOB LUDWIG CARL (1785–1863), German philologist and mythologist, was born on Jan 4, 1785, at Hanau, in Hesse-Cassel His father, who was a lawyer, died while he was a child, and the mother was left with very small means, but her sister, who was lady of the chamber to the landgravine of Hesse, helped to support and educate her numerous family. Jacob, with his younger brother Wilhelm (b Feb. 24, 1786), was sent in 1798 to the public school at Cassel The two brothers studied law at Marburg The lectures of Savigny (*q v*) on Roman law taught Grimm to realize what it meant to study any science Savigny's lectures also awakened in him that love for historical and antiquarian investigation which forms the basis of all his work In Savigny's well-provided library Grimm first turned over the leaves of Bodmer's edition of the Old German minnesingers and other early texts In the beginning of 1805 Savigny, who had removed to Paris, invited him to help him in his literary work Grimm passed a very happy time in Paris, strengthening his taste for the literatures of the middle ages by his studies in the Paris libraries Towards the close of the year he returned to Cassel, where his mother and Wilhelm had settled, and obtained a small clerkship in the War Office. In 1808 he was appointed superintendent of the private library of Jerome Buonaparte, king of Westphalia, and auditor to the State council After the expulsion of Jerome and the reinstalment of an elector, Grimm was appointed in 1813 secretary of legation, to accompany the Hessian minister to the headquarters of the allied army In 1814 he was sent to Paris to demand restitution of the books carried off by the French, and in 1814–15 he attended the congress of Vienna as secretary of legation. On his return he was again sent to Paris on the same errand as before. Meanwhile Wilhelm had received an appointment in the Cassel library, and in 1816 Jacob was made second librarian under Volkel The brothers removed next year to Gottingen, where Jacob received the appointment of professor and librarian, Wilhelm that of under-librarian Jacob Grimm lectured on legal antiquities, historical grammar, literary history,

and diplomatics, explained Old German poems, and commented on the *Germania* of Tacitus. In 1837, being one of the seven professors who signed a protest against the king of Hanover's abrogation of the constitution, he was dismissed from his professorship, and banished from the kingdom of Hanover The brothers returned to Cassel, and in 1840 went to Berlin, where they both received professorships, and were elected members of the Academy of Sciences Jacob seldom lectured, but worked with his brother at the great dictionary. He died on Sept. 20, 1863, working up to the last He was never ill, and worked on all day, without haste and without pause.

The purely scientific side of Grimm's character developed slowly. He seems to have felt the want of definite principles of etymology without being able to discover them, and indeed even in the first edition of his grammar (1819) he seems to be often groping in the dark. The first work he published, *Über den altdeutschen Meistergesang* (1811), was of a purely literary character. Yet even in this essay Grimm showed that *Minnesang* and *Meistersang* were really one form of poetry, of which they merely represented different stages of development, and also announced his important discovery of the invariable division of the *Lied* into three strophic parts. His text-editions were mostly prepared in common with his brother In 1812 they published the two ancient fragments of the *Hildebrandslied* and the *Weissenbrunner Gebet,* Jacob having discovered what till then had never been suspected—the alliteration in these poems However, Jacob had little taste for text-editing, and, as he himself confessed, the evolving of a critical text gave him little pleasure. He therefore left this department to others, especially Lachmann, who soon turned his brilliant critical genius, trained in the severe school of classical philology, to Old and Middle High German poetry and metre. Both brothers were attracted from the beginning by all national poetry, whether in the form of epics, ballads or popular tales. They published in 1816–18 an analysis and critical sifting of the oldest epic traditions of the Germanic races under the title of *Deutsche Sagen* They collected all the popular tales they could find, partly from the mouths of the people, partly from mss and books, and published in 1812–15 the first edition of those *Kinder- und Hausmarchen* which have carried the name of the brothers Grimm into every household of the civilized world, and founded the science of folk-lore The closely allied subject of the satirical beast epic of the middle ages also had a great charm for Jacob Grimm, and he published an edition of the *Reinhart Fuchs* in 1834. His first contribution to mythology was the first volume of an edition of the Eddaic songs, undertaken conjointly with his brother, published in 1815, which, however, was not followed by any more. The first edition of his *Deutsche Mythologie* appeared in 1835. This great work covers the whole range of the subject, tracing the mythology and superstitions of the old Teutons back to the very dawn of direct evidence, and following their decay and loss down to the popular traditions, tales and expressions of his time.

Of all his more general works the boldest and most far-reaching is his *Geschichte der deutschen Sprache,* where at the same time the linguistic element is most distinctly brought forward. He laboriously collects the scattered words and allusions to be found in classical writers, and endeavours to determine the relations in which the German language stood to those of the Getae, Thracians, Scythians, and many other nations whose languages are known only by doubtfully identified, often extremely corrupted remains preserved by Greek and Latin authors Grimm's results have been greatly modified by the work of later scholars; but his book will always be one of the most fruitful and suggestive that have ever been written. His *Deutsche Grammatik* was the outcome of his purely philological work. Grimm himself did not at first intend to include all the languages in his grammar; but he soon found that Old High German postulated Gothic, that the later stages of German could not be understood without the help of the Low German dialects, including English, and that the rich literature of Scandinavia could as little be ignored The first edition of the first part of the *Grammar* appeared in 1819, the second in 1822. While the first edition gives only the inflections, in the second volume phonology takes up no fewer than 600 pages, more than half of the whole volume. Grimm had, at last, awakened to the full conviction that all sound philology must be based on rigorous adhesion to the laws of sound-change Up to Grimm's time philology was nothing but a more or less laborious and conscientious dilettanteism, with occasional flashes of scientific inspiration, he made it into a science His advance must be attributed mainly to the influence of his contemporary R Rask Even in Grimm's first editions his Icelandic paradigms are based entirely on Rask's grammar, and in his second edition he relied almost entirely on Rask for Old English. His debt to Rask can only be estimated at its true value by comparing his treatment of Old English in the two editions, the difference is very great. To Rask belongs the merit of having first distinctly formulated the laws of sound-correspondence in the different languages

Grimm's Law.—The question, Who discovered what is known as *Grimm's law?* is a difficult one This law of the correspondence of consonants in the older Indo-germanic, Low and High German languages respectively was first fully stated by Grimm in the second edition of the first part of his grammar The correspondence of single consonants had been more or less clearly recognized by several of his predecessors; but the one who came nearest to the discovery of the complete law was the Swede J. Ihre, who established a considerable number of "literarum permutationes" Rask, in his essay on the origin of the Icelandic language, gives the same comparisons, with a few additions As Grimm in the preface to his first edition expressly mentions this essay of Rask, there is every probability that it gave the first impulse to his own investigations. But there is a wide difference between the isolated permutations of his predecessors and his comprehensive generalizations The extension of the law to High German is also entirely his own. The importance of Grimm's generalization in the history of philology cannot be overestimated, and even the mystic completeness and symmetry of its formulation, although it has proved a hindrance to the correct explanation of the causes of the changes, impressed the popular mind, and gave it a vivid idea of the paramount importance of law, and the necessity of disregarding mere superficial resemblance.

The grammar was continued in three volumes, treating principally of derivation, composition and syntax, which last was left unfinished Grimm then began a third edition, of which only one part, comprising the vowels, appeared in 1840, his time being afterwards taken up mainly by the dictionary The grammar stands alone for comprehensiveness, method and fullness of detail. Every law, every letter, every syllable of inflection in the different languages is illustrated by an almost exhaustive mass of material It has served as a model for all succeeding investigators. Diez's grammar of the Romance languages is founded entirely on its methods, which have also exerted a profound influence on the wider study of the Indo-Germanic languages in general.

In the great German dictionary Grimm undertook a task on so large a scale as to make it impossible for him and his brother to complete it themselves The dictionary, as far as it was worked out by Grimm himself, may be described as a collection of disconnected antiquarian essays of high value Grimm's patriotism and love of historical investigation received their fullest satisfaction in the study of the language, traditions, mythology, laws and literature of his own countrymen and their nearest kindred But from this centre his investigations were pursued in every direction as far as his unerring instinct of healthy limitation would allow. He was equally fortunate in the harmony that subsisted between his intellectual and moral nature He made cheerfully the heavy sacrifices that science demands from its disciples, without feeling any of that envy and bitterness which often torment weaker natures; and although he lived apart from his fellow men, he was full of human sympathies His was the very ideal of the noblest type of German character

The following is a complete list of his separately published works, those which he published in common with his brother being marked with a star. For a list of his essays in periodicals, etc, *see* vol v. of his *Kleinere Schriften,* from which the present list is taken *Über den altdeutschen Meistergesang* (Gottingen, 1811); **Kinder- und Hausmärchen* (Berlin, 1812–15) (many editions);

**Das Lied von Hildebrand und das Weissenbrunner Gebet* (Cassel, 1812); *Altdeutsche Wälder* (Cassel, Frankfort, 1813–16, 3 vols); **Der arme Heinrich von Hartmann von der Aue* (1815); *Irmenstrasse und Irmensaule* (1815), **Die Lieder der alten Edda* (1815); *Silva de romances viejos* (1815); **Deutsche Sagen* (1816–18, 2nd ed, 1865–66), *Deutsche Grammatik* (Göttingen, 1819, 2nd ed, Gottingen, 1822–40) (reprinted 1870 by W. Scherer, Berlin); *Wuk Stephanovitsch's kleine serbische Grammatik, verdeutscht mit einer Vorrede* (Leipzig and Berlin, 1824); *Zur Recension der deutschen Grammatik* (Cassel, 1826); **Irische Elfenmarchen, aus dem Englischen* (Leipzig, 1826), *Deutsche Rechtsaltertumer* (Gottingen, 1828, 2nd ed, 1854); *Hymnorum veteris ecclesiae XXVI interpretatio theodisca* (Gottingen, 1830); *Reinhart Fuchs* (1834); *Deutsche Mythologie* (Gottingen, 1835, 3rd ed, 1854, 2 vols); *Tacitι Germania edidit* (Göttingen, 1835); *Über meine Entlassung* (Basle, 1838); (together with Schmeller) *Lateinische Gedichte des X und XI Jahrhunderts* (Gottingen, 1838), *Sendschreiben an Karl Lachmann uber Reinhart Fuchs* (1840); *Weistumer*, Th i (Gottingen, 1840) (continued, partly by others, in 5 parts, 1840–69); *Andreas und Elene* (Cassel, 1840); *Frau Aventure* (1842), *Geschichte der deutschen Sprache* (Leipzig, 1848, 3rd ed, 1868, 2 vols); *Das Wort des Besitzes* (1850); **Deutsches Worterbuch*, Bd i. (Leipzig, 1854); *Rede auf Wilhelm Grimm und Rede uber das Alter* (1868, 3rd ed, 1865), *Kleinere Schriften* (1864–70, 5 vols)

(H Sw, **X**)

Grimm's *Selbstbiographie* is printed in his *Kleinere Schriften* His correspondence with other savants has been printed at intervals from 1877 onwards. *See* W. Scherer, *Jacob Grimm* (2nd ed. 1885, new ed., 1925), and various monographs by R Steig

GRIMM, ROBERT (1881–), Swiss socialist, was born on April 16, 1881 From 1899 to 1905 he worked as a foreman printer in Switzerland and abroad From 1906 to 1909 he acted as secretary to the labour organization at Basle, and from 1909 edited the *Berner Tagwacht* for nine years During the latter period he was elected (1916) member of the *grand conseil bernois*, of which he became president in 1922–23 In 1911 he was elected *conseiller national* and was an active leader of the Swiss socialist party In 1919, owing to his conduct during the general strike of 1918, he was sentenced to six months' imprisonment on a charge of inciting to disorder These events also led to his defeat in the election of president of the *Conseil national* in 1926, although he was the official candidate of his party

Grimm is the author of *Histoire de la Suisse dans les luttes de classe*

GRIMM, WILHELM CARL (1786–1859) For the chief events in the life of Wilhelm Grimm *see* article on Jacob Grimm above As Jacob himself said in his celebrated address to the Berlin Academy on the death of his brother, the whole of their lives were passed together In their schooldays they had one bed and one table in common, as students they had two beds and two tables in the same room, and they always lived under one roof, and had their books and property in common Nor did Wilhelm's marriage in any way disturb their harmony As Cleasby said ("Life of Cleasby," prefixed to his *Icelandic Dictionary*, p lxix), "they both live in the same house, and in such harmony and community that one might almost imagine the children were common property" Cleasby describes Wilhelm as "an uncommonly animated, jovial fellow" He was, accordingly, much sought in society, which he frequented much more than his brother

His first work was a spirited translation of the Danish *Kaempeviser, Altdänische Heldenlieder*, published in 1811–13, which made his name at first more widely known that that of his brother Of his other works the most important is *Deutsche Heldensage* (2nd ed 1868)

GRIMMA, a town in the republic of Saxony, on the left bank of the Mulde, 19 m S E of Leipzig Pop (1925) 11,334. It is of Sorbian origin, and is first mentioned in 1203 Among the principal buildings are the Schloss built in the 12th century, and long a residence of the margraves of Meissen and the electors of Saxony; the town-hall, dating from 1442, and the famous school Fürstenschule (*Illustre Moldanum*), erected by the elector Maurice on the site of the former Augustinian monastery in 1550. Among the industries of the town are machine building and dyeworks, while paper and gloves are manufactured there. In the immediate neighbourhood are the ruins of the Cistercian nunnery from which Catherine von Bora fled in 1523, and the village of Doben with an old castle.

GRIMMELSHAUSEN, HANS JAKOB CHRISTOFFEL VON (*c.* 1625–1676), German author, was born at Gelnhausen At the age of ten he was kidnapped by Hessian soldiery, and with them saw military life in the Thirty Years' War, at its close he entered the service of Franz Egon von Fürstenberg, bishop of Strasbourg, and in 1665 was made *Schultheiss* (magistrate) at Renchen, Baden In 1669 he published *Der abenteuerliche Simplicissimus, Teutsch, d h die Beschreibung des Lebens eines seltsamen Vaganten, genannt Melchior Sternfels von Fuchsheim*, the greatest German novel of the 17th century It is modelled on the picaresque romances of Spain, and, beginning with the childhood of its hero, describes his adventures in the Thirty Years' War The realistic detail with which these pictures are presented makes the book a valuable historical document Towards the end Grimmelshausen over-indulges in allegory, and finally loses himself in a Robinson Crusoe story

Among his other works are the so-called *Simplicianische Schriften· Die Erzbetrugerin und Landstortzerin Courasche* (*c.* 1669); *Der seltsame Springinsfeld* (1670) and *Das wunderbarliche Vogelnest* (1672) His satires, such as *Der teutsche Michel* (1670), and "gallant" novels, like *Dietwald und Amelinde* (1670) are of inferior interest He died at Renchen on Aug 17, 1676.

There are numerous modern editions of *Simplicissimus*, and the *Simplicianische Schriften* have been published by H Kurz (1863–64), J Tittmann (Leipzig, 1877), and Scholte (1923). A reprint of the first edition of the novel was edited by R Kögel for the series of *Neudrucke des 16 und 17 Jahrhunderts* (1880); it was first published in an Eng trans in 1912 *See* the introductions to these editions, also F Antoine, *Étude sur le Simplicissimus de Grimmelshausen* (1882), A Bechtold, *J J C von Grimmelshausen und seine Zeit . . .* (1914), Lochner, *Ein deutscher Mensch im 17ten Jahrhundert* (1924)

GRIMOARD, PHILIPPE HENRI, COMTE DE (1753–1815), French soldier and military writer, became one of Louis XVI's most valued counsellors in political and military matters, served in Louis's military cabinet, and was marked out as future minister of war His scheme of defence (1791) proved later of great assistance to the Committee of Public Safety but his military career was ended by the revolution

His numerous works include *Histoire des dernières campagnes de Turenne* (1780), *Troupes légères et leur emploi* (1782), *Conquêtes de Gustave-Adolphe* (Stockholm and Neufchatel, 1782–91), *Recherches sur la force de l'armée française depuis Henri IV jusqu'en 1805* (1806), and (with Servant) *Tableau historique de la guerre de la Révolution 1792–1794* (1808)

GRIMSBY or **GREAT GRIMSBY,** a municipal, county and parliamentary borough of Lincolnshire, England, on the south shore of the Humber Pop (1921) 83,355 Grimsby (*Grimesbi*) is associated with the Danish invasions of the 8th century It was a borough by prescription as early as 1201, in which year King John granted the burgesses a charter similar to that of Northampton Henry III in 1227 granted to "the mayor and good men" of Grimsby, that they should hold the town for a yearly rent of £111, and confirmed the same in 1271 These charters were confirmed by later sovereigns A governing charter was given by James II in 1688 In 1201 King John granted the burgesses an annual fair for 15 days, beginning on May 25 Two annual fairs are now held Grimsby returned two members to the parliament in 1298, but in 1833 the number was reduced to one which it still sends The church of St James, in the older part of the town, is Early English, with fine details but poorly restored The chief buildings are that containing the town hall and the grammar school (a foundation of 1547), and the exchange

In the time of Edward III Grimsby was an important seaport, but the haven became obstructed by silt from the Humber At the beginning of the 19th century a subscription was raised by the proprietors of land in the neighbourhood for improving the harbour, and an act was obtained by which they were incorporated

The fishing trade had become so important by 1800 that it was necessary to construct a new dock. The proximity of the town to the great fishing centres in the North sea, accounts for its modern rise as a fishing centre With the improvement in the harbour after 1846, the rise of the great industrial areas in the midlands, and the ever-increasing population of London, the railway companies, particularly the Great Central (now L N E R. and then the Manchester Sheffield and Lincolnshire Line), ran lines into Grimsby, so that the fish might be taken rapidly to these great centres for consumption At the same time the advent of the steam trawler greatly enlarged the area covered by the fishing fleets This now reaches from the Arctic Circle to the Mediterranean Grimsby also trades in timber used for pit props in the industrial regions and exports coal The fishing trade has increased largely since 1910 and new dock facilities have been organized There is also a regular passenger service to Dutch, Danish and South Swedish ports In 1912 the railway company built Immingham Dock, a port 6 m farther up the Humber, for vessels too large to enter Grimsby

GRIMSTON, SIR HARBOTTLE (1603–1685), English politician, born at Bradfield Hall, near Manningtree on Jan 27, 1603, and educated at Emmanuel college, Cambridge, he became a barrister of Lincoln's Inn, recorder of Harwich in 1634, and recorder of Colchester (1638). As member for Colchester he sat in the Short and the Long parliaments, and in 1642 he was made deputy-lieutenant of Essex Though of royalist sympathies, he remained a nominal adherent of the parliamentary party during the Civil War, but was later excluded from the House of Commons and, for a short time, imprisoned In 1648 he succeeded his father as 2nd baronet, and in the Convention Parliament of 1660 he was chosen speaker This office he lost at the dissolution of the parliament, but he was a member of the commission which tried the regicides, and in Nov. 1660 he was appointed master of the rolls. He died on Jan 2, 1685 Grimston translated from Norman French the law reports of the judge, Sir George Coke (1560–1642)

On the death of his son Samuel in 1700, the baronetcy became extinct The grandson of Sir Harbottle's eldest daughter Mary succeeded to the estates of his great uncle

See G Burnet, *History of My Own Time*, edit O. Airy (1900)

GRIMTHORPE, EDMUND BECKETT, 1ST BARON (1816–1905), son of Sir Edmund Beckett Denison, was born on May 12, 1816 He was educated at Eton and Trinity college, Cambridge He was called to the bar at Lincoln's Inn in 1841, became Q C in 1854, and was for many years a leader of the parliamentary bar From 1877 to 1900 he was chancellor and vicar-general of York, and he was raised to the peerage in 1886 He was interested in astronomy, horology and architecture, more especially Gothic ecclesiastical architecture The present tower clock of the Houses of Parliament, popularly known as "Big Ben," was constructed after Lord Grimthorpe's designs He undertook in the late 'seventies to "restore, repair and refit" the abbey of St Albans His treatment of the roof, the new west front, and the windows inserted in the terminations of the transepts, excited a storm of adverse criticism He died on April 29, 1905

GRINDAL, EDMUND (1519?–1583), successively bishop of London, archbishop of York and archbishop of Canterbury, was the son of a farmer of Hensingham, Cumberland He was educated at Magdalene and Christ's Colleges and then at Pembroke Hall, Cambridge, where he was elected fellow in 1538 He proceeded M A in 1541, was ordained deacon in 1544 and was proctor and Lady Margaret preacher in 1548–49. Probably through the influence of Ridley, who had been master of Pembroke Hall, Grindal was selected as one of the Protestant disputants during the visitation of 1549 When Ridley became bishop of London, he made Grindal one of his chaplains and gave him the precentorship of St Paul's He was soon promoted to be one of Edward VI 's chaplains and prebendary of Westminster, and in Oct 1552 was one of the six divines to whom the Forty-two articles were submitted for examination

The death of Henry VIII frustrated Grindal's proposed elevation to the episcopal bench He abandoned his preferments on Mary's accession and made his way to Strasbourg, and then to Frankfurt, where he endeavoured to compose the disputes between the "Coxians" (*see* Cox, Richard), who regarded the 1552 Prayer Book as the perfection of reform, and the Knoxians, who wanted further simplification He returned to England in 1559, was appointed one of the committee to revise the liturgy, and one of the Protestant representatives at the Westminster conference. In July he was also elected Master of Pembroke Hall in succession to the recusant Dr Thomas Young (1514–80) and Bishop of London in succession to Bonner

Grindal himself was, however, inclined to be recalcitrant from different motives He had qualms about vestments and other traces of "popery" as well as about the Erastianism of Elizabeth's ecclesiastical government His Protestantism was robust enough; he did not mind recommending that a priest "might to put to some torment " But he was loth to execute judgments upon English Puritans; he had not that firm faith in the supreme importance of uniformity and autocracy which enabled Whitgift to persecute with a clear conscience nonconformists whose theology was indistinguishable from his own As it was, his attempts to enforce the use of the surplice evoked angry protests, especially in 1565, when considerable numbers of the nonconformists were suspended; and Grindal of his own motion denounced Cartwright to the Council in 1570

In 1570 Grindal was translated to the archbishopric of York, where Puritans were few and coercion would be required mainly for Roman Catholics By Burghley's influence he was chosen to succeed Parker as archbishop of Canterbury in 1576 Burghley wished to conciliate the moderate Puritans and advised Grindal to mitigate the severity which had characterized Parker's treatment of the nonconformists Grindal indeed attempted a reform of the ecclesiastical courts, but his metropolitical activity was cut short by a conflict with the arbitrary temper of the queen Elizabeth required Grindal to suppress the "prophesyings" or meetings for discussion which had come into vogue among the Puritan clergy, and she even wanted him to discourage preaching; she would have no doctrine that was not inspired by her authority Grindal remonstrated, claiming some voice for the Church, and in June 1577 was suspended from his jurisdictional, though not his spiritual, functions for disobedience He stood firm, and in January 1578 Secretary Wilson informed Burghley that the queen wished to have the archbishop deprived She was dissuaded from this extreme course, but Grindal's sequestration was continued in spite of a petition from Convocation in 1581 for his reinstatement Elizabeth then suggested that he should resign, this he declined to do, and after making an apology to the queen he was reinstated towards the end of 1582 While making preparations for his resignation, he died on July 6, 1583, and was buried in Croydon parish church He left considerable benefactions to Pembroke Hall, Cambridge, Queen's College, Oxford, and Christ's College, Cambridge, he also endowed a free school at St Bees, and left money for the poor of St Bees, Canterbury, Lambeth and Croydon

Strype's *Life of Grindal* is the principal authority, *see* also *Dict Nat Biogr* and, besides the authorities there cited, Gough's General Index to Parker Soc Publ , Acts of the Privy Council, Cal of Hatfield mss , Dixon's *Hist of the Church of England*, Frere's volume in Stephens' and Hunt's series, *Cambridge Mod Hist* vol iii , Gee's *Elizabethan Clergy*, Birt's *Elizabethan Religious Settlement*, and Pierce's *Introduction to the Marprelate Tracts* (1909)

GRINDELWALD, a valley in the Bernese Oberland, and one of the chief resorts of tourists in Switzerland It is shut in on the south by the Wetterhorn, Mettenberg and Eiger, between which are two famous glaciers On the north it is sheltered by the Faulhorn range, while on the east the Great Scheidegg pass leads over to Meiringen; and on the south-west the Little Scheidegg or Wengern Alp (railway across) divides it from Lauterbrunnen The main village is connected with Interlaken by a rack railway (13 m) The valley possesses excellent pastures, as well as fruit trees, though little corn is grown It is watered by the Black Lutschine, a tributary of the Aar. The parish church is 3,468 ft above sea-level The population is practically all Protestant and German-speaking The valley was originally inhabited by serfs of various

great lords in summer for the sake of pasturage A chapel in a cave was superseded about 1146 by a wooden church, replaced about 1180 by a stone church, which was pulled down in 1793 to erect the present building. Gradually the Austin canons of Interlaken bought out all the other owners in the valley, but when that house was suppressed in 1528 by the town of Bern the inhabitants gained their freedom The houses near the hotel Adler bear the name of Gydisdorf, but the name Grindelwald is usually given to the assemblage of hotels and shops between Gydisdorf and the railway station

GRINDING-MACHINES. This important group of machine-tools comprises designs for grinding practically every shape in metal work, including cylindrical (both external and internal), parallel and tapered forms, plane faces, curved and irregular outlines, and difficult forms such as gear teeth and screw threads. That extremely fine quantities of metal can be removed, is proved by the micrometer devices used for adjusting the wheel, which register to one ten-thousandth part of an inch Emery and corundum wheels, formerly the only kinds of abrasive devices available, are now largely supplanted by the artificial products of the electric furnace, which offers great choice of fine or coarse wheels Some of the finest work is performed in the grinding out of small holes, for which the spindles carrying the tiny wheels can be run at 50,000 revolutions per minute without undue friction and heating

In most grinding machines, it is usual to give mechanical guidance to the work or to the wheel, in order to produce true surfaces, the work being supported upon a flat rest, and manoeuvred by the hands to produce flat faces or curves Disc grinders form an important class, used for finishing all sorts of nuts, levers, spanners and numerous objects having flat or curved surfaces, abrasive cloth is cemented to a steel disc, which remains always flat, and is run safely at a high speed without need for a safety-guard The pieces of work are held by the hand on a flat rest (which can be tilted for bevel grinding), and are rocked to and fro across the disc by the oscillation of the arm on a supporting bar Double disc grinders have two discs set face to face, the articles being passed in between them to have each face ground off parallel and simultaneously. Many machines have the disc horizontal, in which case the work is laid on and allowed to grind itself by the pressure of gravity If extra finish is desired, ground work is polished by machines carrying bobs or buffs charged with fine abrasive powder Also for this work an endless band is run over pulleys and the objects to be polished are held against it by the operator

The first attempts at mechanical guidance were developed in the lathe, the slide-rest being fitted with an emery wheel instead of a steel cutting tool This led to the design of grinding-ma-

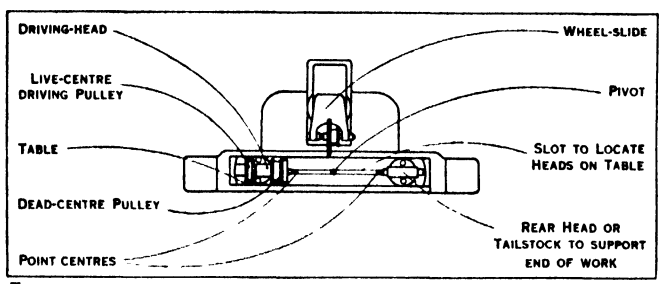


FIG 1 —PLAN VIEW SHOWING THE PRINCIPLE OF A UNIVERSAL CYLINRICAL GRINDING MACHINE

chines built on the same principle, but with proper protection of the bearings and slides, the fine grit and the water applied to cool the work being very destructive to the running surfaces There are now two distinct kinds of machine, the plain and the universal The latter will undertake a more extensive range of operations than the former, and has a pair of heads fitted upon a table which can be swivelled on a stud (fig 1); graduations at the end of the table indicate the desired amount of swivel The work has countersinks drilled in its ends, to rest on the point-centres, and is driven by a clamp or dog secured to it by a screw, and rotated by a pin standing out from the dead-centre pulley. Neither centre revolves in this method, and the most accurate results are obtained by the absence of any minute adverse influences from the driving spindle, which might cause eccentric running Shafts being ground must be supported at the back in opposition to the pressure of the grinding wheel, otherwise vibrations develop *Steadies* are employed, with wood, steel, or bronze shoes making contact with a portion of the curve For grinding the faces of discs, and inside surfaces, a chuck is substituted for the dead-centre pulley, and

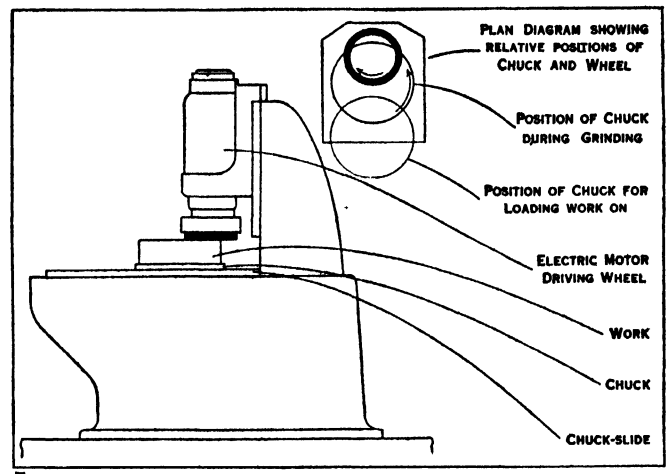


FIG 2 —VERTICAL-SPINDLE ROTARY-TABLE SURFACE GRINDING MACHINE

the live-centre pulley then does the driving of the spindle with the chuck Short tapers are ground by swivelling the driving head or the wheel slide

When the table feeds to and fro for the successive cuts of the wheel on a long shaft, an automatic feed device sets the wheel in deeper at each pass This traverse motion is eliminated in wide-wheel or plunge-cut grinding, a trued wheel, sometimes many inches in width, being fed directly against the revolving piece, and completing the outline without any lateral pass A great many pins, bolts, short shafts, etc , for motor work are ground thus Crankshafts are finished with great accuracy on modifications of the plain grinder, the crank being chucked so that its main journal bearings revolve in an orbit, and the crank-pins run concentrically Cams are ground with the help of a master-cam which causes a movement between wheel and cam to evolve the contour Modifications of the cylindrical grinding machine are constructed for tool and cutter sharpening, numerous special fittings being utilized to sharpen drills, counterbores, saws, milling-cutters and various blades and knives An exception to the usual practice of supporting cylindrical work upon point centres is met with in the centreless grinders, which finish all sorts of pins, studs, rollers, etc , of moderate length, by a peculiar means of guidance between two wheels

Internal Grinding.—These deal specially with the various bushes, rings, collars and other pieces needing internal trueing Hardened gear wheels are also trued in the bore, to make sure that the teeth will run truly One type of internal grinding machine has a driving head with a chuck to hold and revolve the work at a moderate speed, while the small wheel revolving at high speed is passed in by a slide from end to end of the hole Diameter control is exercised by a transverse adjustment of the slide When it is not feasible to rotate the work, as is the case with many cylinder and pump castings, a planetary head is used This has the grinding spindle contained within a drum, which can be driven round at relatively low speed, and the grinding spindle may be set anywhere from a concentric position to the full radius of the hole (*See* CYLINDER) These machines are built in both horizontal and vertical types; the latter shape is chosen for grinding out the holes in locomotive and other rods, duplex machines finishing both ends of a rod at once The radial slot in a link can also be ground by means of a swinging arm pivoted from a centre a suitable distance away

Flat grinding is performed on several types of machines In the rotary table design a vertical spindle usually has a chuck, on

which the articles are held by clamps or by magnetism, and an edge wheel travels across. Sometimes a cup- or ring-wheel is brought down by a slide from above The larger machines of this class assume the shape of fig. 2, but the rotating table is mounted in a slide, to enable the work to be loaded on to the chuck in the out position (*see* the plan) and then slide up to the working position An alternative to the rotary table is a long rectangular one sliding straight under the wheel, or such a table may have two magnetic rotary chucks, one being under the wheel in action, while the other is free, and being cleaned off and reloaded in readiness for another transfer under the wheel The machine is thus always in continuous operation

Long and bulky specimens are often ground on a planer machine with long table feeding between two uprights A cross-rail on these, adjustable for height, carries the grinding-wheel slide and this may be fed across the rail to cover the whole width of the table The horizontal face grinding-machine is another design which has a long table on which big castings can be secured The wheel is large and grinds over the complete area of the work exposed to it. Such wheels are not made as a solid big ring, which is expensive and liable to contain flaws; a circle of blocks or segments is gripped in the body Any fracture can be remedied cheaply by the substitution of a new segment or two

The finest method of finishing gear teeth and screw threads is by grinding In the case of the former a thin flat-faced wheel is accurately controlled so as to move round a true curve, thereby generating the shape on each flank of each tooth in turn Or a *form* wheel passes across and grinds the adjacent flanks simultaneously The shape of the wheel is given by a diamond under control of mechanism which ensures the maintenance of an accurate curve at all times Screw thread flanks are ground with a carefully trued wheel, guided by a machine which eliminates small errors present in the screw, as previously cut in the lathe or arising from the hardening process (F H)

GRINGOIRE or **GRINGORE, PIERRE** (*c* 1480–1539), French poet and dramatist, was born about the year 1480, probably at Caen In his first work, *Le Chasteau de labour* (1499), a didactic poem in praise of diligence, he narrates the troubles following on marriage A young couple are visited by Care, Need, Discomfort, etc , and other personages common to mediaeval allegories take part in the action In Nov 1501 Gringoire was in Paris directing the production of a mystery play in honour of the archduke Philip of Austria, and in subsequent years he received many similar commissions The fraternity of the *Enfans sans Souci* advanced him to the dignity of *Mère Sotte* and afterwards to the highest honour of the gild, that of *Prince des Sots* For twenty years Gringoire seems to have been at the head of this illustrious *confrérie* As *Prince des Sots* he exercised an extraordinary influence At no time was the stage, rude and coarse as it was, more popular as a true exponent of the popular mind Brotherhoods of the kind existed all over France In Paris there were the *Enfans sans Souci*, the *Basochiens*, the *Confrérie de la Passion* and the *Souverain Empire de Galilée;* at Dijon there were the *Mère Folle* and her family; in Flanders the *Société des Arbalétriers* played comedies, at Rouen the *Cornards* or *Conards* yielded to none in vigour and fearlessness of satire On Shrove Tuesday 1512, when the dispute with Julius II was at its height, Gringoire, who was the accredited defender of the policy of Louis XII , represented the *Jeu du Prince des Sots et Mère Sotte Mère Sotte* was disguised as the Church, and disputed the question of the temporal power with the prince The political meaning was even more thinly veiled in the second part of the entertainment, a morality named *L'Homme obstiné,* the principal personage representing the pope The performance concluded with a farce Gringoire adopted for his device on the frontispiece of this trilogy, *Tout par Raison, Raison par Tout, Par tout Raison* He has been called the *Aristophane des Halles*. The Church was further attacked in a poem printed about 1510, *La Chasse du cerf des cerfs* (*serf des serfs,* i e *servus servorum*), under which title that of the pope is thinly veiled About 1514 he wrote his mystery of the *Vie de Monseigneur Saint-Louis par personnages* in nine books for the *confrérie* of the masons and carpenters. He became in 1518 herald at the court of Lorraine, with the title of Vaudemont, and married Catherine Roger, a lady of gentle birth. During the last twenty years of a long life he became orthodox, and dedicated a *Blason des hérétiques* to the duke of Lorraine

His works were edited by C. d'Héricault and A. de Montaiglon for the *Bibliothèque elzévirienne* in 1858. This edition was supplemented by a second volume in 1877 by Montaiglon and James de Rothschild These volumes include the works already mentioned, except *Le Chasteau de labour,* and in addition, *Les Folles Entreprises* (1505), a collection of didactic and satirical poems, chiefly ballades and rondeaux, one section of which is devoted to the exposition of the tyranny of the nobles, and another to the vices of the clergy; *L'Entreprise de Venise* (*c* 1509), a poem in seven-lined stanzas, giving a list of the Venetian fortresses which belonged, according to Gringoire, to other powers; *L'Espoir de paix* (1st ed not dated; another, 1510), a verse treatise on the deeds of "certain popes of Rome," dedicated to Louis XII ; and *La Coqueluche* (1510), a verse description of an epidemic, apparently influenza For details of his other satires, *Les Abus du monde* (1509), *Complainte de trop tard marié, Les Fantasies du monde qui règne;* of his religious verse, *Chants royaux* (on the Passion, 1527), *Heures de Notre Dame* (1525), and a collection of tales in prose and verse, taken from the *Gesta Romanorum,* entitled *Les Fantasies de Mère Sotte* (1516), *see* G Brunet, *Manuel du libraire* (*s v* Gringore). Most of Gringoire's works conclude with an acrostic giving the name of the author. The *Chasteau de labour* was translated into English by Alexander Barclay and printed by Wynkyn de Worde in 1506. Barclay's translation was edited (1905) with his original for the Roxburghe Club by A. W Pollard, who provided an account of Gringoire, and a bibliography of the book *See* also, for the *Jeu du Prince des Sots,* Petit de Julleville, *La Comédie et les moeurs en France au moyen âge,* pp 151–168 (Paris, 1886); for *Saint Louis,* the same author's *Les Mystères,* i 331 *et seq*, ii 583–597 (1880), with further bibliographical references, and E Picot, *Gringore et les comédiens italiens* (1877). The real Gringoire cannot be said to have many points of resemblance with the poet described in Victor Hugo's *Notre-Dame de Paris,* nor is there more foundation in fact for the one-act prose comedy of Théodore de Banville

GRINNELL, a city of Poweshiek county, Ia , U S A , near the centre of the State, at an altitude of about 1,000 feet It is on Federal highway 32, and is served by the Minneapolis and St Louis and the Rock Island railways The population in 1925 (State census) was 4,662 Grinnell has the charm of elm-shaded streets, well kept lawns and comfortable homes It is the seat of Grinnell college, founded in 1847 by three pioneer settlers in Iowa, Congregationalists and graduates of Yale college, and the "Iowa Band" of 12 graduates of Andover Theological seminary, who went west in 1843 as educational missionaries The college was opened at Davenport in 1848 as Iowa college, moving to Grinnell in 1859, but not changing its name until 1909 The city was settled in 1854, and was named after one of its founders, Josiah Bushnell Grinnell (1821–91), a Congregational clergyman, friend of John Brown, and a representative in Congress, 1863–67 It was incorporated as a town in 1865 and as a city in 1882.

GRIQUALAND EAST and **GRIQUALAND WEST,** historical division of the Cape province of the Union of South Africa Griqualand East is bounded on the north-east by Natal, and on the north-west by Basutoland It was named after the settlement there in 1862 of Griquas under Adam Kok, their chief centre being Kokstad The region forms part of the Transkeian Territories and is described under Kaffraria, Cape Colony and South Africa

Griqualand West, also named after its Griqua inhabitants, is part of the inner plateau of South Africa, and lies north of the Orange river, being bounded by Bechuanaland, the Transvaal, and the Orange Free State (*see* CAPE COLONY and SOUTH AFRICA, UNION OF) The climate is dry, the only perennial rivers are in the eastern districts, through which the Vaal flows Severe thunderstorms sometimes occur It is mainly a pastoral area, but its chief wealth is its diamonds Alluvial digging centres occur at Barkly West (*q v.*), Windsorton, Warrenton

History.—At the end of the 18th century a horde known as Bastaards, descendants of Dutch farmers and Hottentot women, led a nomadic life on the plains south of the Orange river In 1803 a missionary named Anderson induced a number of the Bastaards with their chief Barend Barends to settle north of the river, and a mission station was formed at a place where there was a strong flowing fountain, now disappeared, which gave the name of Klaarwater to what is now known as Griquatown or Griquastad

Klaarwater became a retreat for other Bastaards, Hottentot refugees, Kaffirs and Bechuanas From Little Namaqualand came a few half-breeds and others under the leadership of Adam Kok, son of Cornelius Kok and grandson of Adam Kok (*c.* 1710–95), a man of mixed white and Hottentot blood who is regarded as the founder of the modern Griquas The settlement prospered, and the tribesmen abandoned the name of Bastaards in favour of that of Griquas, some of them professing descent from a Hottentot tribe, originally settled near Saldanha bay, called by the early Dutch settlers at the Cape Chariguriqua or Grigriqua Adam Kok and Barends having moved eastward in 1820, those who remained behind elected as their head man a teacher in the mission school named Andries Waterboer, who successfully administered the settlement Meanwhile Adam Kok and his companions had occupied part of the country between the Modder and Orange rivers, and in a short time had exterminated the Bushmen inhabiting that region. Kok died about 1835, and after a period of civil strife was succeeded by his younger son, Adam Kok III, who in Nov. 1843 signed a treaty placing himself under British protection. Eventually finding himself straitened by the Boers of the newly established Orange Free State, he removed in 1861–63 with his people, some 3,000 in number, to the region (then depopulated by Kaffir wars) now known as Griqualand East His sovereign rights to all territory north of the Orange he sold to the Free State for £4,000. He founded Kokstad (*q v.*) and died in 1876 Waterboer, the principal Griqua chief, had entered into treaty relations with the British Government as early as 1834, and received a subsidy of £150 a year. He was succeeded in 1852 by his son Nicholas Waterboer, under whom the condition of the Griquas declined.

The discovery of diamonds along the banks of the Vaal in 1867 entirely altered the fortunes of the country, and by the end of 1869 the rush to the alluvial diggings had begun At the diggers' camps the Griquas exercised no authority, but over part of the district either the South African Republic or the Orange Free State claimed sovereignty At Klip Drift (now Barkly West) the diggers formed a regular Government and elected Theodore Parker as their president Most of the diggers being British subjects, the high commissioner of South Africa interfered, and a Cape official was appointed magistrate at Klip Drift, President Parker resigning office in Feb 1871 Over the "dry diggings," at Kimberley which had just been discovered,[1] the Orange Free State asserted jurisdiction. The land was, however, claimed by Nicholas Waterboer, who, on the advice of his agent, David Arnot, petitioned the British to take over his country This Great Britain consented to do, and on Oct. 27, 1871, proclamations were issued by the high commissioner receiving Waterboer and his Griquas as British subjects and defining the limits of his territory. It included the area claimed by the Transvaal but given to Waterboer by the award of R W Keate, lieutenant-governor of Natal, an award made shortly before the annexation proclamations The Free State Boers in particular were greatly incensed by the action of the British Government, but the dispute was settled in 1876 by the payment of £90,000 by the British to the Free State, in full settlement of their rights

The diggers found the British administration did little for their benefit, and a period of disorder ensued In July 1873 the territory was made a Crown colony. The Government remained unpopular, the diggers complaining of its unrepresentative character, the heavy taxation exacted, and the inadequate protection of property. They formed a society for mutual protection, and the discontent was so great that an armed force was sent (early in 1875) from the Cape to overawe the agitators At the same time measures were taken to render the Government more popular The settlement of the dispute with the Free State paved the way for the annexation of Griqualand to the Cape Colony on Oct 15, 1880. Griqualand East also came under the Cape as part of the Transkei Territories. Here the Griquas preserved some measure of autonomy, but numbers of Europeans settled in the district

[1]The order of discovery of the chief mines was:—Dutoitspan, Sept. 1870, Bultfontein, Nov. 1870; De Beers, May 1871; Colesberg Kop (Kimberley), July 1871.

See KIMBERLEY, CAPE COLONY, TRANSVAAL and ORANGE FREE STATE. For early history and an account of life at the diggings, 1871–75, consult G McCall Theal's *Compendium of the History and Geography of South Africa* (1878), ch xl. and xli, and the later editions of his *History of South Africa;* Gardner F. Williams, *The Diamond Mines of South Africa* (New York and London, 1902); *See* also J. Campbell, *Travels in South Africa* (1815), *Travels . . . A Second Journey . . .* (2 vols, 1822); the Blue Books C. 459 of 1871 and C. 508 of 1872 (which contains the Keate award), *Papers relating to Her Majesty's Colonial Possessions,* part ii (1875), and A Wilmot, *Life of Sir Richard Southey* (sometime lieutenant-governor of Griqualand) (1904). For the Griqua people consult G. W. Stow, *The Native Races of South Africa,* ch xvii–xx. (1905).

GRISAILLE is the name given to the preliminary underpainting of the subject of a picture, executed in a monochrome of grey or brown, previous to the application of colour It is, in effect, a kind of brush drawing in thin oil-paint, usually highly finished, to which the colour scheme is applied It was commonly used thinly but certain masters used it in impasto afterwards applying the colour in glazes

It differs from *camaieu,* in which two tints are used

Its use dates from early times as Zeuxis is said to have employed both grisaille and camaieu but it was not in general use until the 15th century when it was practised by Flemish and Italian masters. It played some part in the development of chiaroscuro, as, without the aid of colour, the painter had to concentrate on light and shade for his effect.

Correggio is said to have used it extensively and Van Dyck left many small paintings in grisaille which he carried no further Prud'hon was addicted to the use of grisaille, sometimes substituting a light blue tint for the more usual grey or brown, but he more often spoilt his pictures by the use of bitumen. Oudry considered the practice a dangerous one on account of the large amount of white used in it

In the present day when direct painting is the general practice, grisaille is rarely used

GRISELDA, a heroine of romance She is said to have been the wife of Walter, marquis of Saluces or Saluzzo, in the 11th century, and her misfortunes were considered to belong to history when they were handled by Boccaccio and Petrarch, although the probability is that Boccaccio borrowed his narrative from a Provençal *fabliau* He included it in the recitations of the tenth day (*Decamerone*), and must have written it about 1350 Petrarch related it in a Latin letter in 1373, which was printed by Ulrich Zel about 1470 and often subsequently Chaucer followed Petrarch's version in the *Canterbury Tales* The story was dramatized by Thomas Dekker, Henry Chettle and W. Haughton in 1603.

An example of the many ballads of Griselda is given in T. Deloney's *Garland of Good Will* (1585), and the 17th century chapbook, *The History of Patient Grisel* (1619), was edited by H B Wheatley (1885) for the Villon Society

GRISI, GIULIA (1811–1869), Italian opera-singer, daughter of one of Napoleon's Italian officers, was born in Milan on July 28, 1811 She came of a family of musical gifts, her maternal aunt Josephina Grassini (1773–1850) being a favourite opera-singer both on the continent and in London, her mother had also been a singer, and her elder sister Giudetta and her cousin Carlotta were both exceedingly talented Giulia was trained for a musical career, and made her stage début in 1828 in Rossini's *Zelmira* Later at Milan she was the first Adalgisa in Bellini's *Norma,* in which Pasta took the title-part Grisi appeared in Paris in 1832, as Semiramide in Rossini's opera, and had a great success She played at the Théâtre Italien for sixteen years, from 1832 to 1849, while in the summers from 1834 onwards she appeared in London Her voice was a brilliant dramatic soprano, and her established position as a prima donna continued for thirty years In 1835 Bellini wrote *I Puritani* for the great quartet of singers, Grisi, Lablache, Rubini and Tamburini, and the tradition of their great performance was long remembered in London and Paris. Later Mario took the place of Rubini, and for them Donizetti wrote *Don Pasquale* In 1854 Grisi toured with Mario in America She had married Count de Melcy in 1836, but the marriage was dissolved, in 1856 she married Mario (*q v.*). She died in Berlin on Nov 29, 1869.

GRISON (*Galictis vittata*), a carnivorous mammal, of the family *Mustelidae*, common in Central and South America and Mexico It is about the size of a marten, and is bluish grey above and dark brown below. The grison lives on small mammals and birds, and in settled districts is destructive to poultry. Allamand's grison (*G allamandi*), with the same range, is larger. The tayra or taira (*G barbara*), about as large as an otter, ranges from Mexico to Argentina. It hunts in companies (*see* CARNIVORA).

GRISONS, the most easterly of the Swiss cantons and also the largest in extent, though relatively the most sparsely populated Pop. (1926) 122,200, giving a density per sq m. of 43 Its area is 2,746 sq m , of which more than a half is classed as "productive" (forests covering about one fifth of the total), but it has 138·6 sq m of glaciers, ranking in this respect next after the Valais and before Bern The whole canton is mountainous, the principal glacier groups being those of the Todi, N. (11,887 ft.), of Medels, S W (10,509 ft), of the Adula Alps, S W (Rheinwaldhorn, 11,149 ft), with the chief source of the Rhine, of the Bernina, S E (13,304 ft.), the most extensive, of the Albula, E (Piz Kesch, 11,228 ft.), and of the Silvretta, N E. (Piz Linard, 11,201 ft). The principal valleys are those of the upper Rhine and of the upper Inn (or Engadine, *q v*) The three main sources of the Rhine are in the canton The valley of the Vorder Rhine is called the Bundner Oberland, that of the Mittel Rhein the Val Medels, and that of the Hinter Rhein (the principal), in different parts of its course, the Rheinwald, the Schams valley and the Domleschg valley, while the upper valley of the Julia is named the Oberhalbstein Other streams join the Ticino and so the Po, the Adda, and the Adige The inner valleys are the highest in Central Europe, and among the loftiest villages are Juf, 6,998 ft (the highest permanently inhabited village in the Alps), at the head of the Avers glen, and St Moritz, 6,037 ft , in the Upper Engadine Below Chur, near Malans, good wine is produced, while in the Val Mesocco, etc , maize and chestnuts flourish Forests and the mountain pasturages are the chief source of wealth The lower pastures maintain a fine breed of cows There are many mineral springs The climate, save on the southern slope of the Alps, is severe Many strangers visit different spots in the canton, especially Davos (*q v*), Arosa and the Engadine A railway runs from Maienfeld to Chur (the capital, *q v*), sending off a branch line from Landquart to Davos From Chur the line bears west to Reichenau whence one branch runs beneath the Albula Pass to St Moritz, and another up the Vorder Rhine valley to Disentis There are carriage roads across the passes leading towards Italy

The German-speaking part of the population live mainly around Chur and Davos, the Italian-speaking in the Val Mesocco, Val Bregaglia and the valley of the Poschiavo The characteristic tongue of the Grisons is a survival of an ancient Romance language which has a scanty printed literature, but is still widely spoken It is distinguished into two dialects the Romonsch which prevails in the Bundner Oberland and in the Hinter Rhein valley, and the Ladin that survives in the Engadine and in the neighbouring valleys of Bergun, Oberhalbstein and Munster There are, however, in these regions German-speaking people, mostly due to immigration from the Upper Valais in the 13th century Many of the population are engaged in attending to the wants of tourists, but there is a considerable trade with Italy, particularly in the wines of the Valtellina Some lead and silver mines were formerly worked, but are now abandoned

The canton is divided into 14 administrative districts, and includes 224 communes It sends members to the Federal *Standerat*, and to the Federal *Nationalrat* The cantonal constitution has created a legislature (*Grossrat*—no numbers fixed by the constitution) elected by universal suffrage The "obligatory referendum" obtains in the case of all laws and important matters of expenditure and revisions of the constitution

History.—The greater part (excluding the three Italian speaking valleys) of the modern canton of the Grisons formed the southern part of the province of Raetia (probably the aboriginal inhabitants, the Raeti, were Celts rather than, as was formally believed, Etruscans), set up by the Romans after their conquest of the region in 15 B.C. The Romanized inhabitants were to a certain extent Teutonized under the Ostrogoths (A D 493–537) and under the Franks (from 537 onwards) Governors called *Praesides* are mentioned in the 7th and 8th centuries, while members of the same family occupied the episcopal see of Coire (founded 4th to 5th centuries) About 806 Charles the Great made this region into a county, but in 831 the bishop procured for his dominions exemption ("immunity") from the jurisdiction of the counts, while before 847 his see was transferred from the Italian province of Milan to the German province of Mainz (Mayence) and was thus cut off from Italy to be joined to Germany The bishop became a prince of the empire in 1170 and later allied himself with the rising power (in the region) of the Habsburgers. This led in 1367 to the foundation of the League of God's House or the *Gotteshausbund,* chiefly in order to stem his rising power, the bishop entering it in 1392 In 1395 the abbot of Disentis, the men of the Lugnetz valley, and the great feudal lords of Razuns and Sax, joined in 1399 by the counts or Werdenberg, formed another League, called the *Oberbund* (as comprising the highlands in the Vorder Rhine valley) and also wrongly the "Grey League" (as the word interpreted "grey" is simply a misreading of *graven* or counts, though the false view has given rise to the name of Grisons or Graubunden for the whole canton) Finally, in 1436, the third Raetian League was founded by the former subjects of the count of Toggenburg, whose dynasty then became extinct, they include the inhabitants of the Prattigau, Davos, Maienfeld, the Schanfigg valley, Churwalden, and the lordship of Belfort (*i e*, the region round Alvaneu), and formed ten bailiwicks, whence the name of the league—*Zehngerichtenbund* or League of ten Jurisdictions In 1450 the *Zehngerichtenbund* concluded an alliance with the *Gotteshausbund* and in 1471 with the *Oberbund;* but of the so-called perpetual alliance at Vazerol, near Tiefenkastels, there exists no authentic evidence in the oldest chronicles, though diets were held there In 1496 the possessions of the extinct counts of Toggenburg passed to the elder Habsburgers, the head of whom, Maximilian, was already emperor-elect, and desired to maintain the rights of his family there and in the Lower Engadine Hence in 1497 the *Ober Bund* and in 1498 the *Gotteshausbund* became allies of the Swiss Confederation War broke out in 1499, but was ended by the great Swiss victory (May 22, 1499) at the battle of the Calven gorge (above Mals) which, added to another Swiss victory at Dornach (near Basel), compelled the emperor to recognize the *practical* independence of the Swiss and their allies of the empire In 1526, by the Articles of Ilanz, the last remaining traces of the temporal jurisdiction of the bishop of Coire was abolished In 1512 the three Leagues conquered from Milan the rich and fertile Valtellina, with Bormio and Chiavenna, and held these districts as subject lands till in 1797 they were annexed to the Cisalpine Republic After the emperor had *formally* recognized, by the treaty of Westphalia (1648), the independence of the Swiss Confederation, the rights of the Habsburgers in the Prattigau and the Lower Engadine were brought up (1649 and 1652) In 1803, after a brief inclusion in the Helvetic Republic, it entered, under the name of Canton of the Grisons or Graubunden, the reconstituted Swiss Confederation

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GRISWOLD, RUFUS WILMOT (1815–1857), American editor and compiler, was born in Benson, Vt, on Feb. 15, 1815 He was a Baptist clergyman for a time, then became a journalist in New York city, and succeeded Poe as editor of *Graham's Magazine* (Philadelphia) As literary executor he edited, together with James R Lowell and N P Willis, the writings (1850) of Edgar Allan Poe. He died in the City of New York on Aug 27, 1857.

See *Passages from the Correspondence and Other Papers of Rufus W Griswold* (1898), edited by his son, W M. Griswold, and "The Poe-Griswold Controversy" by Killis Campbell, *Modern Language Association Publications,* vol. xxxiv, pp 436–464 (Baltimore, 1919).

GRIVET, a monkey, often seen in menageries, *Cercopithecus sabaeus,* of the guenon group, allied to the green monkey It is common throughout equatorial Africa The chin, whiskers, a band across the forehead, and the under parts are white and the head and back olive-green

GRIZZLY BEAR (*Ursus horribilis*), the most dangerous and, on the average, the largest of all living bears, its only rival being the polar bear (*q v*) An inhabitant of western North America, this bear originally ranged from Mexico to Alaska and from the Pacific coast far into the prairies It is now, however, restricted to the wilder parts of the Rocky mountains and Sierra Nevada, reaching its greatest development, both as regards size and numbers, in the north The fur is variable in colour, but is most commonly brownish yellow, with a black stripe on the back and reddish mane An average large specimen of the grizzly bear may be 9 ft. long and 1,000 lb. in weight. (*See* BEAR, CARNIVORA)

GROAT, a name applied as early as the 13th century on the continent of Europe to any large or thick coin (adapted from the Dutch *groot,* great, thick; *cf* Ger *Groschen;* the Med Lat *grossus* gives Ital *grosso,* Fr *gros* as names for the coin) The groat was almost universally a silver coin, but its value varied considerably, as well at different times as in different countries The English groat was first coined in 1351, of a value somewhat higher than a penny The continuous debasement of both the penny and the groat left the latter finally worth four pennies The issue of the groat was discontinued after 1662, but a coin worth fourpence was again struck in 1836 Its issue was again discontinued in 1856

GROCER, literally one who sells by the gross, a wholesale dealer, the word is derived through the O Fr. form *grossier,* from the Med Lat *grossarius* The name, as a general one for dealers by wholesale—"engrossers" as opposed to "regrators," the retail dealers—is found with the commodity attached, thus in the *Munimenta Gildhallae* ("Rolls" series) ii 1,304 (quoted in the *New English Dictionary*) is found an allusion to *grossours de vin, cf groser of fysshe, Surtees Misc* (1888) 63, for the customs of Malton (quoted *ib*) The specific application of the word to one who deals either by wholesale or retail in tea, coffee, cocoa, dried fruits, spices, sugar, and all kinds of articles of use or consumption in a household is connected with the history of the Grocers' Company of London, one of the 12 "great" livery companies In 1345 the pepperers and the spicers amalgamated and were known as the Fraternity of St Anthony The name "grocers," however, first appears during 1373 in the records of the company.

See J Aubrey Rees, *The Grocery Trade* (1910)

GROCYN, WILLIAM (1446?–1519), English scholar, was born at Colerne, Wiltshire He was a scholar and fellow of New college, Oxford, reader in divinity in Magdalen college, and in 1485 became prebendary of Lincoln cathedral About 1488 Grocyn left England for Italy, and before his return in 1491 he had visited Florence, Rome and Padua, and studied Greek and Latin under Demetrius Chalchondyles and Politian As lecturer in Exeter college he found an opportunity of indoctrinating his countrymen in the new Greek learning

Erasmus says in one of his letters that Grocyn taught Greek at Oxford before going to Italy. He seems to have lived in Oxford until 1499, but when his friend Colet became dean of St. Paul's in 1504 he was settled in London He was chosen by his friend to deliver lectures in St Paul's He also counted Linacre, William Lily, William Latimer and More among his friends, and Erasmus writing in 1514 says that he was supported by Grocyn in London, and calls him "the friend and preceptor of us all" He held several preferments, including the wardenship of All Hallows college at Maidstone, Kent He died in 1519, and was buried in the collegiate church at Maidstone Linacre acted as the executor of his estate

An interesting account of Grocyn written by Professor Burrows appeared in the Oxford Historical Society's *Collectanea* (1890)

GRODNO, one of the former Lithuanian Governments of western Russia, which, since the war of 1914–18, has been, as regards its northern part, in dispute between Poland and Lithuania The Government of the Polish republic has occupied practically the whole area and has created the new administrative county of Bialystok (*q v*) In view of the international difficulties, it may be found useful to maintain, in the present edition, some account of the area as it formerly was Its area was 14,926 sq m. and its population was somewhat under two millions, mainly White Russians (54%), with large Jewish (17 4%), and Polish (10%) elements, also Lithuanians and Germans Prior to 1795, when it was annexed by Russia, it had been Polish for centuries Grodno is called, by the Lithuanians, Gardinas In Jan 1929 the Soviet Government made overtures to Lithuania and Poland (in connection with the Kellogg Peace Pact), to the effect that these three countries should send a declaration to the Powers that the conditions of the Peace Pact have always been binding on them, and there was no need to await the ratification of the treaty on the part of the other signatories It was boldly stated by some of the Russian newspapers that the Soviet idea was to obtain sanction by such a treaty for the annexation of certain territories, but others asserted that it was nothing more than a move toward the consolidation of the Baltic States Immediately after the revolution there was much shuffling of provinces and territories, for some years the districts and areas bordering on Russia were in a state of flux; by a system of gradual assimilation some of the territories were absorbed with the Soviet Union—others were simply annexed

Except for some hills (not exceeding 925 ft) in the north, it is a uniform plain, and is drained chiefly by the Bug, Niemen, Narev and Bobr, all navigable There are also several canals, the most important being the Augustowo and Oginsky Granites and gneisses crop out along the Bug, Cretaceous, and especially Tertiary, deposits elsewhere The soil is mostly sandy, and in the district of Grodno and along the rivers is often drift-sand Forests, principally of Coniferae, cover more than one-fourth of the area Amongst them are some that, before 1914–18, were of vast extent, *e g*, those of Grodno (410 sq m) and Byelovitsa (Bialowice) (376 sq m), embracing wide areas of marshy ground In the last mentioned forest the wild ox survived, having been jealously preserved since 1803 Peat bogs, sometimes as much as 4 to 7 ft thick, cover extensive districts The climate is wet and cold, the annual mean temperature being 44 5° F, the January mean 22 5° and the July mean 64 5° The rainfall amounts to 21½ in, hail is frequent Agriculture is the predominant industry, and over 2¼ million acres are arable The crops principally grown are potatoes, rye, oats, wheat, flax, hemp and some tobacco Horses, cattle and sheep are bred in fairly large numbers There is, however, a certain amount of manufacturing industry, especially in woollens, distilling and tobacco There are also other factories which produce silk, shoddy, and leather The district is crossed by the main lines of railway from Warsaw to Leningrad and from Warsaw to Moscow

GRODNO, a town of Poland in the province of Bialystok, on the Niemen, 160 m. by rail N E of Warsaw on the main line to Leningrad Pop. (1921) 34,900, nearly two-thirds Jews, a decline of nearly 15,000 from that of 1910 when it was the capital

of a province of Russia. It has two old castles and two churches. Tobacco factories and distilleries are important; machinery, soap and candles are also made. Once part of the principality of Lithuania, Grodno was frequently ravaged by the Teutonic knights. After the union with Poland in 1569, it became one of the two meeting-places of the Polish-Lithuanian diet. The second partition of Poland was signed at Grodno during the year 1792.

GROENER, WILHELM (1867–), German general, was born on Nov 22, 1867, at Ludwigsburg, Wurttemberg In 1912 he was attached to the railway section of the general staff, and was its chief during the mobilization of 1914. From May 27, 1916 to Aug 1917 he was departmental head of the War Office He went to the eastern front as divisional commander and leader of an army corps in Aug 1917, and in 1918 was chief of staff of the army group under the command of Linsingen and afterwards of Eichhorn In Nov 1918 he succeeded Ludendorff as quartermaster-general, but retired as a protest against the signature of the Treaty of Versailles After the revolution he joined the Democratic Party He was minister of communications (June, 1920–Aug 1923) and combated the proposals for the reversion of the state railways to private ownership He wrote *Der Weltkrieg und seine Probleme* (1920) In January 1928 he became Minister of Defence

GROEN VAN PRINSTERER, GUILLAUME (1801–1876), Dutch politician and historian, was born at Voorburg, near The Hague, on Aug 21, 1801 He studied at Leyden university, and acted (1829–33) as secretary to King William I of Holland He became the leader of the so-called anti-revolutionary party, both in the second chamber, of which he was for many years a member, and outside In Groen the doctrines of Guizot and Stahl found an eloquent exponent They permeate his controversial and political writings and historical studies, of which his *Handbook of Dutch History* (in Dutch) and *Maurice et Barnevelt* (in French, 1875, a criticism of Motley's *Life of Van Olden-Barnevelt*) are the principal Groen was violently opposed to Thorbecke, whose principles he denounced as ungodly and revolutionary He died at The Hague on May 19, 1876 He is best known as the editor of the *Archives et correspondance de la maison d'Orange* (12 vols, 1835–45), a great work of patient erudition

See Bos, *Groen van Prinsterer en zijn tijd* (2 vols, 1886–91).

GROIN, in architecture, the edges formed at the intersections of two vaults at an angle to each other If the vaults intersect at right angles and are of the same height and radius, these intersections will all lie on a vertical plane at 45° to the planes of the two vaults If, however, one vault is lower than the other, or the curvatures are different, winding and distorted curves will result Both the Roman and Renaissance constructors of vaults frequently regularized the rib shapes and slightly warped the surfaces of the vaults until they met at this regularized groin line Thus in the coved, penetrated ceilings of the 16th century, where an elliptical vault was intersected by smaller vaults besides, the groins would often be given simple segmental curves, meeting at a point in the centre of each penetration, and the smaller vaults forming the penetrations given a surface almost conical in order to meet this line The term Welsh groin is often applied to the groin resulting from such an intersection of a smaller cross vault with a higher main vault In the mediaeval period, when ribbed vaulting became common, the ribs under the groins (groin ribs or diagonal ribs), being built first, were usually on curves lying in a simple plane The web, or filling in of small stones between the ribs, could be warped or twisted at will, so as to start correctly from the wall or cross ribs of different sizes and yet meet over the groin rib (*See* VAULT)

GROLIER, JEAN, VICOMTE D'AIGUISY (1479–1565), French bibliophile, was born at Lyons, was the friend of Budé, the patron of Aldus, and was called the Maecenas of men of letters by his contemporaries Of his great library of 3,000 volumes, dispersed in 1675, some 350 are known to be in existence They are richly bound and bear their owner's *ex libris* "Grolerii Lugdunensis, et Amicorum" Grolier made the acquaintance of Aldus while he was French ambassador in Italy (1510–35)

See Leroux de Lincy, *Recherches sur Jean Grolier* (1866).

GROLMANN, KARL WILHELM GEORG VON (1777–1843), Prussian general of infantry, was born in Berlin on July 30, 1777 He entered an infantry regiment when scarcely thirteen, and received rapid promotion As a subaltern he became intimate with Scharnhorst, and after the defeat of Jena (1806) was one of his active assistants in the reorganization of the Prussian army He served as a volunteer in the Spanish army throughout the Peninsular War, returning to Prussia in 1813 He joined the general staff, and was engaged throughout the campaigns of 1813 and 1814 He was now appointed quartermaster-general to Blucher The most famous incident in his life is his persuasion of Gneisenau to press forward to Wellington's assistance at Waterloo (*see* WATERLOO CAMPAIGN and GNEISENAU) After the peace of 1815 Grolmann served on the general staff, at the ministry of war, and as commander-in-chief at Posen, where he died on June 1, 1843 General von Grolmann supervised and provided much of the material for von Damitz's *Gesch des Feldzugs 1815* (Berlin, 1837–1838), and *Gesch des Feldzugs 1814 in Frankreich* (Berlin, 1842–1843).

See v Conrady, *Leben und Wirken des Generals Karl von Grolmann* (1894–96).

GROMATICI or **AGRIMENSORES,** the name for land-surveyors amongst the Romans, from Lat *groma* or *gruma,* a surveyor's measuring appliance The art of surveying was probably at first in the hands of the augurs, who from early times had made use of sighting instruments for marking out the rectangular consecrated space *templum* containing the *tabernaculum* in which the augur observed the omens given by birds The first professional surveyor mentioned is L Decidius Saxa, who was employed by Anthony in the measurement of camps (Cicero, *Philippics,* XI 12, XIV 10) The subsequent increase in the number of military colonies, the settlement of Italian peasants in the provinces, the general survey of the empire under Augustus, the separation of private from State domains, led to the formation of a recognized professional class of highly-paid surveyors, some of whom were even honoured with the title *clarissimus* Their duties required not only geometrical but also legal knowledge, as their decisions were considered authoritative in matters relating to the distribution of lands This led to the institution of special training schools and the growth of a special literature, chiefly between the 1st and 6th centuries A D The earliest of the gromatic writers was Frontinus (*q v*), whose *De agrorum qualitate,* written from A D 81–96, dealt more with the legal aspect of the art Extracts of it are preserved in the commentary of Aggenus Urbicus, a Christian schoolmaster Under Trajan a certain Balbus wrote a manual of geometry for land surveyors (*Expositio et ratio omnium formarum et mensurarum*) Also, under Trajan, Hyginus makes a definite reference to the use of the groma for laying out agricultural holdings Later was Siculus Flaccus (*de condicionibus agrorum,* extant), while the most curious treatise on the subject, written in barbarous Latin and entitled *Casae litterarum,* is the work of a certain Innocentius (4th–5th century) The *Gromatici veteres* contains extracts from official registers (probably 5th century) of land surveys, lists and descriptions of boundary stones, and extracts from the Theodosian Codex According to Mommsen, the collection had its origin during the 5th century in the office of a diocesan governor of Rome, who had a number of surveyors under him The *agrimensores* have been known by various names, e g, *decempedator* (with reference to the instrument used), *finitor, mensor castrorum* in republican times, *togati Augustorum* as imperial civil officials, *professor, auctor* as professional instructors

The best work on the Gromatici is by Blume Lachmann and Rudorff (1848) with supplementary volume, *Die Schriften der römischen Feldmesser* (1852), *see* also *Letters of Cassiodorus,* P. de Tissot, *La Condition des Agrimensores dans l'ancienne Rome* (1879) G Rossi, *Groma e squadro* (Turin, 1877), articles by G Humbert in Daremberg and Saglio's *Dictionnaire des antiquités,* and by Teuffel-Schwabe, *Hist of Roman Literature,* 58; *Geographical Journal,* vol. lxix (1927) contains an illustrated article by Col. Sir Henry Lyons "Ancient Surveying Instruments" (p. 132)

GRONINGEN, the most northerly province of Holland, bounded south by Drente, west by Friesland and the Lauwers Zee,

north and north-east by the North Sea and the mouth of the Ems with the Dollart, and on the south-east by the Prussian province of Hanover It includes the islands of Boschplaat and Rottumeroog, belonging to the group of Frisian islands (*q v.*). Area, 883 sq m., pop. (1926) 388,846; density per sq m. 440. The sandy tongue of the Hondsrug extends from the Drente plateau almost up to the capital. West, north and north-east of this the province is flat and consists of sea-clay or sand and clay mixed, except where patches of low and high fen occur on the Frisian borders Low fen predominates to the east of the capital. The south-east of the province is of high fen resting on diluvial sand largely reclaimed. The morass on the Prussian border was long considered as the natural protection of the eastern frontier, and with the view of preserving its impassable condition neither agriculture nor cattle-rearing was permitted until 1824, and it was only in 1868 that the work of reclamation begun The gradual extension of the seaward boundaries of the province owing to the process of littoral deposits may be traced by a triple line of sea-dikes marking the successive stages in this advance The rivers of Groningen descending from the Drente plateau meet at the capital, whence they are continued by the Reitdiep to the Lauwers Zee (being discharged through a lock), and by the Ems canal (1876) to Delfzyl The south-eastern corner of the province is traversed by the Westerwolde Aa, which discharges into the Dollart The railways belong to the northern section of the State railways, and afford communication with Germany via Winschoten. Agriculture is the main industry and the proportion of landowners is a very large one The ancient custom called the *beklem-recht,* or lease-right, doubtless accounts for this By this custom a tenant-farmer is able to bequeath his farm, as he holds his lease in perpetuity

The chief agricultural products are barley, oats, wheat, and in the north-east flax is also grown, and exported to South Holland and Belgium On the higher clay grounds cattle-rearing and horse-breeding are also practised, together with butter and cheese making Potatoes are cultivated Coast fisheries are considerable Groningen (*q v*) is the only large town. Delfzyl, formerly an important fortress for the protection of the ancient sluices on the river Delf, has benefited by the construction of the Ems (Eems) ship-canal connecting it with Groningen, and has a harbour, importing wood Appingedam and Winschoten are very old towns with cattle and horse markets.

GRONINGEN, a town of Holland, capital of the province of the same name, at the confluence of the two canalized rivers the Drentsche Aa and the Hunse (which are continued to the Lauwers Zee as the Reit Diep), 16 m N of Assen and 33 m E of Leeuwarden by rail Pop (1925) 99,587

History.—The town of Groningen belonged originally to the *pagus,* or *gouw,* of Triantha (Drente), the countship of which was bestowed by the emperor Henry II on the bishop and chapter of Utrecht in 1024 In 1040 Henry III gave the church of Utrecht the royal domain of Groningen, and in the deed of gift the "villa Cruoninga" is mentioned At first the bishops were too strong for the townsmen, and down to the 15th century an episcopal prefect, or burgrave, had his seat in the city, his authority extending over the neighbouring districts known as the Gorecht Gradually, however, the burghers, aided by the neighbouring Frisians, succeeded in freeing themselves from the episcopal yoke The city was walled in 1255; before 1284 it had become a member of the Hanseatic league; and by the end of the 14th century it was practically a powerful independent republic, which exercised an effective control over the Frisian Ommelande between the Ems and the Lauwers Zee. In 1440 Bishop Dirk II finally sold to the city the rights of the see of Utrecht over the Gorecht

The mediæval constitution of Groningen, unlike that of Utrecht, was aristocratic Merchant gild there was none; and the craft gilds were without direct influence on the city government, which held them in subjection Membership of the governing council, which selected from its own body the four *rationales* or burgomasters, was confined to men of approved "wisdom," and wisdom was measured in terms of money This *Raad* of wealthy burghers gradually monopolized all power The bishop's bailiff (*schout*), with his nominated assessors (*scabini*), continued to exercise jurisdiction, but members of the *Raad* sat on the bench with him, and an appeal lay from his court to the *Raad* itself. The council was supreme and in 1439 it decreed that no one might trade in all the district between the Ems and the Lauwers Zee except burghers, and those who had purchased the *burwal* (right of residence in the city) and the freedom of the gilds In 1536 the city passed into the hands of Charles V, and in the great wars of the 16th century suffered all the miseries of siege and military occupation From 1581 onwards, Groningen, still held by the Spaniards, was constantly at war with the "Ommelanden" which had declared against the king of Spain. In 1672 the town was besieged by the bishop of Munster, but it was successfully defended, and in 1698 its fortifications were improved under Coehoorn's direction. The French Republicans planted their tree of liberty in the Great Market in February 1795, and they continued in authority till 1814. The fortifications of the city were destroyed in 1874.

Buildings, etc.—The ancient part of the town is still surrounded by the former moat, and in the centre lies a group of open places The chief church is the Martini-kerk, dating from 1477, and an organ constructed by the famous scholar and musician Rudolph Agricolo, who was born near Groningen in 1443. The Aa church dates from 1465, but was founded in 1253 The provincial museum of antiquities contains interesting Germanic antiquities, as well as mediæval and modern collections of porcelain, pictures, etc. The old Ommelanderhuis was built in 1509.

The university of Groningen, founded in 1614, has among its auxiliary establishments an observatory and a library which contains a copy of Erasmus' New Testament with marginal annotations by Luther. Groningen is the centre from which several important canals radiate Hence steamers ply in all directions, and there is a regular service to Emden and the islands of Borkum and Schiermonnikoog Groningen is the most important town in the north of Holland, with brick houses of the 16th and 17th centuries still standing As capital of the province, and because of its natural position, Groningen maintains a considerable trade, chiefly in oil-seed, grain, wood, turf and cattle The chief industries are flax-spinning, sugar refining, book printing, and it also manufactures beer, tobacco, cotton and woollen stuffs, furniture and pianos; besides which there are numerous goldsmiths and silversmiths

GRONLUND, LAURENCE (1846–1899), American socialist, was born in Copenhagen, Denmark, on July 13, 1846. He graduated at the University of Copenhagen in 1865, began the study of law, removed to the United States in 1867, taught German in Milwaukee, was admitted to the bar in 1869 and practised law in Chicago He became a writer and lecturer on socialism and was for a time connected with the work of the Socialist Labor Party After a period of service in the bureau of labour statistics, he returned to the lecture field, and was an editorial writer for the New York and Chicago *American* from 1898 until his death in New York city on Oct 15, 1899 His principal works are *The Coming Revolution* (1880), *The Co-operative Commonwealth in its Outlines* (1884), *Ça Ira, or Danton in the French Revolution* (1888); *Our Destiny, the Influence of Socialism on Morals and Religion* (1890), and *The New Economy* (1898)

GRONOVIUS (the latinized form of GRONOV), **JOHANN FRIEDRICH** (1611–1671), German classical scholar and critic, was born at Hamburg. In 1643 he was appointed professor of rhetoric and history at Deventer, and in 1658 to the Greek chair at Leyden, where he died (*see* also FABRETTI, RAPHAEL) Besides editing, with notes, Statius, Plautus, Livy, Tacitus, Aulus Gellius and Seneca's tragedies, Gronovius was the author, amongst numerous other works, of *Commentarius de sestertiis* (1643) and of an edition of Hugo Grotius' *De jure belli et pacis* (1660). His *Observationes* contain a number of brilliant emendations.

See J E. Sandys *Hist. of Class. Schol* ii. (1908); F A. Eckstein in Ersch and Gruber's *Allgemeine Encyklopadie.*

GROOM, in modern usage a male servant attached to the stables, whose duties are to attend to the cleaning, feeding, currying, and care generally of horses The earliest meaning of the word appears to be that of a boy, and in 16th and 17th century literature it frequently occurs, in pastorals, for a shepherd lover.

Later it is used for any male attendant, and thus survives in the name for several officials in the royal household, such as the grooms-in-waiting, and the grooms of the great chamber The groom-porter, whose office was abolished by George III, saw to the preparation of the sovereign's apartment, and, during the 16th and 17th centuries, provided cards and dice for playing To him were submitted all questions of gaming within the court.

GROOT, GERHARD (1340–1384), otherwise Gerrit or Geert Groet, in Latin Gerardus Magnus, a preacher and founder of the society of Brothers of Common Life (*q v*), was born at Deventer in the diocese of Utrecht After studying at Paris, where he imbibed nominalistic tendencies, and at Cologne, he visited the papal court at Avignon about 1366 Soon afterwards he was appointed to a canonry in Utrecht and to another in Aix-la-Chapelle. In 1374 he experienced a conversion which led him to retire for three years to the Carthusian monastery at Munnikhuizen near Arnhem In 1379, having received ordination as a deacon, he became missionary preacher throughout the diocese of Utrecht The success which followed his labours was immense; according to Thomas à Kempis the people left their business and their meals to hear his sermons, so that the churches could not hold them. His violent denunciation of the prevailing sins of the laity and clergy provoked hostility, and accusations of heterodoxy were brought against him.

It was in vain that Groot emitted a *Publica Protestatio*. The bishop was induced to issue an edict which prohibited from preaching all who were not in priest's orders, and an appeal to Urban VI was without effect At some period (perhaps 1381, perhaps earlier) he visited the famous mystic Johann Ruysbroeck, prior of the Augustinian canons at Groenendael near Brussels, at this visit was formed Groot's attraction for the rule of the Augustinian canons At the close of his life he was asked by some clerics to form them into a religious order, and Groot resolved that they should be canons regular of St Augustine, but he died before a foundation could be made In 1387, however, a site was secured at Windesheim, and here was established the monastery that became the cradle of the Windesheim congregation of canons regular Groot lived to preside over the first days of his other creation, the society of Brothers of Common Life He died of the plague at Deventer in 1384

The chief authority for Groot's life is Thomas à Kempis, *Vita Gerardi Magni* (Eng trans, J P Arthur, *The Founders of the New Devotion*, 1905), also the *Chronicon Windeshemense* of Johann Busch (ed K Grube, 1886) *See* S Kettlewell, *Thomas à Kempis and the Brothers of Common Life* (1882), F R Cruise, *Thomas à Kempis* (1887) and details in Herzog-Hauck, *Realencyklopadie* (ed. 3)

(E C B, X)

GROOVE-TOOTHED SQUIRREL, a large Bornean squirrel, *Rhithrosciurus macrotis*, representing a genus by itself The tail is large and fox-like, and the ears are tufted and the flanks marked by black and white bands

GROS, ANTOINE JEAN, Baron (1771–1835), French painter, was born at Paris on March 16, 1771 His father, who was a miniature painter, began to teach him to draw at the age of six Towards the close of 1785 Gros entered the studio of David The death of his father threw Gros, in 1791, upon his own resources In 1793 he left France for Italy He studied Rubens at Genoa He was presented to Josephine Beauharnais and through her to Bonaparte On Nov 15, 1796, Gros was present with the army near Arcola when Bonaparte planted the tricolor on the bridge Gros seized on this incident, and showed by his treatment of it that he had found his vocation Bonaparte gave him the post of "inspecteur aux revues," which enabled him to follow the army, and in 1797 nominated him on the commission charged to select the spoils which should enrich the Louvre In 1799, having escaped from the besieged city of Genoa, Gros made his way to Paris His "esquisse" (Musée de Nantes) of the "Battle of Nazareth" gained the prize offered in 1802 by the consuls, but was not carried out, owing it is said to the jealousy of Junot felt by Napoleon; but he indemnified Gros by commissioning him to paint his own visit to the pest-house of Jaffa "Les Pestiférés de Jaffa" (Louvre) was followed by the "Battle of Aboukir" 1806 (Versailles) and the "Battle of Eylau," 1808 (Louvre).

These subjects painted under an impulse of real events made him the artist of the Napoleonic *epos* As long as the military element remained bound up with French national life, Gros received from it a fresh and energetic inspiration which carried him to the very heart of the events which he depicted; but as the army and its general separated from the people, Gros ceased to find the nourishment necessary to his genius, and the defect of his artistic position became evident Trained in the sect of the Classicists, he was shackled by their rules, even when—by his naturalistic treatment of types, and appeal to picturesque effect in colour and tone—he seemed to run counter to them The decoration of the dome of St Geneviève (begun in 1811 and completed in 1824) is the only work of Gros's later years which shows his early force and vigour The "Departure of Louis XVIII." (Versailles), the "Embarkation of Madame d'Angoulême" (Bordeaux), the plafond of the Egyptian room in the Louvre, and finally his "Hercules and Diomedes," exhibited in 1835, testify that Gros's efforts—in accordance with the frequent counsels of his old master David—to stem the rising tide of Romanticism, served but to damage his once brilliant reputation Exasperated by criticism and the consciousness of failure, Gros sought refuge in the grosser pleasures of life On June 26, 1835 he was found drowned along the Seine. Although a classicist, he encouraged young Gericault; while his own treatment of colour made him unwittingly a precursor of the romantic movement.

See Delécluze, *Louis David, son école et son temps* (1855), Julius Meyer, *Geschichte der Modernen franzosischen Malerei* (1867); Jean Baptiste Delestive (pupil of Gros) *Gros, sa vie e ses ouvrages* (1867); G Dargenty, *Le baron Gros* (1887)

GROSART, ALEXANDER BALLOCH (1827–1899), Scottish divine and literary editor, son of a building contractor, was born at Stirling on June 18, 1827, and died at Dublin on March 16, 1899 He edited the works of numerous Puritan divines, the "Fuller Worthies Library," the "Chertsey Worthies Library," the "Huth Library Series" and various other works Grosart was unwearied in searching for rare books, and brought to light much literature formerly almost inaccessible.

GROSBEAK, a name indefinitely applied to many thick-billed birds. It is one of the names of the hawfinch (*q v*) but is generally used in combination The pine-grosbeak (*Pinicola enucleator*) is a finch (*q v*) inhabiting the conifer woods of the New and Old Worlds, moving southwards in large flocks with the approach of winter In structure and habits it resembles a bullfinch, but is larger, in plumage it is much like a crossbill (*q v*). It has many smaller allies The cardinal grosbeak or Virginian nightingale (*Cardinalis cardinalis*) inhabits eastern U S A, south of 40° N lat The cock bird is bright red in colour and possesses a fine song The hen is less conspicuous in both respects Many other American birds are called grosbeaks, of which the rose-breasted grosbeak (*Zamelodia ludoviciana*) is the best known. For "sociable grosbeak," *see* Weaver-bird

GROSE, FRANCIS (*c* 1730–1791), English antiquary, was born at Greenford, Middlesex. Grose early showed an interest in heraldry and antiquities, and his father procured him a position in the Heralds' college In 1763, being then Richmond Herald, he sold his tabard, and shortly afterwards became adjutant and paymaster of the Hampshire militia The fortune left him by his father being squandered, he began to turn to account his excellent education and his powers as a draughtsman In 1757 he had been elected fellow of the Society of Antiquaries In 1773 he began to publish his *Antiquities of England and Wales*, completed in 1787. In 1789 he set out on an antiquarian tour through Scotland, and in the course of this journey met Burns, who composed in his honour the famous song beginning "Ken ye aught o' Captain Grose," and in that other poem, still more famous, "Hear, land o' cakes, and brither Scots," warned all Scotsmen of this "chield among them taking notes" He died in Dublin on June 12, 1791.

Grose was a sort of antiquarian Falstaff—at least he possessed in a striking degree the knight's physical peculiarities, but he was a man of true honour and charity, a valuable friend, an inimitable boon companion His humour, his varied knowledge and his good nature all contributed to make him a favourite in society.

Grose's works include *The Antiquities of England and Wales*

(6 vols., 1773–87); *Advice to the Officers of the British Army* (1782), a satire in the manner of Swift's *Directions to Servants; A Guide to Health, Beauty, Riches and Honour* (1783), a collection of advertisements of the period, with characteristic satiric preface, *A Classical Dictionary of the Vulgar Tongue* (1785); *A Treatise on Ancient Armour and Weapons* (1785–89); Darrell's *History of Dover* (1786); *Military Antiquities* (2 vols., 1786–88); *A Provincial Glossary* (1787); *Rules for Drawing Caricatures* (1788), *The Antiquities of Scotland* (2 vols, 1789–91), *Antiquities of Ireland* (2 vols, 1791), edited and partly written by Ledwich *The Grumbler,* 16 humorous essays, appeared in 1791 after his death; and in 1793 *The Olio,* a collection of essays, jests and bits of poetry, highly characteristic of Grose was printed

A capital full-length portrait of Grose by N. Dance is in the first volume of the *Antiquities of England and Wales,* and another is among Kay's *Portraits.* A versified sketch of him appeared in the *Gentleman's Magazine,* lxi 660 See *Gentleman's Magazine,* lxi. 498, 582, Noble's *Hist. of the College of Arms,* p. 434, *Notes and Queries,* passim

GROSS. Apart from the direct meaning of the word (thick, bulky), and such figurative senses as coarse, vulgar or flagrant, the chief uses are whole, entire, without deduction, as opposed to "net," or as applied to that which is sold in bulk as opposed to "retail." As a unit of tale, "gross" equals 12 dozen, 144, sometimes known as "small gross," in contrast with "great gross," *i.e.*, 12 gross, 144 dozen As a technical expression in English common law, "in gross" is applied to an incorporeal hereditament attached to the person of an owner (*See* EASEMENT)

GROSSENHAIN, a town in the republic of Saxony, 20 m N. from Dresden, on the main line of railway to Berlin Pop (1925) 12,893 The industries include manufactures of woollen stuffs, leather, glass, chemicals, carriages and machinery

GROSSETESTE, ROBERT (*c.* 1175–1253), bishop of Lincoln, and one of the greatest of mediaeval statesmen and philosophers, was born of humble parents at Stradbrook, Suffolk About 1197, he graduated at Oxford where he had become proficient in law, medicine and the natural sciences Some ten years later he took his divinity degree, and soon after this event, as the outstanding teacher at Oxford, he was appointed Master of the Oxford Schools, a status which was first termed "Chancellor" in the Legatine Ordinance of 1214 In 1229 when the Franciscans established their first school at Oxford, Grosseteste was secured as their reader in theology According to Roger Bacon, who was a severe critic, Grosseteste was pre-eminent among his contemporaries for his knowledge of the natural sciences and of mathematics Between 1214 and 1231 Grosseteste held in succession the archdeaconries of Chester, Northampton and Leicester In 1232, he resigned all his preferments except one prebend at Lincoln But he retained the office of chancellor, and in 1235 accepted the bishopric of Lincoln, an appointment which he held until his death on Oct 9, 1253

Grosseteste's scheme to reform morals and clerical discipline throughout his vast diocese, brought him into conflict with more than one privileged corporation, in particular with his own chapter, and it was only in 1245 that by a personal visit to the papal court at Lyons, he secured a favourable verdict His zeal for reform led him to advance, on behalf of the courts-Christian, pretensions which it was impossible that the secular power should admit He twice incurred a well-merited rebuke from Henry III upon this subject; although it was left for Edward I to settle the question of principle in favour of the state The devotion of Grosseteste to the hierarchical theories of his age is attested by his correspondence with his chapter and the king Against the former he upheld the prerogative of the bishops, against the latter he asserted that it was impossible for a bishop to disregard the commands of the Holy See Where the liberties of the national church came into conflict with the pretensions of Rome he stood by his countrymen Of royal exactions he was impatient

It was, however, soon made clear that the king and pope were in alliance to crush the independence of the English clergy; and from 1250 onwards Grosseteste openly criticized the new financial expedients to which Innocent IV had been driven by his desperate conflict with the Empire While visiting Innocent in 1250, the bishop laid before the pope and cardinals a written memorial in which he ascribed all the evils of the Church to the malignant influence of the Curia. It produced no effect, although the cardinals felt that Grosseteste was too influential to be punished for his audacity In 1251 he protested against a papal mandate enjoining the English clergy to pay Henry III one-tenth of their revenues for a crusade, and in 1253 against a command to provide in his own diocese for a papal nephew

In literary and speculative activities, Grosseteste found some release from his ecclesiastical and political cares He was familiar with the Neo-Platonic materials introduced into the West by the Arabians, with their scientific treatises and with the newly translated works of Aristotle He himself contributed to the revival of learning by his commentaries on Aristotle, and by his Greek-Latin translations of the Ethics, of the works of the pseudo-Dionysius and of the *De Fide Orth* of the Damascene; hence Grosseteste, rather than Albert the Great, must be credited with having introduced Aristotle into the West The peculiar originality of his mind is further manifested by his profound interest in science, by his exaltation of mathematics, by his enthusiasm for the study of languages, by his treatises on husbandry and politics, by his poetical compositions and by his concern for music and ecclesiastical architecture His philosophy, which represents the first attempt to reconcile the doctrines of Augustine and of Aristotle, is full of interest, especially in its denial of the eternity of the world, and in its doctrines of light as the origin of corporeity, of the stars as composed of the four elements, of the active intellect in man, of angelology and of the divine knowledge of singulars

BIBLIOGRAPHY.—An account of the mss and editions of Grosseteste's works is given in the preface to Baur's edition of the scientific opuscula published in vol. ix of the series *Beitrage zur Gesch der Phil des Mittelalters* (Munster, 1912) The *Letters* were edited by H R Luard in the Rolls Series (1861) and the famous memorial to the pope is printed in the appendix to E Brown's *Fasciculus rerum expetendarum et fugiendarum* (1690) A French poem, *Le Chastel d'amour,* was edited by R F. Weymouth for the Philological Society in 1864 For Grosseteste's life and work *see* F S Stevenson, *Robt Grosseteste* (1899); Baur, *Die Philosophie des Grosseteste* in Bd xviii of the *Beitrage* series (1917), *see* also A G Little, *The Grey Friars in Oxford* (1899), and "The Franciscan School at Oxford," *Arch Fran Hist* (1926); P. Duhem, *Le Système du Monde* (5 vols. 1913, foll), and Überweg, *Gesch. der Philosophie* (Bd II, 1928)

GROSSETO, a town and episcopal see of Tuscany, capital of the province of Grosseto, 90 m S S E of Pisa by rail Pop (1921) 8,027 (town), 8,737 (commune) It is 38 ft above sea-level. Fortifications constructed by Francis I (1574–87) and Ferdinand I (1587–1609) form a hexagonal enciente with projecting bastions, with two gates only. The small cathedral begun in 1190 and rebuilt in 1294, is of red and white marble, in the Italian Gothic style. The citadel was built in 1311 by the Sienese. Grosseto is on the main line from Pisa to Rome

The town dates from the middle ages In 1138 the episcopal see was transferred thither from Rusellae. In 1224, with the rest of the Maremma, of which it is the capital, it came under the dominion of Siena By the peace of 1559, however, it passed to Cosimo I of Tuscany In 1745 the malaria had grown to such an extent, owing to the neglect of the drainage works, that Grosseto had only 648 inhabitants, though in 1224 it had 3,000 men who bore arms Leopold I renewed drainage operations, and by 1836 the population had risen to 2,392

GROSSI, TOMMASO (1791–1853), Lombard poet and novelist, was born at Bellano, on the Lake of Como, on Jan. 20, 1791 He studied law at Pavia, and began to practise in Milan, but the Austrian Government, suspecting his loyalty, interfered with his prospects, and in consequence Grossi was a simple notary all his life He wrote in the Milanese dialect the battle poem *La Prineide,* in which he described the tragic death of Prina, chief treasurer during the empire, in the streets of Milan in 1814 His *The Golden Rain* (*La Pioggia d' oro*) and *The Fugitive* (*La Fuggitiva*) secured him the friendship of Porta and Manzoni He wrote the narrative poems *Ildegonda* (1814) and *Ulrico and Lida* (1837); the epic *I Lombardi alla prima crociata* (1826); and an historical romance *Marco Visconti* (1834), inspired by Manzoni. He wrote little after 1838, and died at Milan on Dec. 10, 1853 His

collected poems were published in 1877 (Milan)

See C. Cantù, *Vita ed opere di Tommaso Grossi* (1854), M Chini, *Le teorie dei romantici intorno al poema epico "I lombardi alla prima crociata" di Tommaso Grossi* (Lanciano, 1920).

GROSSMITH, GEORGE (1847–1912), English comedian, was born on Dec 9, 1847, the son of a law reporter and entertainer of the same name After some years of journalistic work he started about 1870 as a public entertainer, with songs and recitations; but in 1877 he began a long connection with the Gilbert and Sullivan operas at the Savoy Theatre, London, in *The Sorcerer* For 12 years he had the leading part, his capacity for "patter-songs," and his humorous acting, dancing and singing marking his creations of the chief characters in the Gilbert and Sullivan operas as the expression of a highly original individuality In 1889 he left the Savoy, and again set up as an entertainer, visiting all the cities of Great Britain and the United States, but retiring in 1901 Among other books he wrote *The Reminiscences of a Society Clown* (1888), and, with his brother Weedon (*q v*), *The Diary of a Nobody* (1894) His humorous songs and sketches numbered over 600 He died at Folkestone on March 1, 1912 George Grossmith's two sons, Laurence Grossmith and George Grossmith, Jr, were both actors, the latter becoming a well-known figure in the musical comedies at the Gaiety Theatre, London

GROSSMITH, WEEDON (1853–1919), English comedian, brother of the second George Grossmith, was born in London on June 9, 1853 He was educated as a painter and exhibited at the Royal Academy and the Grosvenor Gallery, London, but in 1885 he joined Rosina Vokes's theatrical company and went on tour in the provinces and in America He first appeared in London in 1887 in *Woodcock's Little Game;* his earliest notable success was made in *A Pantomime Rehearsal* In 1894 he took over the management of Terry's theatre and produced a play of his own, *The Night of the Party* His gift of quiet humour brought him much success, his best-known parts were in *The New Boy, Baby Mine, The Amazons, The Misleading Lady* and *Stopping the Breach,* this being the last play in which he appeared (1917) He married Miss May Palfrey, an actress. In 1913 he published his autobiography, *From Studio to State* He died in London on June 14, 1919

GROS VENTRES, a tribe of North American Indians of Algonquian stock The name is said to have reference to the greediness of the people, but more probably originated from their prominent tattooing They are settled at Fort Belknap agency, Montana The name has also been given to other tribes, *e g*, the Hidatsa or Minitari, now at Fort Berthold, North Dakota

GROTE, GEORGE (1794–1871), English historian of Greece, was born on Nov 17, 1794, at Clay Hill, near Beckenham, Kent, of a well-known family of bankers originating from Bremen He was sent to the Sevenoaks grammar school and afterwards to Charterhouse, but at the age of 16 he entered the bank in which his father was a partner He spent all his spare time in the study of classics, history, metaphysics and political economy, and in learning German, French and Italian In 1820 he married Harriet Lewin.

In 1817 Grote came under the influence of David Ricardo, and through him of James Mill and Jeremy Bentham. His first published work, the *Statement of the Question of Parliamentary Reform* (1821), was a reply to Sir James Mackintosh's article in the *Edinburgh Review* advocating popular representation, vote by ballot and short parliaments In April 1822 he published in the *Morning Chronicle* a letter against Canning's attack on Lord John Russell, and edited, or rather re-wrote, some papers of Bentham, which he published as *Analysis of the Influence of Natural Religion on the Temporal Happiness of Mankind, by Philip Beauchamp* (1822) The book was published in the name of Richard Carlile, then in gaol at Dorchester From the *Posthumous Papers* (pp 22, 24) it is clear that Mrs Grote was wrong in asserting that she first in 1823 suggested the *History of Greece;* the book was already in preparation in 1822, though what was then written was subsequently reconstructed From 1826 to 1830 he worked with J. S Mill and Henry Brougham in the organization of the new "university" in Gower street. He was a member of the council which organized the faculties and the curriculum of University college, London; but in 1830, owing to a difference with Mill as to an appointment to one of the philosophical chairs, he resigned his position In 1849 he was re-elected to the council, in 1860 he became treasurer, and on the death of Brougham (1868) president. He became a member of the senate in 1850 and was vice-chancellor in 1862 He presented to the college the *Marmor Homericum,* and finally bequeathed the reversion of £6,000 for the endowment of a chair of philosophy of mind and logic. He succeeded his friend Henry Hallam as a trustee of the British Museum in 1859, and took part in the reorganization of the departments of antiquities and natural science

Meanwhile, in 1830, he had spent some months in Paris in the society of the Liberal leaders Recalled by his father's death, July 6, he became manager of the bank and began to take a leading position among the city Radicals In 1831 he published his *Essentials of Parliamentary Reform* (an elaboration of his previous *Statement*), and in Dec 1832 entered parliament as one of the members for the City of London He sat in the House of Commons until 1841, representing the Benthamite school of "philosophic radicalism" During these years of active public life his interest in Greek history and philosophy increased, and after a trip to Italy in 1842 he devoted himself to literature In 1846 the first two volumes of the *History of Greece* appeared, and the remaining ten between 1847 and 1856 The formation of the Sonderbund (July 20, 1847) led him to visit Switzerland to study a condition of things in some sense analogous to that of the ancient Greek States This visit resulted in the publication in *The Spectator* of seven weekly letters, collected in book form, at the end of 1847 (*See* a letter to de Tocqueville in Mrs Grote's reprint of the *Seven Letters,* 1876)

In 1856 Grote began to prepare his works on Plato and Aristotle Perhaps Grote's most distinctive contribution to the study of Greek philosophy is his chapter in the *History of Greece* on the Sophists, of whom he took a view somewhat more favourable than has been accepted before or since *Plato and the Other Companions of Sokrates* (3 vols) appeared in 1865, but the work on Aristotle he was not destined to complete He had only finished the *Organon* (2nd ed, 1880) when he died on June 18, 1871, he was buried in Westminster Abbey

It is on his *History of Greece* that Grote's reputation mainly rests It contains a mass of information carefully collected from all sources, arranged on a simple plan, and expressed in direct, forcible language It is in this respect one of the few great comprehensive histories, great in scope, conception and accomplishment It is also interesting as among the first works in which Greek history became a separate study, based on real evidence and governed by the criteria of modern historical science Further, Grote, a practical man, a rationalist and an enthusiast for democracy, was the first to consider Greek political development with a sympathetic interest in opposition to the attitude of John Gillies and Mitford, who had written under the influence of horror at the French Revolution The value of the *History* consists to-day primarily in its inspiring examination of the Athenian democracy, its growth and decline

BIBLIOGRAPHY—The *History of Greece* passed through five editions, the fifth (10 vols, 1888) being final It was published in Everyman's Library (1907) and in a condensed form in the same year by J M Mitchell and M O B Caspari Grote's *Minor Works* were published by Alexander Bain (1873). *See* Mrs Grote's *Personal Life of George Grote* (1873) and article in *Dict Nat. Biog* by G Croom Robertson

GROTEFEND, GEORG FRIEDRICH (1775–1853), German epigraphist, was born at Munden in Hanover on June 9, 1775 He studied at Gottingen, and became conrector of the Frankfurt gymnasium, and then director of the gymnasium at Hanover He published some important works on the Umbrian and Oscan dialects, on the coins of Bactria and other subjects But it was in the East rather than in the West that Grotefend did his greatest work The cuneiform inscriptions of Persia had for some time been attracting attention in Europe, exact copies of them had been published by the elder Niebuhr, who lost his eyesight over the work, and Grotefend's friend, Tychsen of Rostock, believed that he had ascertained the characters in the

column, now known to be Persian, to be alphabetic At this point Grotefend took the matter up His first discovery was communicated to the Royal Society of Gottingen in 1800, and reviewed by Tychsen two years afterwards. In 1815 he gave an account of it in Heeren's great work on ancient history, and in 1837 published his *Neue Beiträge zur Erlauterung der persepolitanischen Keilschrift.* Three years later appeared his *Neue Beiträge zur Erlauterung der babylonischen Keilschrift.* His discovery may be summed up as follows. (1) that the Persian inscriptions contain three different forms of cuneiform writing, so that the decipherment of the one would give the key to the decipherment of the others; (2) that the characters of the Persian column are alphabetic and not syllabic; (3) that they must be read from left to right; (4) that the alphabet consists of 40 letters, including signs for long and short vowels, and (5) that the Persepolitan inscriptions are written in Zend (which, however, is not the case), and must be ascribed to the age of the Achaemenian princes. The process whereby Grotefend arrived at these conclusions illustrates his persevering genius (*see* CUNEIFORM) He died Dec 15, 1853

GROTESQUE, a type of ornament in architecture, painting or sculpture, consisting of fanciful combinations of animals and foliated forms The word is also commonly applied to any whimsical design or decorative style

GROTIUS, HUGO (1583–1645), in his native country Huig van Groot, Dutch publicist and statesman, was born at Delft on April 10, 1583. The Groots were descended from the French noble family of de Cornets, and this cadet branch had taken the name of Groot on the marriage of Hugo's great-grandfather with a Dutch heiress Hugo's father had four times served the office of burgomaster of Leyden, and was one of the three curators of the university of that place Hugo Grotius wrote good Latin verses at nine, was ripe for the university at 12, and at 15 edited the encyclopaedic work of Martianus Capella At 15 he accompanied Count Justin of Nassau, and the grand pensionary J van Oldenbarneveldt on their special embassy to the court of France He took the degree of doctor of law at Leyden, and entered on practice as an advocate

In 1600 Grotius edited the remains of Aratus, with the versions of Cicero, Germanicus and Avienus Some Latin lines on the siege of Ostend spread his fame beyond the circle of the learned He wrote three dramas in Latin —*Christus patiens; Sophomphaneas,* on the story of Joseph and his brethren; and *Adamus exul,* a production still remembered as having given hints to Milton The *Sophomphaneas* was translated into Dutch by Vondel, and into English by Francis Goldsmith (1652); the *Christus patiens* into English by George Sandys (1640)

In 1603 the States-General appointed Grotius historiographer, though he was but 20 years of age He then became advocate-general of the fisc for the provinces of Holland and Zeeland In 1608 he married Marie Reigersberg, a woman of great capacity and noble disposition

In the winter of 1604 Grotius composed (but did not publish) a treatise entitled *De jure praedae* The ms remained unknown till 1868, when it was edited by Prof Fruin It shows that the principles and the plan of the celebrated *De jure belli,* which was not composed till 1625, more than 20 years after, had already been conceived by a youth of 21 The chief difference between the two treatises is the substitution of more cautious and guarded language, less dogmatic affirmation, more allowance for exceptions and deviations The *Jus pacis* was an addition introduced first in the later work. The *De jure praedae* shows that Grotius was drawn to this subject by a special occasion presented by his professional engagements He was retained by the Dutch East India company as their advocate One of their captains, Heemskirk, had captured a rich Portuguese galleon in the Straits of Malacca The right of a private company to make prizes was hotly contested in Holland, and denied by the stricter religionists, especially the Mennonites. In maintaining the lawfulness of Heemskirk's action Grotius was led to investigate the grounds of the lawfulness of war in general It was necessary to his defence of Heemskirk that he should show that the Portuguese pretence that Eastern waters were their private property was untenable Grotius maintains that the ocean is free to all nations. Years afterwards the jealousies between England and Holland gave importance to the novel doctrine of the *mare liberum,* broached in the tract by Grotius, a doctrine which Selden set himself to refute in his *Mare clausum* (1632). In his *De antiquitate reipublicae Batavae* (1610) Grotius vindicates, on grounds of right, prescriptive and natural, the revolt of the United Provinces against the sovereignty of Spain

Grotius, when he was only 30, was made pensionary of the city of Rotterdam In 1613 he formed one of a deputation to England, in an attempt to adjust those differences which gave rise afterwards to a naval struggle disastrous to Holland. Though the mediating views in the great religious conflict between Catholic and Protestant, by which Grotius was afterwards known, had been arrived at by him by independent reflection, yet he was probably confirmed in them by finding in England a developed school of thought of the same character already in existence After his return from England Grotius sought to find some mean term in which the two hostile parties of Remonstrants and Anti-remonstrants, or as they were subsequently called Arminians and Gomarists (*see* REMONSTRANTS), might agree A form of edict drawn by Grotius was published by the States, recommending mutual toleration, and forbidding ministers in the pulpit to handle the disputed dogmas But the stadtholder, Maurice of Nassau, supported the orthodox party—a party to which he inclined the more readily that Oldenbarneveldt, the grand pensionary, the man whose uprightness and abilities he most dreaded, sided with the Remonstrants

In 1618 Prince Maurice disbanded the civic guards in the various cities of Guelders, Holland and Zeeland, and occupied the places with troops on whom he could rely The States of Holland sent a commission, of which Grotius was chairman, to Utrecht, with the view of strengthening the hands of their friends, the Remonstrant party, in that city. But the stadtholder entered the city with troops on the night of July 26, 1618 On the early morning of the 31st the civic guard was disarmed—Grotius and his colleagues saving themselves by a precipitate flight But it was only a reprieve The grand pensionary, Oldenbarneveldt, the leader of the Remonstrant party, Grotius and Hoogerbeets were arrested, brought to trial and condemned—Oldenbarneveldt to death, and Grotius to imprisonment for life and confiscation of his property In June 1619 he was immured in the fortress of Louvestein near Gorcum His confinement was rigorous, but after a time his wife obtained permission to share his captivity. Grotius returned in captivity to the classical pursuits of his youth, making Latin translations of Greek tragedians and other writers

The ingenuity of Madame Grotius at length devised a mode of escape The books which he had done with were sent out in a chest along with his linen After a time the warders began to let the chest pass without opening it Madame Grotius prevailed on her husband to allow himself to be shut up in it at the usual time. The two soldiers who carried the chest out complained that it was so heavy "there must be an Arminian in it" "There are indeed," said Madame Grotius, "Arminian books in it" The chest was carried to the house of a friend, where Grotius was released He was then dressed like a mason with hod and trowel, and so conveyed over the frontier His first place of refuge was Antwerp, from which he proceeded to Paris, where he arrived in April 1621 In October he was joined by his wife There he was presented to the king, Louis XIII, who granted him a pension of which only small instalments were ever paid In 1623 the president Henri de Même lent him his château of Balagni near Senlis (dep. Oise), and there Grotius passed the spring and summer of that year. De Thou gave him facilities to borrow books from the superb library formed by his father.

In these circumstances the *De jure belli et pacis* was composed. The achievement would have been impossible, but for the fact that Grotius had with him the first draft of the work made in 1604 In March 1625 the printing of the *De jure belli,* which had taken four months, was completed, and the edition despatched to the fair at Frankfort Though his book brought him no profit it brought him a great and enduring reputation. Grotius hoped

that his fame would soften the hostility of his enemies in Holland, but he was disappointed. He then accepted service under Sweden, in the capacity of ambassador to France He never enjoyed the confidence of the court to which he was accredited, and in 1645 he demanded and obtained his recall. He was not happy at Stockholm, and he asked permission to leave He was driven by a storm on the coast near Danzig He got as far as Rostock, where he found himself very ill There he died on Aug 29, 1645

Value of His Work.—Grotius combined a wide circle of general knowledge with a profound study of one branch of law History, theology, jurisprudence, politics, classics, poetry,—all these fields he cultivated His commentaries on the Scriptures were the first application on an extensive scale of the principle affirmed by Scaliger, that, namely, of interpretation by the rules of grammar without dogmatic assumptions As in many other points Grotius inevitably recalls Erasmus, so he does in his attitude towards the great schism Grotius thought that a basis for reconciliation of Protestant and Catholic might be found in a common piety, combined with reticence upon discrepancies of doctrinal statement His *De veritate religionis Christianae* (1627), a presentment of the evidences, is so written as to form a code of common Christianity, irrespective of sect The little treatise became widely popular, gaining rather than losing popularity in the 18th century It became the classical manual of apologetics in Protestant colleges, and was translated for missionary purposes into Arabic (by Pococke, 1660), Persian, Chinese, etc His *Via et votum ad pacem ecclesiasticam* (1642) was a detailed proposal of a scheme of accommodation Like all men of moderate and mediating views, he was charged by both sides with vacillation The true interpretation of Grotius's mind appears to be an indifference to dogmatic propositions, produced by a profound sentiment of piety He approached parties as a statesman approaches them, as facts which have to be dealt with, and governed, not suppressed in the interests of some one of their number

His *Annals of the Low Countries*, begun as an official duty while he held the appointment of historiographer, was being continued and retouched by him to the last It was not published till 1657, by his sons Peter and Cornelius

Grotius was a great jurist, and his *De jure belli et pacis* (Paris, 1625), though not the first attempt in modern times to ascertain the principles of jurisprudence, went far more fundamentally into the discussion than any one had done before him The fundamental idea of the book is the law of nature; he recognized and stated clearly that the sovereignty of the new national States of Europe did not involve anarchy in the absence of a common superior but that prior to any political organization there still exists law, based on reason and the nature of man as a social being For the content of that law he went to the Roman *jus gentium*, the generalization by the praetor of the customs of the peoples with whom he had to deal, which had been itself rationalized into a law of nature under the influence of Stoicism, and thereby laid down the other fundamental doctrine of international law, that the primary evidence of what that law is is the existing practice of nations

For a complete bibliography of the works of Grotius, *see* Lehmann, *Hugonis Grotii manes vindicati* (Delft, 1727), which also contains a full biography Of this Latin life De Burigny published a *réchauffée* in French (2 vols, 1752) Other lives are Van Brandt, *Historie van het Leven II de Groot* (2 vols, Dordrecht, 1727), Von Luden, *Hugo Grotius nach seinen Schicksalen und Schriften dargestellt* (1806), *Life of Hugo Grotius*, by Charles Butler of Lincoln's Inn (1826) The work of the Abbé Hély contains a life of Grotius *See* also *Hugo Grotius*, by L Neumann (1884), *Opinions of Grotius*, by D P. de Bruyn (1894).

Grotius's theological works were collected in 3 vols at Amsterdam (1644–46, reprinted London, 1660, Amsterdam, 1679, and again Amsterdam, 1698) His letters were printed first in a selection, *Epistolae ad Gallos* (Leyden, 1648), abounding, though an Elzevir, in errors of the press They were collected in *H. Grotii epistolae quotquot reperiri potuerunt* (Amsterdam, 1687) A few may be found scattered in other collections of *Epistolae* Supplements to the large collection of 1687 were published at Haarlem, 1806, Leyden, 1809, and Haarlem, 1829 The *De jure belli* was translated into English by Whewell (3 vols, 1853), into French by Barbeyrac (2 vols, Amsterdam, 1724), into German in Kirchmann's *Philosophische Bibliothek* (3 vols, Leipzig, 1879). (M Pa, X)

GROTON, a town of New London county, Connecticut, on the east bank of the Thames river, opposite New London It is served by the New York, New Haven and Hartford railroad The population was 9,227 in 1920, and was estimated locally at 11,250 in 1928 It is a residential suburb and has shipbuilding yards, a thread mill and fishing industries, and is a base for U S submarines The town was settled about 1650 and incorporated in 1704.

GROTTAFERRATA, a village of Italy, province of Rome, 13 m southeast from Rome by electric tramway, and 2½ m south of Frascati, 1,080 ft above sea-level, in the Alban Hills The name (in its Latin form, Crypta ferrata, *i.e.*, the crypt with an iron grille) probably comes from an older building, perhaps an oratory, perhaps originally an ancient tomb, which served as the foundation for the campanile Pop (1921) 3,557 It is noticeable for the Greek monastery of Basilians founded by S Nilus in 1002 under the Emperor Otho III, which occupies the site of a large Roman ville It was fortified (end 15th century) by Cardinal Giuliano della Rovere (afterwards Pope Julius II), whose arms may be seen about it The church with its fine campanile belongs to the 12th century, and the original portal, with a mosaic over it, is still preserved, as is also the mosaic of the apse The chapel of S Nilus contains frescoes by Domenico Zampieri (Domenichino) of 1610, illustrating the life of the saint The abbot's palace has a fine Renaissance portico, and contains local antiquities An *omophorion* (*see* PALLIUM) of the 11th or 12th century, with scenes from the Gospel in needlework, and a chalice of the 15th century with enamels are among its treasures The library contains valuable MSS, among them one from the hand of S Nilus (965); and a palaeographical school, for the copying of MSS in the ancient style, is maintained

See T Ashby in *Papers of the British School at Rome*, v (London, 1910), 228 *sqq*; F Tomassetti, *Campagna Romana*, iv (Rome, 1926), 279 *sqq* (T. A)

GROUCHY, EMMANUEL, MARQUIS DE (1766–1847), marshal of France, was born in Paris on Oct 23, 1766, and entered the army He served in La Vendée (1793), in the Army of Ireland (1796–1797), and in the campaign against the Russians and Austrians, being taken prisoner at Novi On his release he returned to France and from 1801 onwards was employed by Napoleon in important military and political positions At the Restoration he was deprived of the post of colonel-general of *chasseurs à cheval* and retired He joined Napoleon on his return from Elba and was made marshal and peer of France In the Waterloo campaign he was appointed to command the right wing to pursue the Prussians (*see* WATERLOO CAMPAIGN) After the great disaster, Grouchy gathered up the wrecks of Napoleon's army and retired to Paris, where he resigned his command to Marshal Davout He was court-martialed for his partial failure at Waterloo and exiled in America, till amnestied in 1821 On his return to France he was reinstated as general In 1830 Louis Philippe gave him back the marshal's bâton and restored him to the Chamber of Peers He died at St Etienne on May 29, 1847.

His publications include *Observations sur la rélation de la campagne de 1815 par le général de Gourgaud* (Philadelphia and Paris 1818), *Réfutation de quelques articles des memoires de M le Duc de Rovigo* (1829) and other defences of his military policy

See his *Memoires* (ed Marquis de Grouchy, 1873–74), Gen Marquis de Grouchy, *Le Général Grouchy en Irlande* (1866), *Le Maréchal Grouchy du 16 au 18 juin, 1815* (1864), *Appel à l'histoire sur les faits de l'aile droite de l'armée française* (Paris, n d), *Sévère Justice sur les faits du 28 juin au 3 juillet 1815* (1866) and the literature of the Waterloo campaign

GROUND BASS, in music a form of bass which is repeated again and again unaltered, while the music above is constantly varied The *chaconne* (*q.v.*) and the *passacaglia* are familiar forms of which this device constitutes an essential feature (*See* VARIATIONS.)

GROUND BEETLE, the name for members of a family of Coleoptera, the *Carabidae*, comprising 13,000 species and forming the largest and most typical family of Adephaga In many *Carabidae* the hind wings are reduced or absent, and the elytra fused together along the suture, the hind legs being adapted for rapid movement They are world-wide in their dis-

tribution being represented in the Arctic regions and on almost all oceanic islands and can be traced back in fossil history to Liassic times. *See* COLEOPTERA.

GROUND-ICE, ice formed at the bottom of streams while the temperature of the water is above freezing-point. Everything points to radiation as the prime cause of the formation of ground-ice. It is formed only under a clear sky, never in cloudy weather; it is most readily formed on dark rocks, and never under any covering such as a bridge, and rarely under surface-ice Prof. H T. Barnes of McGill University concludes that the radiation from a river bed in cold and clear nights proceeds through the water in long rays that penetrate much more easily from below upwards than the sun's heat rays from above downwards, which are mostly absorbed by the first few feet of water On a cold clear night, therefore, the radiation from the bottom is excessive, and loosely-grown spongy masses of anchor-ice form on the bottom On the next bright sunny day heat from the sun may detach them and they will rise to the surface with considerable force Probably a thin film of stationary water rests upon boulders and sand over which a stream flows, and this, becoming frozen owing to radiation, forms the foundation for the anchor-ice and produces a surface upon which the descending frazil-ice (*see* below) can lodge The ice which rises to the surface has a spongy texture and frequently carries gravel with it This "anchor-ice," as it was called by Canadian trappers, frequently forms dams across narrow portions of rivers where the floating masses are caught Dr H Landor pointed out that the Mackenzie and Mississippi rivers, carry ground-ice from their head-waters for a considerable distance down stream, and suggested that many forms of vegetable and animal life may be distributed by this agency, since the material carried by the floating ice would contain the seeds and eggs or larvae of many forms

"Frazil-ice" is a Canadian term from the French for "forge-cinders" It is surface ice formed in spicules and carried downwards in water agitated by winds or rapids The frazil-ice may render swiftly moving water turbid with ice crystals, it may be swirled downwards and accumulated upon the ground ice, or it may be swept under the sheet of surface-ice, coating the under surface of the sheet to a thickness as great as 80 ft of loose spicular ice (*See* H T Barnes, *Ice Formation with special Reference to Anchor-ice and Frazil-ice,* 1906)

GROUND-NUT (*Apios tuberosa* or *Glycine Apios*), a North American plant of the pea family (Leguminosae), called also Indian potato, native to moist low grounds from New Brunswick to Minnesota and southward to Florida and Texas It is a twining perennial, climbing to a height of several feet, with leaves composed of five to seven ovate leaflets, and bearing in late summer showy clusters of rather large, fragrant, chocolate-brown flowers From the root are produced strings of starchy edible tubers, 1 to 2 in long, with a somewhat nutty flavour These tubers were used for food by the Delawares, Iroquois and other American Indians, and it is recorded that the Pilgrims, during their first winter in Massachusetts, "were enforced to live on ground-nuts" Concerning its possibilities of utilization Asa Gray observed that, except for the prior cultivation of the potato, the ground-nut might have been developed into a food plant of high economic value In Great Britain the name ground-nut is given to the fruit of *Arachis hypogaea,* commonly known as peanut (*q v*) in the United States

GROUND or REASON is that which is regarded as justifying a certain judgment or belief *See* THOUGHT, LAWS OF and LOGIC

GROUND-PEARL, the outer pearly coverings of encysted pupae of scale insects (*q v*) of the genus *Margarodes* They are collected and strung into necklaces, particularly in South Africa and the Bahamas

GROUND RENT. The accepted meaning of ground rent is the rent at which land is let for the purpose of improvement by building, *i e* , a rent charged in respect of the land only and not in respect of the buildings to be placed thereon It thus conveys the idea of something less than a rack rent (*see* RENT); and accordingly, if a vendor described property as property for which he paid a "ground rent," without any further explanation of the term, a purchaser would not be obliged to accept the property if it turned out to be held at a rack rent But while a rack rent is generally higher in amount than a ground rent, the latter is usually better secured, as it carries with it the reversionary interest in buildings and improvements put on the ground *after* the date at which the ground rent was fixed, and accordingly ground rents have been held a good investment (*see* TRUST AND TRUSTEES) A devise of "ground rent" carries not only the rent but the reversion Where a tenant is compelled, in order to protect himself in the enjoyment of the land in respect of which his rent is payable, to pay ground rent to a superior landlord (who is of course in a position to distrain on him for it), he is considered as having been authorized by his immediate landlord to apply his rent, due or accruing due, in this manner, and the payment of the ground rent will be held to be payment of the rent itself or part of it. A lodger should make any payment of this character under the Law of Distress Amendment Act 1908 (s 3, and *see* RENT). Ground rents are apportionable (*see* APPORTIONMENT).

In Scots law, the term "ground rent" is sometimes used in the above sense in relation to the rent stipulated for on building leases, but it has no technical significance Owing to the limited nature of leasehold rights, builders and other improvers of land in Scotland have generally insisted upon acquiring the right of property in the land taken by them in return for an annual payment economically equivalent to a ground rent, but legally distinct from rent Where the land in question is not subject to prohibition against subinfeudation this has generally been done by a subfeu, the *reddendo* or feu-duty of which is the economic equivalent of ground rent Where subinfeudation is prohibited the procedure in modern times has been by way of *Contract of Ground Annual,* a complex conveyancing device whereby the builder becomes proprietor, of and under the former feudal superior, in return for a payment to the former vassal of a ground annual economically equivalent, alone or in conjunction with an existing feu-duty, to a ground rent

"Ground rents" in the English sense do not seem to be in general use in the United States, but they obtain in Pennsylvania They are rent services and not rent charges—the statute *Quia Emptores* never having been in force in Pennsylvania Ground rents are also found in Maryland and to a lesser extent in Ohio

A ground rent being a freehold estate, created by deed and perpetual in duration, no presumption could, at common law, arise from lapse of time, that it had been released But now, by statute (Act of April 27, 1855, s 7), a presumption of release or extinguishment is created where no payment, claim or demand has been made for the rent, nor any declaration or acknowledgment of its existence made or given by the owner of the premises subject to it, for the period of 21 years Ground rents were formerly irredeemable after a certain time But the creation of irredeemable ground rents is now forbidden (Pennsylvania Act 7 Assembly, April 22, 1850)

For English law *see* Foa, *Landlord and Tenant;* for American law, Bouvier, *Law Dictionary,* Bingham and Andrews, *Financing Real Estate* (A W R , J WA)

GROUNDSEL, *Senecio vulgaris,* an annual, glabrous, or more or less woolly plant of the family Compositae, having a branched succulent stem 6 to 15 in in height, pinnatifid irregularly and coarsely-toothed leaves, and small cylindrical heads of yellow tubular florets enveloped in an involucre of numerous narrow bracts, the ribbed fruit bears a soft, feathery, hoary tuft of hairs (*pappus*) The plant is indigenous to Europe, whence it has been introduced into all temperate climates It is often a troublesome weed, flowering throughout the year, and propagating itself rapidly by means of its light feathery fruits, it is used as a food for cage-birds The groundsel tree, *Baccharis halimifolia,* a native of the North American sea-coast from Massachusetts southward to Florida and Texas, is a shrub of the same family attaining 6 ft to 12 ft. in height, and having angular branches, obovate, somewhat scurfy leaves, and flowers larger than but similar to those of common groundsel The long white pappus of the female plant renders it a conspicuous object in autumn The groundsel tree

is sparingly cultivated for ornament

GROUND-SQUIRREL, one of the names for a group of (chiefly) North American striped terrestrial squirrel-like rodents, generally known as chipmunks They are allied to squirrels, from which they are distinguished by the possession of cheek-pouches The sides and back are marked with light stripes bordered by dark bands; the ears are small, and without tufts, and the tail short With the exception of one Siberian species (*Tamias asiaticus*), ground-squirrels are confined to North America, where they are represented by a large number of species all referable to the genus *Tamias* They feed on nuts, beechmast, and roots An American species is *T striatus* The name ground-squirrel is also applied to a variety of African genera such as *Xerus, Euxerus,* and *Atlantoxerus* *See* SPINY SQUIRREL.

GROUND WIRE, used in a radio set, is a conductive connection to the earth

GROUP CAPTAIN. An officer's rank of the Royal Air Force (Great Britain) introduced on August 27, 1919. A "group" consists of a number of air force squadrons and other ancillary service units, the number varying with requirements, and the officer commanding this formation is the Group Captain The rank, however, is not confined to the commander of a group but is also held by officers commanding training units and depots Group captains also serve on the Staff of the R A F "Group captain" is equivalent to the rank of captain of 3 years' seniority in the Royal Navy and to a colonel in the British army (*See* OFFICERS)

GROUPER, a general name in America for certain sea-bass of the genus *Epinephelus* and allied genera The commonest is the red grouper (*E morio*) found in the Atlantic from Virginia to Brazil, a valuable food-fish, grey in colour, red about the snout *E adscensionis,* also known from Africa, is another important food-fish, as is the black grouper of Key West (*Mycteroperca bonaci*) To this group belongs the jewfish (*q v*) (*See* BASS)

GROUP INSURANCE: *see* LIFE INSURANCE

GROUP MARRIAGE, the marriage of several men with several women It has been found among various peoples who practise polyandry (*q v*)—in Tibet, India and Ceylon In many of these cases we are told that if one of the brothers who have a wife in common brings a new wife, he shares, or has to share, her with his brothers And that in the other cases, also, the group marriage has arisen as a combination of polygyny with polyandry may be inferred from the facts that both in Tibet and India polyandry is much more prevalent than group marriage, that the latter occurs there nowhere except side by side with polyandry, and that the occasional combination of polygyny with polyandry, when the circumstances permit it, is easy to explain, whereas no satisfactory reason has been given for the opinion held by some sociologists that polyandry has developed out of an earlier stage of group marriage It is possible that Caesar's well-known statement about the marriages of the ancient Britons, if correct, likewise refers to a combination of polygyny with polyandry He says "In their domestic life they practise a form of community of wives, ten or twelve combining in a group, especially brothers with brothers and fathers with sons"

While genuine group marriage has been found only side by side with polyandry, there are peoples—such as the Chukchee, the Herero in South-West Africa the Masai and Akamba in East Africa, certain communities in New Guinea, and some Australian tribes—who have a kind of sex communism, in which several men have the right of access to several women, although none of the women is properly married to more than one of the men Thus the *pirrauru* relation among the Central Australian Dieri and the *piraungaru* relation among their neighbours, the Urabunna, almost exclusively imply sexual licence Yet these relations have been considered to give support to the hypothesis of ancient group marriage in Australia, according to which the men of one division or class had as wives the women of another division or class Marriages of this sort do not exist anywhere in Australia at the present time, and no person becomes a *pirrauru* or *piraungaru* as a matter of course on account of his or her status An agreement must be made with the husband, the *pirrauru* may have to pay for it, and the relation may even be of very short duration (in the case of a visitor); while the *piraungaru* requires the consent of the woman's elder brothers These institutions may, partly at least, owe their origin to circumstances not unlike those which have led to more or less similar customs in other parts of the world From various parts of Australia we hear of the difficulty the young native has in getting a wife on attaining manhood, and the *pirrauru* or *piraungaru* custom may serve as a substitute for regular marriage in the case of young men who have to remain unmarried or who have only got old women as wives But it is also evident that the old and influential men largely make use of that custom to their own advantage And we must also remember another fact, which is elsewhere found in connection with polyandry, namely, the necessity of a married woman to have a protector and guardian during the temporary absence of her husband. A man has sexual rights over a woman who is *pirrauru* or *piraungaru* to him chiefly, if not exclusively, while her husband is away, and on such occasions only does she live with him, enjoying his protection

The existence of an early state of group marriage has been assumed from a variety of other customs, such as the lending or exchange of wives, the sexual intercourse to which a girl is subject before her marriage, the licence allowed at the performance of certain ceremonies when the ordinary rules of morality are more or less suspended, the levirate, and the use of classificatory terms of relationship which group together under single designations many distinct degrees and kinds of relationship There seem, however, to be much more satisfactory explanations of these customs than to regard them as survivals of earlier group marriage, and the theory set forth by certain writers, that group marriage is the earliest form of marriage out of which the others have gradually developed seems to be in no way justified

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(E W)

GROUPS. In mathematics one frequently encounters sets of operations having the property that when two operations are carried out in succession the result is one that could be reached by a single operation of the set Such a set of operations is called a *closed set,* and the property of closure is called the *group property* A simple illustration is given by the four numbers, 1, -1, $\sqrt{-1}$, and $-\sqrt{-1}$ of ordinary algebra where the effect of multiplying in succession any number by two of the set is the same as multiplying by a definite third A formal definition of a group is given later under abstract groups

SUBSTITUTION GROUPS

Among the first closed sets of operations to be studied were closed sets of substitutions on letters or symbols To such a closed set Galois gave the name *group* A letter substitution, or, briefly, a *substitution,* is the operation of replacing a set of symbols or letters by the same set of symbols or letters arranged in a different order, *e g* , the notation

$$s = \begin{pmatrix} x_1 & x_2 & x_3 & x_4 & x_5 & x_6 \\ x_2 & x_3 & x_1 & x_5 & x_4 & x_6 \end{pmatrix}$$

indicates that each letter in the upper row is replaced by the letter under it in the second row The same operation may be indicated by the notation

$$s = (x_1 x_2 x_3)(x_4 x_5),$$

where the first parenthesis means that x_1 is replaced by x_2, x_2 by x_3, and x_3 by x_1, thereby closing the cycle This notation can be still further abbreviated by writing only the subscript in the cycle Thus, $s = (123)(45)$.

Every substitution may be expressed in the cycle notation where no two cycles contain a common letter If each of the n letters is replaced by itself, the substitution is called the iden-

tical substitution and is denoted by the figure 1. If the n letters be operated on by a given substitution s and the letters in the new order be operated upon by a second substitution t, the result is a new arrangement and the replacing of the letters in the original order by the final order is a third substitution called the product of s and t and denoted by st Multiplication of two substitutions is not in general commutative. For example, if $s=(x_1x_2x_3)$ and $t=(x_1x_2)$, $st=(x_2x_3)$ and $ts=(x_1x_3)$. A substitution consisting of a single cycle of two letters is called a *transposition* Every substitution may be resolved into the product of transpositions and in more than one way. A fundamental property of all substitutions is that the number of transpositions into which a given substitution may be resolved is either always even or always odd The product of two even, or of two odd substitutions, is even, and the product of an odd and an even substitution is odd

Multiplication is associative, *i e*, $(st)u=s(tu)$, so that the meaning of stu is unambiguous The product of a substitution s taken m times as a factor is written s^m Since the associative law holds, powers of substitutions follow the index law of ordinary algebra In symbols, $s^m \cdot s^n = s^{m+n}$ Moreover, $s^0=1$ Since the number of possible substitutions on n letters is finite, in the series $1, s, s^2, s^3, \cdots$ there must sometime arise a repetition such that $s^{m+n}=s^n$ and consequently $s^m=1$ The smallest positive integer m for which $s^m=1$, is called the *order* of the substitution Corresponding to any given substitution s there is another denoted by s^{-1} such that $ss^{-1}=s^{-1}s=1$ This substitution s^{-1} is called the reciprocal of s To see that s^{-1} always exists, it suffices to note that $s\ s^{m-1}=1$, so that $s^{-1}=s^{m-1}$ The possible n-factorial substitutions on n letters form a group, which contains the identical element and an inverse for every element in the group

ABSTRACT GROUPS

A group may be defined without reference to the properties of the particular elements of which it is composed Indeed, these elements need have no mathematical properties other than those defined by the rules of combination. When so defined the group is called an *abstract group* An abstract group is defined by E H. Moore to be a system consisting of a set of elements $a, b, c, \cdots$ and a mode of combination, ordinarily called multiplication, which satisfies the following postulates·

(1) The product of any two elements a and b of the set, whether a and b denote two distinct elements or the same element, is a unique element c, which is an element of the set In symbols, $ab=c$

(2) The associative law for multiplication holds, *i e*.,

$$(ab)c=a(bc)=abc.$$

(3) The system contains a so-called identical element I such that $aI=Ia=a$ for every element a of the set

(4) Corresponding to any element a of the set there is in the set a reciprocal element a^{-1} such that $aa^{-1}=a^{-1}a=I$

A group is said to be finite or infinite according as the number of elements is finite or infinite By the aid of postulates (3) and (4) it is easy to prove the following theorem (3a) If $ab=ab'$, then $b=b'$, and if $ab=a'b$, then $a=a'$ For it is only necessary to note that left-hand multiplication of both members of the first equation by a^{-1} gives $b=b'$, and right-hand multiplication of both members of the second by b^{-1} gives $a=a'$. On the other hand, if the number of elements in the group is finite and (3a) be assumed as a postulate along with (1) and (2), it is easy to prove (3) and (4) as theorems If the group is infinite it is not possible to prove (3) and (4) without assuming a further postulate: (4a). If two elements a and b are given, a third element c, unique in each case, is determined by any one of the three equations, $ac=b$, $ca=b$, $ab=c$ For finite groups the proposition (4a) is a direct consequence of postulates (1), (2), (3) and (4) A finite group may be defined by three postulates, (1), (2) and (3a), and an infinite group by the four postulates, (1), (2), (3a) and (4a) (Weber)

The elements of a closed set do not necessarily form a group since they need satisfy postulate (1) alone. Closed sets lacking the identical element and the inverse elements have been called *semi-groups*. The positive integral powers of a number which is neither zero nor a root of unity form a semi-group The number of elements in a finite group is called the *order* of the group If there exists within a group G a set which satisfies the group property, *i.e.*, postulate (1), this set is called a *subgroup* of G. A group for which the product of every two elements is commutative is called an *Abelian group* The simplest example is the group composed of the powers of a single substitution of prime order The customary notation for a group whose elements are $a, b, c, \cdots$ is $G=[a, b, c, \cdots]$

Examples of Groups.—1. The n-factorial substitutions on n letters form a group of order $n!$ called the *symmetric group*. The even substitutions of the symmetric group form a sub-group of order $\frac{n!}{2}$ called the *alternating group*. The odd substitutions of the symmetric group, or, for that matter, of any substitution group, do not form a group since the product of two odd substitutions is even A substitution group is said to be *transitive* if it contains at least one substitution which will replace an arbitrary given letter by another arbitrary given letter, otherwise it is *intransitive*. Transitivity is not an essential property of a group since the same group may be represented by both transitive and intransitive substitution groups.

2 The rotations of a regular solid into itself form a group in which the product of two elements is defined to be the rotation equivalent to the two rotations performed in succession Included among these rotation groups are the dihedral groups which are obtained by rotating regular polygons into themselves, or what amounts to the same thing, rotating double right pyramids with regular bases into themselves The rotations of a polygon into itself without turning it over form a *cyclic* group The groups of the cube and the dodecahedron are the same as those of their respective polar figures, the tetrahedron and the icosahedron The polyhedral groups, *i e*, the cyclic, dihedral, tetrahedral, octahedral and icosahedral groups, complete the enumeration of the finite rotation groups

3 The totality of linear fractional transformations of the form $z'=\frac{\alpha z+\beta}{\gamma z+\delta}$ for which the determinant $\alpha\delta-\beta\gamma=1$ form a group for which multiplication is defined by the elimination of z' from two transformations

$$S\quad z'=\frac{\alpha_1 z+\beta_1}{\gamma_1 z+\delta_1},\qquad T\quad z''=\frac{\alpha_2 z'+\beta_2}{\gamma_2 z'+\delta_2}.$$

The determinant of the product ST will be the product of the determinants of the two transformations The identical transformation is obtained by making $\alpha=\delta=1$ and $\beta=\gamma=0$, and the inverse is found by solving the transformation for z in terms of z'. If the linear fractional transformation has the form

$$z'=\frac{(d+ic)z-(b-ia)}{(b+ia)z+d-ic}$$

where $a=\xi\sin\frac{\theta}{2}$, $b=\eta\sin\frac{\theta}{2}$, $c=\zeta\sin\frac{\theta}{2}$, $d=\cos\frac{\theta}{2}$, and ξ, η, ζ are the co-ordinates of a point on a sphere of unit radius with centre at the origin, it represents a rotation through angle θ about the diameter through the point (ξ, η, ζ) The points z and z' of the $x+iy$-plane are the stereographic projections from the north pole of the sphere upon its equatorial plane of the point (ξ, η, ζ) and the point into which (ξ, η, ζ) is rotated This formula, known as Cayley's rotation formula, gives all the polyhedral groups, which are the only finite groups that can be represented as groups of linear fractional transformations on one variable (*See* F. Klein's *Vorlesungen uber das Ikosaeder*)

Closely related to the polyhedral groups are the crystallographic groups whose operations are rotations, reflections, or combinations of these. Every so-called symmetry group defines a definite crystal system, and, conversely, every crystal belongs to a symmetry group (*See* Hilton's *Mathematical Crystallo-*

graphy.) Groups of linear and linear fractional transformations will be discussed in a later section If $\alpha, \beta, \gamma, \delta$ are rational integers subject to the condition $\alpha\delta-\beta\gamma=1$, an infinite discrete group, known as the modular group, is obtained The modular group plays a fundamental rôle in the theory of the elliptic functions.

Isomorphism.—Two groups are said to be simply isomorphic when the following conditions hold:

1. A one-to-one correspondence can be established between the elements of the two groups
2. If to two elements s and t of one group correspond two elements S and T respectively of the other, to the product st corresponds the product ST

From the point of view of abstract groups, two simply isomorphic groups, are identical; or, we may say they differ only in their mode of representation The tetrahedral group is simply isomorphic with the alternating group on four letters; the octahedral group is simply isomorphic with the symmetric group on four letters, and the icosahedral group is isomorphic with the alternating group on five letters

The prime importance of substitution groups lies in the fact that according to a fundamental theorem due to Cayley (sometimes attributed to Jordan), any finite group of order N is simply isomorphic with a transitive substitution group on N letters. To prove Cayley's theorem, let the elements of the group G be

$$G=[1, s_2, s_3, \cdots, s_N].$$

If s_i be any element of the group, the products

$$s_1s_i,\ s_2s_i,\ s_3s_i, \cdots, s_Ns_i$$

will be the elements of the group in some order It follows that

$$S_i=\begin{pmatrix} s_1, & s_2, & s_3, & \cdots, & s_N \\ s_1s_i, & s_2s_i, & s_3s_i, & \cdots, & s_Ns_i \end{pmatrix}$$

is a substitution on the letters $s_1, s_2, \cdots, s_N$. Similarly, if s_j be a second element of G, there is formed on the N letters a second substitution S_j which corresponds to s_j It follows that the product S_iS_j is in the set $S_1, S_2, \cdots$ and, moreover, corresponds to the product s_is_j in G The group $\Gamma=[S_1, S_2, \cdots, S_N]$, simply isomorphic with G, is transitive and the number of elements is equal to the number of letters. Such a group is called *regular*. One of the important problems in the group theory is that of finding the smallest number of letters by means of which a given group can be represented as a group of substitutions. Such substitution groups will not be regular except in special cases If the groups G and G' are p-fold and q-fold isomorphic respectively to a group Γ, then G and G' are said to be $(p-q)$-fold isomorphic to each other

PROPERTIES INDEPENDENT OF THE MODE OF REPRESENTATION OF A GROUP

If N be the order of a group G and r the order of a sub-group H, then r is an integral divisor of N For, let the subgroup be $H=[h_1=1, h_2, h_3, \cdots, h_r]$ and let g_2 be any element of G not found in H. The elements of the set $h_1g_2, h_2g_2, h_3g_2, \cdots, h_rg_2$ are all distinct by (3a), and none are found in H. Proceeding in this manner, the elements of G can be arranged in the form of a rectangle whose dimensions are r by ρ In this rectangle no element is repeated for if $h_ag_i=h_ig_j$, $(i\neq j)$, then $g_j=h_i^{-1}h_ag_i$ is an element already enumerated It follows that $N=\rho r$. The integer $\rho=\frac{N}{r}$ is called the *index* of H under G. This theorem, due to Lagrange, is the chief cornerstone of the theory of finite groups

The set of elements in the ith row may be written Hg_i and is called a right-hand *co-set* of G with respect to H. The group G may then be indicated by the notation

$$G=H+Hg_2+Hg_3+\cdots+Hg_\rho.$$

Similarly, G can be expressed in terms of left-hand co-sets so that

$$G=H+g_2'H+g_0'H+\cdots+g_\rho'H,$$

where $g_2', g_3', \cdots, g_\rho'$ are suitably chosen In particular, the group may be expressed in the form

$$G=H+g_2^{-1}H+g_3^{-1}H+\cdots+g_\rho^{-1}H,$$

where the elements of $g_i^{-1}H$ are the reciprocals of the elements of Hg_i.

Dedekind has expressed G in terms of *double* co-sets Rg_i H. Thus

$$G=RH+Rg_2H+Rg_3H\ \cdots$$

Invariant Sub-groups.—An element $h'=g^{-1}hg$, where h is an element of a group H and g is either an element of H, or of a larger group G containing H, is called a *transform* of h, or a *conjugate* of h. The set of elements obtained by transforming all the elements of H form a group H'. For if h_i and h_j be two elements of H, the product $g^{-1}h_ig\cdot g^{-1}h_jg=g^{-1}h_kg$ is again in the set of transforms. The group H' is called a *conjugate* of H and is simply isomorphic to it. We may write $H'=g^{-1}Hg$

If a subgroup H of a group G be transformed in succession by all the elements of G, a set of groups $H, H', H'', \cdots$, all conjugate to H is obtained. The group H_0, composed of the elements common to the conjugate groups $H, H', H'', \cdots$, has the important property that $g^{-1}H_0g=H_0$ for every element g of G. Such a group is called a *self-conjugate subgroup*, or an *invariant subgroup*, or a *normal divisor*, of G. The alternating group $G_{\frac{n!}{2}}$ is an invariant subgroup of the symmetric group $G_{n!}$.

Simple Groups.—A group G which contains no invariant subgroup except the trivial cases of the identity and the group itself is called a *simple group*, otherwise it is *composite* Every group of prime order is simple. A fundamental theorem is that the alternating group on n letters is simple except for the single case $n=4$. The icosahedral group which is simply isomorphic with the alternating group on 5 letters, is the smallest simple group of composite order. The orders of the remaining simple groups of composite order less than 2000 are 168, 360, 504, 660, 1092.

The number of simple groups of composite order is infinite. Dickson in his *Linear Groups with an Exposition of the Galois Field Theory* has enumerated 78 known simple groups of composite orders less than one billion Of the 53 whose orders are less than one million, all but 3 belong to known infinite systems of simple groups There are two distinct simple groups of order 20,160 Dickson has shown further that there is an infinite number of orders corresponding to which there exist more than one type of simple group It is known that a group cannot be simple if its order N has one of the forms p^α, $p^\alpha q^\beta$, $pqr\cdots$ or $p^2q^2r^2(p, q, r, \cdots)$distinct primes, or if it has fewer than 6 prime factors $(N>2000)$, or if it is not divisible by one of the numbers 12, 16, 56 $(N=2n)$ So far no simple group of odd composite order has been discovered

Factor Groups.—If G_1 be an invariant subgroup of a group

$$G=G_1+G_1g_2+G_1g_3+\ \cdots\ +G_1g_\rho,\ \left(\rho=\frac{N}{N_1}\right),$$

the co-sets of G with respect to G_1 may be looked upon as the elements of a group The product $G_1g_i\cdot G_1g_k$ is interpreted to mean the totality of distinct elements of the form $gg_ig'g_j$ as g and g' run through the elements of G_1 Since G_1 is invariant in G, $g_iG_1=G_1g_i$ and $G_1G_1=G_1$ It follows that

$$G_1g_i\cdot G_1g_j=G_1\cdot g_iG_1\cdot g_j=G_1G_1g_ig_j=G_1g_k$$

The product of two co-sets is a co-set and the co-sets form a group $\Gamma=[G_1, G_1g_2, G_1g_3, \cdots, G_1g_\rho]$ when and only when G_1 is invariant This group is called the *quotient*, or *factor group*, or the *complementary group* of G_1 with respect to G and is usually written $\frac{G}{G_1}$. The co-set G_1 is the identical element and the element G_1g^{-1} is inverse to G_1g. Between the groups G and $\frac{G}{G_1}$ there is an (N_1-1)-fold isomorphism

Series of Composition.—An invariant subgroup G_1 of G which is contained in no other invariant subgroup of G is called a *maximal invariant subgroup* of G The series $G, G_1, G_2, \cdots, 1$, terminating with the identity group, in which every group is a

maximal invariant subgroup of the preceding group is called a *series of composition* of G. The integers $e_1, e_2, e_3, \cdots$ defined to denote the respective indices of $G_1, G_2, \cdots$ under the preceding group are called the *factors of composition* of G. The factor groups $\frac{G}{G_1}, \frac{G_1}{G_2}, \frac{G_2}{G_0}, \cdots$ are all simple. For if $\frac{G_i}{G_{i+1}}$ had an invariant subgroup, G_i would contain a proper invariant subgroup G'_{i+1} which would contain G_{i+1}

If the factors of composition are all prime numbers, the group is said to be *solvable*, a term carried over from the theory of equations (*see* EQUATIONS, THEORY OF), where it is shown that the necessary and sufficient condition that an equation be solvable by radicals is that its group have only prime numbers for its factors of composition If a group has more than one series of composition, the theorem of Camille Jordan published in his *Traité des Substitutions* in 1870, asserts that the factors of composition are, apart from their order, the same for every series of composition. Jordan's theorem is a direct consequence of a more general theorem published in 1889 by Hölder proving that the factor groups $\frac{G}{G_1}, \frac{G_1}{G_2}, \frac{G_2}{G_3}, \cdots$ are identical in some order with the factor groups for any other series of composition.

Conjugate Sets of Elements.—If s be any operation of a group G, the distinct elements $s_1, s_2, \cdots, s_h$ obtained by transforming s by every element of G is called a *complete conjugate set* Clearly, s itself will be found in the set and, moreover, the complete set of transforms of any element s_i of the set is identical with the complete set obtained from s If t be any element in the group not in the set determined by s, a new complete set of elements conjugate to t may be found In this way the elements of the group G may be separated into non-overlapping complete conjugate sets. If h_i be the number in a set and r the number of complete conjugate sets, the order N of G may be written

$$N = h_1 + h_2 + \cdots h_r$$

Since the identical element is transformed into itself by every element at least one h is unity If the group is Abelian, every h is unity Every h is a divisor of the order N of the group.

An element which is commutative with every element of the group is called an *isolated element* The totality of the isolated elements form an Abelian subgroup called the *central* of G. For any two elements s and t there is a unique third element c such that $st = tsc$ so that $c = s^{-1}t^{-1}st$ This element c was called by R. Dedekind the *commutator* of s and t. The commutators of a group G do not necessarily form a group but they generate a group This group, which may be identical with G, is an invariant subgroup C of G called the *commutator group* It has the property that it is the smallest invariant subgroup of G for which the factor group G/C is Abelian

Sylow's Theorem.—Our knowledge of the structure of finite groups depends largely upon a set of closely related theorems of which Sylow's theorem was the first to be proven. In a paper of fundamental importance published in 1872, L. Sylow showed that if p^α is the highest power of a prime p contained in the order of a group G, then G must contain at least one subgroup of order p^α and that if there are more than one, they form a conjugate system whose number is $1+kp$, where k is a positive integer Such groups are called *Sylow subgroups*

It is shown that a group whose order is p^α contains subgroups of orders $p^{\alpha-1}, p^{\alpha-2}, \cdots, p^2, p$, whence it follows that G contains subgroups of order p^r for $r \leqq \alpha$ Froebenius extended Sylow's theorem by showing that the number of subgroups of order p^r, $(r<a)$, is also $1+kp$ However, the subgroups of order p^r, $(r<a)$, do not necessarily form a conjugate set. Sylow proved that every group whose order is a power of a prime is solvable. Froebenius reached the same result for groups whose orders have the forms $N = pqr \cdots$ or $N = p^\alpha q$ where $p, q, r \cdots$ are distinct primes, while Burnside showed that if $N = p^\alpha q^\beta$ the group is solvable.

Abelian Groups.—An Abelian group, *i e*, a group whose elements are all commutative, has the property that there exist within the group a set of elements $A_1, A_2, A_3, \cdots$ of orders $a_1, a_2, a_3, \cdots$ such that every element θ of the group may be expressed in the form

$$\theta_1 = A_1^{\alpha_1} A_2^{\alpha_2} A_3^{\alpha_3} \cdots, \quad (\alpha_i = 0, 1, 2, \cdots, a_i - 1).$$

The elements $A_1, A_2, A_3, \cdots$ form a *base*, the elements of which may be selected in more than one way. In particular, they may be selected so that their orders are powers of the prime factors occurring in the order of the group. For example, if the order of the group is $N = p_1^{n_1} p_1^{n_2}, \cdots p_s^{n_s}$, where the p_i are distinct primes, $A_1, A_2, \cdots, A_s$ may be so selected that their orders are $a_1 = p_1^{n_1}$, $a_2 = p_2^{n_2}, \cdots, a_s = p_s^{n_s}$, respectively This is expressed by the theorem which asserts that an Abelian group G of order $p_1^{n_1}, p_2^{n_2}, \cdots, p_s^{n_s}$ is the direct product of Abelian groups $G_{p_1}, G_{p_2}, \cdots, G_{p_s}$ of orders $p_1^{n_1}, p_2^{n_2}, \cdots, p_s^{n_s}$, respectively. It follows that the problem of determining all Abelian groups of any given order is solved when we know the possible types of Abelian groups whose orders are prime powers

The distinct types of Abelian groups whose orders are p^n are given by the form

$$P_1^{s_1} P_2^{s_2} P_3^{s_3} \cdots P_t^{s_t} \quad (s_i = 0, 1, 2, 3, \cdots, p^{n_i} - 1)$$

where $P_1, P_2, \cdots, P_t$ are generators of orders $p^{n_1}, p^{n_2}, \cdots, p^{n_t}$, and $n = n_1 + n_2 + \cdots + n_t$ is any partition of n Thus, there are three distinct Abelian groups of order p^3 corresponding to the partitions 3, $2+1$, $1+1+1$, of 3 The type of an Abelian group of order p^n is completely specified by the partition.

The Isomorphisms of a Group with Itself.—If $G = [s_1 = 1, s_2, s_3, \cdots, s_N]$ be a group and t an element not commutative with every element of G, the conjugate group

$$G' = [s_1' = 1, s_2', s_3', \cdots, s_N'],$$

where $s_i' = t^{-1} s_i t$, $(i = 1, 2, \cdots, N)$, is simply isomorphic with G If t be an element of G, then G' is identical with G though its elements do not necessarily occur in the same order We have, therefore, an *isomorphism of the group with itself* If G is Abelian, a correspondence which shows the group to be isomorphic to itself may be set up by making each element correspond to its inverse The isomorphism in which each element corresponds to itself is called the identical isomorphism. For a group of order 2 the identical isomorphism is the only one possible In every other case there exist isomorphisms different from the identical isomorphism.

An isomorphism of a group with itself defines a substitution

$$S' = \begin{pmatrix} 1, & s_2, & s_3, & \cdots, & s_N \\ 1, & s_2', & s_3', & \cdots, & s_N' \end{pmatrix}$$

and the totality of the isomorphisms form an intransitive substitution group L isomorphic to G An isomorphism determined by taking the transforms $t^{-1}s_i t$ of all the elements of G is called a *cogredient isomorphism* All other isomorphisms of G with itself are called *contragredient* An important theorem is that the *cogredient isomorphisms* of a group G form an invariant subgroup of the group of isomorphisms

LINEAR GROUPS

Linear Homogeneous Substitutions.—A generalization of the notion of a letter substitution of far-reaching importance is the linear homogeneous substitution on n independent variables $y_1, y_2, \cdots, y_n$ given by the n equations

$$A: \begin{cases} z_1 = a_{11} y_1 + a_{12} y_2 + \cdots + a_{1n} y_n \\ z_2 = a_{21} y_1 + a_{22} y_2 + \cdots + a_{2n} y_n \\ \cdots \\ z_n = a_{n1} y_1 + a_{n2} y_2 + \cdots + a_{nn} y_n \end{cases}$$

or, briefly, $A \quad z_i = \sum_{j=1}^{n} a_{ij} y_j, \quad (i = 1, 2, \cdots, n);$

or, still more briefly, $z = A(y)$.

The matrix of the coefficients a_{ij} is called the *matrix of the substitution* and the corresponding determinant is the *determinant of the substitution.* A substitution is completely determined by its matrix so that the same notation may be used for both.

The study of groups of linear homogeneous substitutions may be looked upon as a special chapter in the theory of matrices. The matrix and determinant of a substitution are denoted respectively by

$$A=(a_{ij})=\begin{vmatrix} a_{11} & a_{12} & \cdots & a_{1n} \\ a_{21} & a_{22} & \cdots & a_{2n} \\ \cdot & \cdot & \cdots & \cdot \\ a_{n1} & a_{n2} & \cdots & a_{nn} \end{vmatrix}, \text{ and } a=|a_{ij}|=\begin{vmatrix} a_{11} & a_{12} & \cdots & a_{1n} \\ a_{21} & a_{22} & \cdots & a_{2n} \\ \cdot & \cdot & \cdots & \cdot \\ a_{n1} & a_{n2} & \cdots & a_{nn} \end{vmatrix}.$$

The product AB of the substitution A the substitution

$$B: y_j=\sum_{k=1}^{n} b_{jk}\,x_k, \qquad (j=1,\ 2,\ \cdots,\ n)$$

is found by eliminating the y's from the equations for A and B. We may write $(z)=A(y)=A[B(x)]=AB(x)$ The resultant is a linear substitution

$$AB=C: z_i=\sum_{k=1}^{n} p_{ik}\,x_k, \qquad (i=1,\cdots,n),$$

where $p_{ik}=\sum_{j=1}^{n} a_{ij}b_{jk}$, *i e*, the element in the ith row and the kth column of C is found by taking the sum of the products of the elements of the ith row of A by the corresponding elements of the kth column of B. The identity is that substitution for which $a_{ii}=1$ $(i=1,\cdots,n)$, and all other coefficients are zero. If the determinant $a\neq 0$, the substitution A^{-1} found by solving the n equations A for $y_1, y_2, \cdots, y_n$ is the inverse of A.

From the formula for the coefficient p_{ik}, of the ith row and the jth column of C, it follows that the determinant of the product of two substitutions is the product of their determinants. The associative law for multiplication holds. It follows that the totality of linear homogeneous substitutions with determinants different from zero form a group, which is in the general case an infinite group However, by placing proper restrictions on the coefficients a_{ij}, it is possible to find finite groups of linear homogeneous substitutions known by the briefer designation *linear groups*

A fundamental theorem in linear transformations is that if two sets of variables $y_1, y_2, \cdots, y_n$ and $x_1, x_2, \cdots, x_n$ be related by a linear transformation

$$S\ .\ y_i=\sum_{j=1}^{n} s_{ij}x_j \quad (i=1,\cdots,n,\ |s_{ik}|\neq 0)$$

and if the y's be subjected to a transformation

$$A \quad y_i'=\sum_{j=1}^{n} a_{ij}y_j \quad (i=1,\ 2,\ \cdot,\ n),$$

the x's will undergo a linear transformation $A'=S^{-1}AS$. To prove the theorem, let $(y')=S(x')$, $(y')=A(y)$ Then

$$x'=S^{-1}(y')=S^{-1}A(y)=S^{-1}AS(x).$$

The matrix $A'=S^{-1}AS$ is called the *transform* of A with respect to S

Every group of substitutions on n letters (and consequently every finite group) is simply isomorphic with a linear group on n variables For, let

$$s=\begin{vmatrix} x_1, & x_2, & \cdot, & x_n \\ \xi_1, & \xi_2, & \cdot, & \xi_n \end{vmatrix} \text{ and } t=\begin{vmatrix} \xi_1, & \xi_2, & \cdot, & \xi_n \\ \eta_1, & \eta_2, & \cdot, & \eta_n \end{vmatrix}$$

be two letter substitutions where ξ_i and η_i are permutations of the n letters x_i If s and t be made to correspond to the linear homogeneous substitutions

$$A: x_1=\xi_1,\ x_2=\xi_2,\ \cdots,\ x_n=\xi_n,$$

and

$$B: \xi_1=\eta_1,\ \xi_2=\eta_2,\ \cdots,\ \xi_n=\eta_n,$$

the product st will correspond to the product AB A substitution having the form

$$y_1=\mu_1x_1,\ y_2=\mu_2x_2,\ \cdots,\ y_n=\mu_nx_n$$

is called a *multiplication*. If all the multipliers μ_i are equal, the substitution is called a *similarity substitution*, and is commutative with every substitution.

The Characteristic Equation.—Whether or not a linear substitution is of finite order depends upon the form to which its matrix may be transformed. To this end it is convenient to make use of the so-called *characteristic equation* of the substitution This equation may be obtained as follows: If the variables $x_1, x_2, x_3, \cdots, x_n$ be looked upon as homogeneous point coordinates in space of $n-1$ dimensions, a point is unchanged if its co-ordinates be transformed by a linear substitution A into $\lambda x_1, \lambda x_2, \cdots, \lambda x_n$ It follows that λ must satisfy the equation

$$\phi(\lambda)\equiv\begin{vmatrix} a_{11}-\lambda & a_{12} & \cdots & a_{1n} \\ a_{21} & a_{22}-\lambda & \cdots & a_{2n} \\ \cdot & \cdot & \cdots & \cdot \\ a_{n1} & a_{n2} & \cdots & a_{nn}-\lambda \end{vmatrix}=0,$$

or, briefly $\phi(\lambda)=0$. The same equation is found if we suppose that $\sum_{i=1}^{n} c_ix_i$ is a linear form which is changed into a multiple of itself by the substitution A, for then $\sum_{i,j=1}^{n} c_ia_{ij}x_j\equiv\lambda\sum_{i=1}^{n} c_ix_i$ whence

$$\sum_{i=1}^{n} c_ia_{ij}=\lambda c_j, \quad (j=1,\ 2,\ \cdots,\ n)$$

The result of eliminating the c's from these n equations is $\phi(\lambda)=0$.

The equation $\phi(\lambda)=0$ is called the *characteristic equation* of A. The determinant $\phi(\lambda)$ is the *characteristic determinant* and the matrix $A-\lambda I$, where I is the unit matrix, formed by subtracting λ from the elements in the principal diagonal of the matrix A, is the *characteristic matrix* of A The characteristic determinants and characteristic equations of A and $A'=S^{-1}AS$ are identical. The equation $\phi(\lambda)=0$ has no zero root since the absolute term is $|a_{ij}|\neq 0$. The sum of the roots, $a_{11}+a_{22}+a_{33}+\cdots+a_{nn}$, is called the *characteristic* of the substitution.

One fundamental property, at once apparent, of a substitution of finite order is that the roots of the characteristic equation $\phi(\lambda)=0$ must be roots of unity, for if the linear form $\sum_{i=1}^{n} c_ix_i$ is changed into λ times itself and if $A^m=1$, then must $\lambda^m=1$. Another fundamental property, not so easily demonstrated, is that if A is of finite order there is a substitution S such that the transform $S^{-1}AS$ is a multiplication

$$y_1=\omega_1x_1, \quad y_2=\omega_2x_2, \cdots, y_n=\omega_nx_n,$$

where $\omega_1, \omega_2, \cdots, \omega_n$ are roots of unity called the multipliers of A. Since the characteristic equation of a substitution and its transform are the same it follows that $\omega_1, \omega_2, \cdots, \omega_n$ are the roots of $\phi(\lambda)=0$ If the group is Abelian, all its elements can be transformed simultaneously into multiplications. The first publication of the classical theorem that every substitution of finite order can be transformed into a multiplication was given by Jordan in 1877. Subsequent proofs were given by Lipschitz, Kronecker, Weyr, Moore, Maschke, and Rost

Collineation Groups.—Every linear group G contains at least one similarity substitution The totality of these form an invariant subgroup H. From the viewpoint of geometry, every substitution in H leaves the point $(x_1, x_2, \cdots, x_n)$ unchanged If G contains another substitution, the product HA_2 forms a class of substitutions all of which transform $(x_1, x_2, \cdots, x_n)$ into the same new point and all of which transform three given collinear points into the same three new collinear points The class of substitutions HA_2, or any given element of the class, which may be called a representative of the class, is called a collineation. It may happen even when G is an infinite group, that the number of collineations is finite. If $I, A_2, A_3, \cdots, A_t$ represent the classes of the group $G=H+HA_2+\cdots+HA_t$, the group G/H is called a *Collineation Group*.

From the linear homogeneous substitution $y=A(x)$ we obtain a linear fractional substitution

$$A': w_i=\frac{a_{i1}z_1+a_{i2}z_2+\cdots+a_{in-1}z_{n-1}+a_{in}}{a_{n1}z_1+a_{n2}z_2+\cdots+a_{nn-1}z_{n-1}+a_{nn}}, \ (i=1,\ 2,\ \cdot,\ n),$$

by dividing the first $n-1$ equations of A by the last, member by member, then replacing $\frac{y_i}{y_n}$ by w_i and $\frac{x_i}{x_n}$ by z_i. The linear fractional group is simply isomorphic with the corresponding collineation group

Reducible and Irreducible Groups.—A linear group on the n variables $x_1, x_2, \cdots, x_n$ is called reducible if it is possible to find n_1 linear functions $\xi_1, \xi_2, \cdots, \xi_{n_1}$, $(n_1<n)$, of the n variables which are transformed among themselves by every substitution of the group; otherwise, it is irreducible Every matrix of a reducible group may be transformed by a suitably chosen matrix into the form

$$\begin{pmatrix} A, & 0 \\ C, & D \end{pmatrix},$$

where A is a square matrix of order n_1, D a square matrix of order $n-n_1$, C a matrix of $n-n_1$ rows and n_1 columns and 0 a zero matrix of $n-n_1$ columns and n_1 rows A reducible group is completely reducible, that is to say, there exist r sets of linear functions

$$\xi_{i1}, \xi_{i2}, \cdots, \xi_{in_i}, \quad (i=1, 2, \cdots, r)$$

of the variables $x_1, x_2, \cdots, x_n$ such that the functions of each set are transformed among themselves by every operation of the group A reducible group is said to be intransitive (H Maschke) and each set of linear functions $\xi_{i1}, \xi_{i2}, \cdots, \xi_{in_i}$ is a *set of intransitivity*

A problem of chief interest in the theory of linear groups is the determination of those irreducible linear groups which furnish representations for given abstract groups since from the irreducible representations any representation can be derived This problem was most successfully studied by Frobenius in a series of memoirs published in the Berliner Sitzungsberichte between 1896 and 1903, in which he originated and developed the theory of group characteristics Frobenius' theory has been simplified and extended by Schur, Burnside, Dickson, and Blichfeldt

An abstract group $G=[S_1=1, S_2, S_3, \cdots, S_N]$ is said to be represented by a group of linear substitutions

$$\Gamma=[s_1=1, s_2, s_3, \cdots, s_N']$$

when to every element S_i of G there corresponds a linear substitution s_i with square matrix A_{s_i} of order m such that $A_{s_i}\cdot A_{s_j}=A_{s_i s_j}$, and, further, that not every A_{s_i} is singular Under these assumptions it follows that no A_{s_i} is singular. If the matrices A_{s_i} are not all distinct, the group Γ is multiply isomorphic with G. Two representations

$$\Gamma=[s_1=1, s_2, s_3, \cdots, s_N'] \text{ and } \Gamma'=[s_1'=1, s_2', \cdot\ \cdot, s_N']$$

are equivalent if there exists a linear substitution t on the m symbols with matrix T such that $T^{-1}A_{s_k}T=A'_{s_k}$ for every k, otherwise the representations are distinct.

The Group Matrix.—If x be any quantity, the scalar product Ax is formed by multiplying each element of the matrix A by x. If, now, $x_{s_1}, x_{s_2}, \cdots, x_{s_n}$ be n independent variables, we may form the matric sum $A=\sum A_{s_i}x_{s_i}$. This new matrix A formed by adding all the elements in the ith row and jth column of each constituent matrix to form the element in the ith row and jth column of A is called the *group matrix* corresponding to the representation of the group G by the linear group Γ. The elements of the group matrix will be homogeneous linear forms in $x_{s_1}, x_{s_2}, \cdots, x_{s_n}$; *e.g*, the cyclic group on three elements $s_1=1$, $s_2=(123)$, $s_3=(132)$ is isomorphic with the group of matrices

$$\begin{vmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{vmatrix}, \quad \begin{vmatrix} 0 & 1 & 0 \\ 0 & 0 & 1 \\ 1 & 0 & 0 \end{vmatrix}, \quad \begin{vmatrix} 0 & 0 & 1 \\ 1 & 0 & 0 \\ 0 & 1 & 0 \end{vmatrix}.$$

So that the group matrix is

$$A=\begin{vmatrix} x_1 & x_2 & x_3 \\ x_3 & x_1 & x_2 \\ x_2 & x_3 & x_1 \end{vmatrix}$$

The n^2 elements of the group matrix are linear forms in the n independent variables x. In case A is a reducible group matrix, it is equivalent to a matrix

$$A=\begin{vmatrix} A_1 & 0 & 0 & 0 \\ 0 & A_2 & 0 & 0 \\ \cdot & \cdot & \cdot & \cdot \\ 0 & 0 & 0 & A_r \end{vmatrix},$$

where A_i are irreducible group matrices of orders $n_1, n_2, \cdots, n_r$, called the irreducible components of A.

If a reducible group matrix A be equivalent to a second matrix A' of the same type with irreducible components $A_1', A_2', \cdots, A_r'$, the components of A and A' will be equivalent in some order. It follows that the number of distinct components is invariant for a given group matrix. The determinant of an irreducible matrix is an irreducible function of the variables x. Moreover, the necessary and sufficient condition that two irreducible group matrices shall be equivalent is that their determinants shall be identical

When a group G given as a regular letter substitution group is represented by a linear group Γ having the form

$$x'_1=x_\alpha, \quad x_2=x_\beta, \quad x_3=x_\gamma \cdots$$

where $\alpha, \beta, \gamma \cdots$ are the subscripts 1, 2, 3 $\cdots$ in some order the group matrix A of Γ is said to be regular. When the group matrix A is transformed into its completely reduced form, it will be found that each component $A_1, A_2, \cdot\ \cdot, A_r$ is repeated exactly n_s times, where n_s is the order of the component matrix, and that the number of distinct components is equal to the number of conjugate sets of elements in the group It follows that the number r of non-equivalent transitive linear groups into which a regular substitution group breaks up is equal to the total number of sets of conjugate elements in the group.

Group Characters.—If an abstract group G be represented by a group of linear transformations $\Gamma=[s_1=1, s_2, s_3, \cdots, s_N']$ with matrices $A_{s_1}, A_{s_2}, \cdots, A_{s_N}$ to each matrix will correspond a characteristic equation whose roots, which are the multipliers of A, are roots of unity. The sum of these multipliers will be the sum of the coefficients in the principal diagonal of the matrix This sum has already been defined to be the *characteristic* of the linear transformation s and is denoted by

$$\chi(s)=a_{11}+a_{22}+\cdots+a_{nn}$$

Since the characteristic equations of a matrix and its transform are identical, there are exactly r distinct characteristics of any irreducible representation Γ_i of G where r is the number of conjugate sets in Γ_i These r characteristics, usually denoted by

$$\chi^i_1, \quad \chi^i_2, \quad \cdots, \chi^i_r$$

are called a *set of characteristics* or a *character* of Γ_i For a given group G there are exactly r sets of characteristics corresponding to the r irreducible representations of G

The far-reaching character of the theory of group characteristics is indicated by the theorem which asserts that the necessary and sufficient condition that two representations of a group of finite order by means of linear substitutions shall be equivalent, is that the characteristics of each set of conjugates shall be the same in both representations Not only does the theory throw important light upon the theory of linear groups themselves but its application has led to the discovery of important theorems concerning abstract groups not otherwise proven One of the most important of these is Burnside's proof that every group, whose order is of the form $p^\alpha q^\beta$ (p and q prime), is solvable.

Group Invariants.—In the early part of this article, it was noted that to the various groups of letter substitutions correspond functions of the letters which are unchanged by every element of the group If $x_1, x_2, \cdots, x_n$ be the roots of an equation, every symmetric function S is unchanged by all the substitutions of the symmetric group. Every function having the form $S_1(x_1, x_2, \cdots, x_n)+\sqrt{\Delta}S_2(x_1, x_2, \cdots, x_n)$, where Δ is the discriminant of the x's, is unchanged by the substitutions of the

alternating group. In general, if under the substitutions of a given group G a function ϕ takes ρ values $\phi_0, \phi_1, \phi_2, \cdots, \phi_{\rho-1}$, any symmetric function of $\phi_0, \phi_1, \cdots, \phi_{\rho-1}$ will be unchanged by every substitution of G (*See* THEORY OF EQUATIONS.)

Similarly, if the independent variables $x_1, x_2, \cdots, x_n$ operated on by a group G of linear substitutions be changed into the n linear functions $x_1^{(s)}, x_2^{(s)}, \cdots, x_n^{(s)}$, any rational function $F(x_1, x_2, \cdots, x_n)$ is called an *invariant* of the group if

$$F(x_1^{(s)}, x_2^{(s)}, \cdots, x_n^{(s)} \equiv F(x_1, x_2, \cdots, x_n),$$

for every element s of G. Clearly, as in the case of letter substitutions, if $f(x_1, x_2, \cdots, x_n)$ be any rational function, not identically zero, any symmetric function of the N functions $f(x_1^{(s)}, x_2^{(s)}, \cdots, x_n^{(s)})$ will be an *invariant* of the group. Since the n variables $x_1, x_2, \cdots, x_n$ are independent, any $n+1$ invariants must be connected by an algebraic equation That n algebraically independent invariants actually exist may be proven easily Given n algebraically independent invariants, it is always possible to find an $(n+1)$st invariant such that every other invariant can be expressed rationally in terms of the $n+1$ A further important theorem is that if F be an invariant of an irreducible group it is not possible by means of any linear substitution to express F as a function of fewer than n variables No small part of the value of the group theory to other branches of mathematics depends upon the existence of invariants with respect to certain groups which thereby furnish a means of classification of functions

Linear Substitutions Whose Coefficients Are Marks of a Galois Field.—So far it has been assumed that coefficients of the substitutions of the linear group were ordinary algebraic numbers Many results of extraordinary elegance and simplicity are obtained by considering these coefficients as numbers or marks in a Galois field. A *field* may be defined as a set of elements or marks $u_1, u_2, \cdots$, such that the rational operations of algebra may be performed on the numbers of the field and the results are again numbers of the field A Galois field, for which the customary abbreviation is $GF[p^n]$, consists of p^n marks where p is a rational prime and n is a positive rational integer

If $l_{\xi_1, \xi_2, \cdots, \xi_m}$ represent a letter or symbol and the ξ's be allowed to run through the marks of a Galois field, the symbol represents p^{nm} letters The linear homogeneous substitution

$$A \cdot \xi' = \sum_{j=1}^{m} a_{ij}\xi_j, \quad (i = 1, 2, \cdots, m), \quad |a_{ij}| \neq 0,$$

where a_{ij} are marks of $GF[p^n]$, may be shown to be an analytic representation of a substitution on the p^{nm} letters. The totality of such substitutions must then form a finite group called the *general linear homogeneous group* denoted by the symbol $GLH[m, p^n]$. The same results may be reached by defining the group as a group of linear homogeneous substitutions on m arbitrary independent variables $\xi_1, \xi_2, \cdots, \xi_m$. It follows that the transformation group whose matrices are formed from marks of a Galois field may be represented as a group of letter substitutions on p^{nm} letters

The order of the $GLH[m, p^n]$ is

$$N = (p^{nm}-1)(p^{nm}-p^n)(p^{nm}-p^{2n}) \cdots (p^{nm}-p^{n(m-1)})$$

From the $GLH(m, p^n)$ the linear fractional group $LF(m, p^n)$, on $m-1$ non-homogeneous variables, is formed as in the section on Collineation Groups The order of the $LF(m, p^n)$ is

$$\frac{1}{d}(p^{nm}-1)p^{n(m-1)}(p^{n(m-1)}-1)\,p^{n(m-2)} \cdots (p^{2n}-1)p^n,$$

where d is the greatest common divisor of m and p^n-1. This group has the extraordinary property that for every case except two, viz., $m=2$, $p^n=2$, and $m=2$, $p^n=3$, it is simple. For a comprehensive development of these ideas the reader is referred to Dickson's *Linear Groups with an Exposition of the Galois Field Theory.*

CONTINUOUS TRANSFORMATION GROUPS

Essentially different from the groups already mentioned are the *transformation groups* studied by Sophus Lie and his pupils. The system of n equations

$$T: x_i' = f_i(x_1, x_2, \cdots, x_n | a_1, a_2, \cdots, a_r), \quad (i = 1, 2, 3, \cdots, n)$$

with parameters $a_1, a_2, \cdots, a_r$ determine a transformation of the variables $x_1, x_2, \cdots, x_n$ into the variables $x_1', x_2', \cdots, x_n'$ provided the equations can be solved for $x_1, x_2, \cdots, x_n$. The transformation may be written briefly

$$T: x_i' = f_i(x|a), \quad (i = 1, 2, \cdots, n)$$

If, as the parameters $a_1, a_2, \cdots, a_r$ vary, $f_i(x|a+\partial a) - f_i(a)$ approaches zero with ∂a, the totality of all transformations thus obtained form a *continuous transformation group* of ∞^r elements under the following conditions.

(1) The functions f_i considered as functions of $x_1, x_2, \cdots, x_n$ must be independent.

(2) The parameters $a_1, a_2, \cdots, a_r$ must be essential, that is to say, a transformation cannot be expressed by means of a smaller number of parameters For this it is necessary and sufficient that the f's shall not all satisfy a differential equation of the form

$$\sum_{i=1}^{r} A_i(a_1, a_2, \cdots, a_r)\frac{\partial f}{\partial a_i} = 0.$$

(3) The product $T_a T_b$ of two transformations T_a and T_b is expressible in the same form

$$x_i'' = f_i(x|c), \quad (i = 1, 2, \cdots, n),$$

where c_k is a function of $a_1, a_2, \cdots, a_r$ and $b_1, b_2, \cdots, b_r$ alone for $k = 1, 2, \cdots, r$

(4) The associative law for multiplication holds

(5) The system of transformations contains the identical transformation That is, there is a system of values $a_1^0, a_2^0, \cdots, a_r^0$ of the parameters a such that

$$x_i = f_i(x|a^0) = x_i, \quad (i = 1, 2, 3, \cdots, n)$$

From (5) it follows directly that to every transformation T of the group there is in the group an inverse transformation T^{-1} such that $TT^{-1} = T^{-1}T = 1$.

Infinitesimal Transformations.—Corresponding to every transformation group with r parameters, there is a general infinitesimal transformation also containing r parameters and giving rise to ∞^{r-1} infinitesimal transformations. The group is generated by any r independent infinitesimal transformations The determination of the infinitesimal transformations and their relation to the finite equations of the group are best shown by considering a particular group

The group whose transformations have the form

$$T: x_i' = \frac{a_{i1}x_1 + a_{i2}x_2 + a_{i3}}{a_{31}x_1 + a_{32}x_2 + a_{33}}, \quad (i = 1, 2), \quad |a_{ij}| \neq 0,$$

is called the projective group of the plane It contains eight essential parameters and has the characteristic property that every transformation of the group transforms a straight line into a straight line If the parameters a_{ij} be given the values

$$a_{ij} = \epsilon_{ij} + \alpha_{ij}\delta t, \quad \text{where} \quad \begin{cases} \epsilon_{ij} = 1 \text{ for } i = j \\ \epsilon_{ij} = 0 \text{ for } i \neq j \end{cases},$$

∂t is an arbitrary infinitesimal, and α_{ij} are arbitrary constants the expressions for x_1' and x_2' with higher powers of ∂t discarded may be written in the form

$$x_1' = x_1 + \xi\, t\partial, \qquad x_2' = x_2 + \eta\, \partial t,$$

where $\xi = a + cx_1 + dx_2 + kx_1x_2$ and $\eta = b + ex_1 + gx_2 + hx_1x_2 + kx^2$, Of the eight constants $a, b, c, \cdots$, which are linear combinations of α_{ij}, only seven are essential since the infinitesimal $k\partial t$ is not essentially different from the arbitrary infinitesimal ∂t

For any arbitrary function $f(x, y)$

$$df = \frac{\partial f}{\partial x}\partial x + \frac{\partial f}{\partial y}\partial y = \left(\xi\frac{\partial f}{\partial x} + \eta\frac{\partial f}{\partial y}\right)t\partial,$$

since $dx_1 = x_1' - x_1 = \xi\partial t$ and $dx_2 = x_2 - x_2 = \eta\partial t$ The symbol U defined by the equation

$$Uf = \xi\frac{\partial f}{\partial x} + \eta\frac{\partial f}{\partial y} = \xi p + \eta q, \quad \left(p = \frac{\partial f}{\partial x}, \quad q = \frac{\partial f}{\partial y}\right)$$

is called the symbol of the infinitesimal transformation. It is made up of the sum of the eight simpler ones, viz,

$$p, q, xp, yp, xq, yq, x^2p, +xyq, xyp+y^2q,$$

each multiplied by the appropriate constant chosen from the set $a, b, c, \cdots$. The finite equations for the group will be obtained by integrating the simultaneous system

$$\frac{dx}{a+cx_1+dy_1+hx_1^2+kx_1y_1} = \frac{dy}{b+ex_1+gy_1+hx_1y_1+ky_1^2} = dt,$$

subject to the initial condition that when $t=0$, $x_1=x$ and $y_1=y$.

For two infinitesimal transformations, U_1f and U_2f it is easy to show that

$$U_1(U_2f)-U_2(U_1f)=(U_1\xi_2-U_2\xi_1)p+(U_1\eta_2-U_2\eta_1)q,$$

which is again an infinitesimal transformation The left member of this equation (Lie's *Klammerausdruck*) is denoted by $(U_1\ U_2)$ Denoting by $U_1f,\ U_2f, \cdots, U_8f$ of the simpler infinitesimal transformations given above, one obtains for the general projective group of the plane the important result

$$(U_i\ U_k)=\sum_1^8 c_{ik\,s}\ U_sf\ \ (i, k=1, 2, 3, \cdots, 8)$$

This formula is a special case of a very general theorem which asserts that the necessary and sufficient condition that r-independent infinitesimals shall generate a group is that for every pair U_i, U_k the expression $(U_i\ U_k)$ is expressible linearly in $U_1, U_2, \cdots, U_r$ The general theory which proceeds upon similar lines may be found in Lie's *Continuierliche Gruppen* or in admirably brief and succinct form in the article "Kontinuierliche Transformations Gruppen" in the *Encyclopaedie der Mathematischen Wissenschaften*, by L Maurer and H. Burkhardt.

Applications.—The applications of the theory of continuous transformation groups are manifold One of the most important is the application to the theory of differential equations A simple, but characteristic result, is that for every ordinary differential equation $Xdx-Ydy=0$, whose integral curves are transformed into themselves by an infinitesimal transformation $Uf=\xi p+\eta q$ the expression $(X\eta-y\xi)^{-1}$ is an integrating factor

Lie made the theory the starting point for a profound study of the foundations of geometry He reached the important result which may be stated as follows: Every real continuous group of transformations in a space of three or more dimensions whose points have free infinitesimal mobility may be transformed by real point transformations into a transitive $\frac{n(n+1)}{2}$-parameter projective group of one of the three following kinds.

(1) The group of Euclidean motions in the space

(2) A projective group which leaves invariant the imaginary quadric surface

$$x_1^2+x_2^2+\cdots+x_n^2+1=0.$$

(3) A projective group which leaves invariant the real quadric surface

$$x_1^2+x_2^2+\cdots+x_n^2-1=0$$

The first relates to the Euclidean or parabolic geometry, the second to the elliptic and the third to the hyperbolic geometry corresponding to spaces of constant zero, positive and negative curvature respectively. Each geometry is completely characterized by its group.

In 1884 Poincaré pointed out that to every complex number system taken over the field of ordinary complex numbers and having n linearly independent units, there corresponds a simply transitive group of homogeneous transformations linear in n parameters, and conversely It follows that the theory of hypercomplex numbers in the ordinary complex number field may be identified with the theory of certain types of continuous transformation groups (*See* L E Dickson, *Algebras and their Arithmetics* Chap III)

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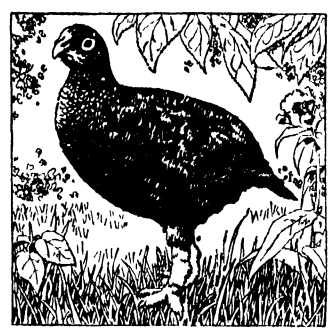
GROUSE, applied particularly to the bird *Lagopus scoticus*, the red grouse, the only species of bird peculiar to the British Isles, where it inhabits the moors, feeding on the heather shoots It is distinguished from the closely allied and subarctic willow-grouse, *L. lagopus*, by the fact that it does not turn white in winter, and is rarely found away from heather *L lagopus* has the same rich chestnut-brown on the head, neck, and breast when in summer plumage, and ranges from Scandinavia to Siberia and from the Aleutian Islands to Newfoundland A third species of the genus, which also turns white in winter, is the ptarmigan (*q v*) (*L mutus*), which is replaced in America, Greenland, and Iceland by the scarcely distinguishable *L rupestris* A large form, *L hemileucurus* inhabits Spitsbergen, while *L leucurus* is confined to the northern Rockies



RED GROUSE, THE ONLY SPECIES OF BIRD CONFINED TO THE BRITISH ISLES, WHERE IT OCCURS IN SCOTLAND AND NORTHERN ENGLAND

The bird to which the name grouse originally belonged is the blackcock (*q v*) or black grouse (*Tetrao tetrix*)

In America is the forest-dwelling *Bonasa umbellus*, the ruffed grouse or beech-partridge, in which males "drum" on a log in spring, while other New World forms include *Canachites canadensis*, the spruce partridge, *Centrocercus urophasianus*, the sage grouse, in which, as in the blackcock, the males assemble at definite tournament grounds in spring, *Pedioecetes*, the sharp-tailed grouse, and *Tympanuchus* the prairie-hen, with the sexes unusually similar in appearance

See Elliot's *Monograph of the Tetraoninae*, and Baird, Brewer, and Ridgway's *North American Birds*, also the article on SHOOTING

GROVE, SIR GEORGE (1820–1900), English writer on music, was born at Clapham on Aug 13, 1820 He was articled to a civil engineer, and worked for two years in a factory near Glasgow In 1841 and 1845 he was employed in the West Indies, erecting lighthouses in Jamaica and Bermuda In 1849 he became secretary to the Society of Arts, and in 1852 to the Crystal Palace In this capacity he threw all the weight of his influence into the task of promoting the best music of all schools in connection with the weekly and daily concerts at Sydenham, which had a long and honourable career under the direction of Mr (afterwards Sir) August Manns Without Sir George Grove that eminent conductor would hardly have succeeded in doing what he did to encourage young composers and to educate the British public in music Grove's analyses of the Beethoven symphonies,

and the other works presented at the concerts, set the pattern of what such things should be; and it was as a result of these, and of the fact that he was editor of *Macmillan's Magazine* from 1868 to 1883, that the scheme of his famous *Dictionary of Music and Musicians*, published from 1878 to 1889 (2nd edition, edited by J. A Fuller Maitland, 1904–1907; 3rd ed., ed. H. C Colles, 1927), was conceived and executed When the Royal College of Music was founded in 1882 he was appointed its first director, receiving the honour of knighthood. He died at Sydenham on May 28, 1900

See C. L. Graves, *Life and Letters of Sir George Grove* (1904).

GROVE, SIR WILLIAM ROBERT (1811–96), English judge and man of science, was born on July 11, 1811 at Swansea, South Wales He went to Brasenose College, Oxford, and in 1835 was called to the bar at Lincoln's Inn Grove occupied his leisure with scientific studies His researches dealt very largely with electro-chemistry and with the voltaic cell, of which he invented several varieties One of these, the Grove gas-battery, which is of special interest, was based on his observation that a current is produced by a couple of platinum plates standing in acidulated water and immersed, the one in hydrogen, the other in oxygen In 1846 he published his book on *The Correlation of Physical Forces* In 1871 he was made a judge of the Common Pleas and remained on the bench till 1887. He died in London on Aug 1, 1896

A selection of his scientific papers is given in the sixth edition of *The Correlation of Physical Forces*, published in 1874.

GROVE does not appear in any other Teutonic language, and the New English Dictionary can refer it to no Indo-European root; Skeat connects it with "grave," to cut, and makes the original meaning a glade cut through a wood, a small group of trees smaller than a wood, growing naturally or planted in particular shapes in a park, etc Groves have been connected with religious worship from the earliest times. (*See* TREE-CULTS)

"Grove" was used by the authors of the Authorized Version to translate two Hebrew words (1) *'ēshel*, Gen xxi 33, 1 Sam xxii 6, rightly given in the Revised Version as "Tamarisk"; (2) *asherah* in many places in the Old Testament The *asherah*, a wooden post erected at the Canaanitish places of worship, and by the altars of Yahweh, may have represented a tree

GROVE CITY, a borough of Mercer county, Pa , U S A., on Wolf creek, 65m. N. of Pittsburgh It is served by the Bessemer and Lake Erie railroad The population in 1920 was 4,944 (96% native white) and was estimated locally at 6,500 in 1928 It is a coal-mining and dairying centre, and has various manufactures, including lumber, flour, brooms, motor trucks, bus bodies and gas engines An experimental creamery is conducted by the U S department of agriculture Grove City college, opened as an academy in 1876, occupies 60ac in the heart of the town The borough of Grove City, previously the town of Pine Grove, was incorporated in 1883

GROWTH may be defined as increase in volume or in bulk, and as such it may apply to anything, alive or dead The most important use of the term is that which concerns the growth of living organisms, or organic growth, for growth is one of the fundamental properties of life

Growth in Plants.—It is a peculiarity of the higher plants (trees, shrubs, etc) that they grow actively throughout life, although this growth may in other than tropical climates be restricted to certain seasons The apex of the stem is called the growing-point, and it is made up of a number of small, simple cells, capable of rapid multiplication The simplicity of such cells is expressed by calling them embryonic or undifferentiated, and this condition is to be contrasted with that of older cells which are more complicated in structure (differentiated) and less easily capable of growth New cells are thus continuously being produced and left behind by the growing-point as it moves further up. The material of which the new cells are composed is derived from the building up of new living matter or protoplasm out of food The chief factor in the upward growth of the stem of a plant, however, is the absorption of water by the cells at some little distance beneath the growing-point. The result of this process is that the cells become distended and elongated, and it illustrates the fact that growth may be due to the inflating effect of non-living substances (such as water), as well as to the production of new living matter. The apex of the root is provided with a growing-point analogous to that of the stem, differing in that it is protected by a cap of cells which prevents the growing-point itself from being injured in its downgrowth through the soil The root similarly elongates by the absorption of water by the cells.

In addition to growing in length, the stems and roots of dicotyledons and gymnosperms are capable of another kind of growth, which results in the increase of their diameter This is brought about by the formation of a cylindrical zone of embryonic cells, called the cambium, which, as its cells divide, produces new bast on the outside and new wood on the inside In climates outside the tropics, this growth is seasonal, which accounts for the growth-rings characteristic of cross-sections of stems

Abnormal growths in plants are to be found in the case of galls, which are developed in response to the irritation caused by certain kinds of insects in the process of depositing their eggs, and in the development of these eggs

Growth in Animals.—Growth is an important factor in the development of an animal from the egg to the adult, and also in regeneration, which is the replacement of lost parts In some animals, and especially those which live in water, there appears to be no definite limit to the size to which they grow, that is to say that they grow throughout life Maximum size is then determined by the time at which death occurs, and by the actual rate of growth In other animals, such as birds and mammals, however, there is a fixed final adult size depending on a limit set by the bony skeleton. Insects also have a fixed adult size When this size has been reached, only that small amount of growth takes place which is necessary for the repair of wear and tear and for the healing of wounds The tissues whose cells are capable of multiplication throughout life are relatively undifferentiated (epidermis, blood-corpuscles, certain glands), whereas highly differentiated tissues such as nerve-cells never divide any more after birth in mammals Elongated animals such as earthworms and tape-worms have a special growth-zone, where the cells are embryonic and multiply to produce new segments which are intercalated in the body This growth-zone is just in front of the hind end of the earthworm, and just behind the front end of the tape-worm; it is the nearest approach among animals to the growing-point of plants In many cases the growth of animals may be seasonal as in bony fish, where the age and the size of the animal is proportional to the number and size of the growth-rings on the scales. Abnormal growths in animals take the form of galls, as in some corals, or of tumours or cancers These latter are groups of cells which start or continue to divide and grow at a time when they would not normally be doing so. Tumours may grow more or less fast, and they may lose the differentiated structure which they possessed more or less completely, and return to the embryonic condition The fast-growing tumours which sometimes also invade the neighbouring tissues are called malignant, while more slowly-growing tumours are described as benign

All these cases of growth in animals have involved increase in the number of the cells. Growth by the increase in volume of cells without their multiplication is much rarer and less important than in plants, but two striking examples may be mentioned The growth of the egg-cell by accumulation of yolk is a case of inflation by non-living matter, leading to such huge cells as the yolk of the ostrich's egg The cells of the womb of a pregnant female mammal increase in volume very considerably, and keep pace with the increasing size of the contained embryo After the birth of the latter, the cells of the womb return to their original volume. If the growth of the womb had taken place by cell-multiplication, return to the original size would be impossible

Growth and Function.—Continued excessive use of a part of an animal's body generally leads to the enlargement of that part, resulting in what may be called functional growth A well-known case of this kind is the growth of the muscles of the body of athletes. Other examples are to be found in the compensatory hypertrophy which takes place in one member of a pair of organs

if the other member of the pair is lost. This is shown in the case of the kidneys in man and other mammals, for when one kidney is removed, the other grows to the size of two normal kidneys. In addition to its effect on adult animals, function is an important factor in development, where, after a certain point is reached, it is necessary for the normal differentiation and growth of certain organs (*see* EXPERIMENTAL EMBRYOLOGY).

The Rate of Growth.—The irregular shapes of animals and plants make it difficult or impossible to obtain accurate measurements of their volume This difficulty is overcome by obtaining their weight, which is proportional to their volume By weighing at successive intervals of time, it is possible to study the speed at which organisms grow, and to express it diagrammatically in the form of a graph. The curve of such a graph, of weight plotted against time, is usually of a characteristic S-like or sigmoid shape It shows that the organism grows most rapidly where the slope of the curve is steepest, which is when roughly half the time has elapsed This fact can be brought out more clearly by plotting against time, not the total weight of the organism, but the additions to its weight which it has made during certain constant intervals of time This curve, of increments plotted against time, has a peak in the centre, corresponding to the steepest point in the curve of total weight plotted against time However, these curves do not convey a perfect impression of the rate of growth, because no allowance is made for the relative size of the growing organism A small organism increasing its weight by one pound is obviously growing faster than a larger organism increasing its weight by the same amount The relative speed of growth can be expressed by taking the additions of weight made during constant intervals of time, and expressing them as percentages of the total weight of the organism at the start of each of these intervals of time Such a curve, of percentage intervals plotted against time, shows that growth is relatively most rapid at the start of development, and that thereafter its rate decreases This is interesting, for it is at the start that the cells are the most embryonic, and they get progressively more differentiated with time The decrease in the relative rate of growth appears partly to be due to the decreased growth-capacity of differentiated cells, partly to true ageing, and partly to the difficulties put in the way of growth by mere increase in bulk The rate of growth of tissues in regeneration is of the same nature as that during development

It is now necessary to return to the curve of total weight plotted against time, because its sigmoid shape is similar to that which characterises curves of certain chemical reactions called autocatalytic In such a reaction, the speed of the reaction itself is accelerated by a substance (catalyser) which is a product of the selfsame reaction As the reaction proceeds, more of this substance is produced, and the more of it there is, the faster the reaction goes on, up to a point when half the material on which the reaction is working is used up After this point, the speed of the reaction decreases through lack of "fuel" The similarity between the two curves has led to the view that growth itself is an autocatalytic chemical reaction Some of the reactions which are concerned in growth are possibly autocatalytic (such as the synthesis of nuclear matter during the cleavage of the egg), but it is not justified to regard growth as a whole as autocatalytic until chemical proof, now absent, is forthcoming, since S-shaped curves may result from various types of chemical process In this connection, it may be mentioned that experiments on the growth of the nucleus of certain Protozoa and embryos of sea-urchins at different temperatures, have given reason to believe that physical processes (such as imbibition, with temperature coefficients of zero or negative sign) are involved together with chemical processes (with positive temperature coefficients in the neighbourhood of Q_{10}-2)

Growth and Cell-multiplication.—Since living matter is divided up into cells, and true growth means the production of more living matter, it entails cell-growth, or cell-multiplication (by cell-division), or both Now, the volume of a cell often stands in a quantitative relation to the volume of its nucleus This has been shown experimentally in a number of cases in which it has been possible to alter the normal quantity of nuclear matter present in the cell. By causing eggs to develop parthenogenetically, the cells are made to contain only half the normal quantity of nuclear material, and the volume of such cells is half the normal. This relation can be expressed mathematically, and is called the nucleocytoplasmic ratio. It varies with the tissue, the stage of development, and with external conditions. Normally, all the cells of an organism contain an equal quantity of nuclear material, and it is found that for most types of tissue, at a given stage and under certain conditions, there is a characteristic normal cell-magnitude. It follows that since within a tissue cell-volume is more or less constant, tissue-growth is dependent on cell-division. Tissue-growth by cell-growth alone (as in the case of the egg, or of the womb) is exceptional

Interesting cases of growth are to be observed among the Arthropoda These animals, which include Insects and Crustacea, are characterised by the possession of a hard outer "shell," which is shed at intervals Growth can only take place in jerks, during the intervals of time between the shedding of one shell and the formation of a new one On comparing such animals after successive moults, it is common to find that their linear dimensions have been increased by a coefficient of about 1·26 This figure is approximately the cube root of 2, and consequently, if each of the three linear dimensions has been multiplied by 1·26, the volume of the animal has doubled This would be expected if at each moult every cell of the body divided once, and the daughter-cells grew up to the characteristic cell-size It is, however, not yet known if this is the correct interpretation

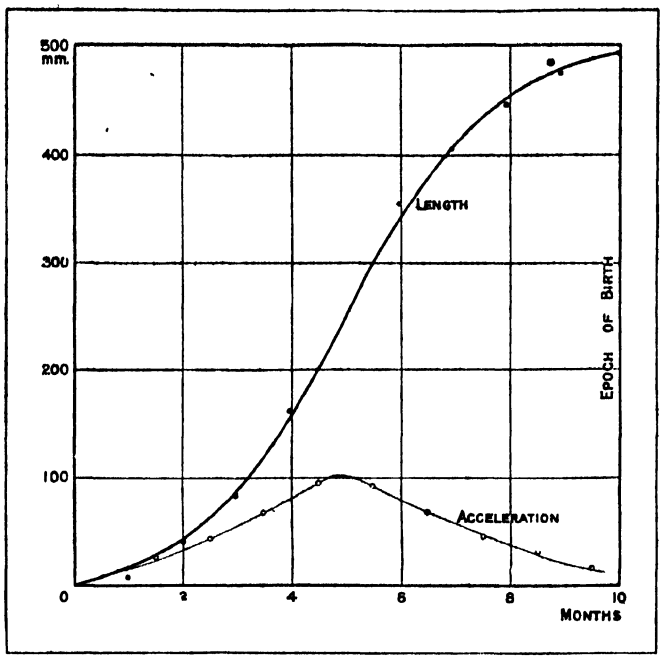
Growth and Differentiation.—As indicated in the article EXPERIMENTAL EMBRYOLOGY, the term differentiation is applied to two different classes of phenomena There is in the first place morphological differentiation or change of shape, and this is brought about by variations in the speed of growth in different directions Such processes are responsible for the modelling of the embryo out of the more or less spherical egg, and differential growth may therefore be regarded as the main cause of morphological differentiation On the other hand, there is histological differentiation, or change in substance and structure of the cells themselves, resulting in the characters which distinguish one kind of tissue from another The ability of a cell to divide is related to its degree of histological differentiation The more embryonic or undifferentiated a cell is, the more easily can it divide, and the more easily can tissues which are composed of such cells grow. On the contrary, a high degree of histological differentiation impedes cell-division and growth Experimental evidence on this subject is obtained from the study of tissue-culture Normal tissues removed from an organism and cultivated *in vitro* tend to lose their differentiation, and grow as sheets of embryonic cells, sometimes even coming to resemble the rapidly-dividing cells of malignant tumours Had these tissues remained in the organism, they would not have multiplied in this way if at all When two normal tissues such as epithelium and connective tissue are cultivated together, they affect one another mutually in such a way that each maintains its differentiation Should one of the two tissues die or be removed, the other undergoes dedifferentiation (*q v*) and grows rapidly Loss of differentiation is therefore a factor in the power of growth Further cases bearing on this subject will be found below in connection with growth-control.

The Raw Materials of Growth.—True growth involves the production of new living matter or protoplasm, and this has to be synthesised from the food Protoplasm contains proteins, which are highly complex chemical compounds composed of a number of amino-acids The latter contain carbon, hydrogen, oxygen, nitrogen and sometimes other elements such as sulphur One of the chief distinctions between plants and animals lies in the difference between the powers which these two types of organisms possess of synthesising protoplasm, and it is therefore necessary to treat them separately

The requirements of a plant are very simple The carbon is obtained from the carbon dioxide in the air, with the help of the green pigment chlorophyll and the energy of sunlight Nitrogen is obtained from nitrates in watery solution in the soil, and this water may also contain the other necessary elements as simple salts With these ingredients and the atmospheric oxygen ob-

tained in respiration, the plant is able to build up proteins, carbohydrates and fats.

Animals, on the other hand, are unable to synthesise protoplasm from the simple food-constituents which suffice for the plant Some of the simplest animals or Protozoa (*q.v.*) are capable of using substances such as ammonium glycerophosphate, but the majority of animals require for their food proteins, carbohydrates and fats In other words, animals require the products which have been elaborated out of simpler substances by plants



FROM THOMPSON, "GROWTH AND FORM" (CAMBRIDGE UNIVERSITY PRESS)

FIG 1.—GRAPH ILLUSTRATING THE PRENATAL GROWTH OF CHILD
The thick line shows the curve of total length plotted against time. The thin line represents the curve of increments of length (made during a given constant interval of time) against time; it shows the acceleration in the rate of growth

From the point of view of growth, carbohydrates and fats are important on account of the energy which they provide when they are oxidized, or burnt in the body; but since they contain no nitrogen and nitrogen is present in protoplasm, the proteins, which are the only nitrogen-containing constituents of an animal's food, are of chief significance This is not the place in which to deal extensively with the problem of nutrition, but attention may be called to a few points Lysine is an amino-acid which is lacking from certain proteins such as gliadin, and animals fed on gliadin can maintain themselves in good health, but they cannot grow Lysine is therefore necessary for growth, and these facts indicate that the processes which are concerned in the maintenance of protoplasm which has already been formed are not the same as those which are involved in the production of new protoplasm An interesting point in connection with gliadin is that the young of gliadin-fed mothers grow normally so long as they are being suckled, showing that the mother can synthesise growth-promoting amino-acids, but when these young are fed on gliadin themselves, as stated above, they cease growing

The Energy Necessary for Growth.—The synthesis of the complex organic compounds which constitute protoplasm involves an expenditure of energy Ultimately, since plants are the prime producers of these compounds, the necessary energy is supplied by sunlight and by atmospheric oxygen In normal animal tissues, the construction of proteins out of amino-acids absorbs the energy provided by the combustion of other substances (mostly carbohydrates and fats) with oxygen. If a growing embryo is deprived of oxygen, it obtains energy not by burning its carbohydrate (sugar), but by fermenting it and breaking it down to lactic acid This process is called glycolysis, and since it does not require any oxygen, it belongs to the class of processes which are called anaerobic. A number of bacteria normally obtain their energy in this way, but normal growing embryonic tissues cannot derive sufficient energy from glycolysis, and die if deprived of oxygen. If, however, after being deprived of oxygen, a growing embryo is supplied with oxygen again, provided that it is still alive, the glycolysis ceases, and it reverts to the ordinary method of deriving energy by burning the sugar This fact is of great interest and importance, because it is found that growing tumours habitually derive energy from glycolysis, so much so that even when oxygen is plentifully supplied to them they do not discontinue their anaerobic method of obtaining energy It may be mentioned that malignant tumours derive relatively more energy anaerobically than do benign tumours

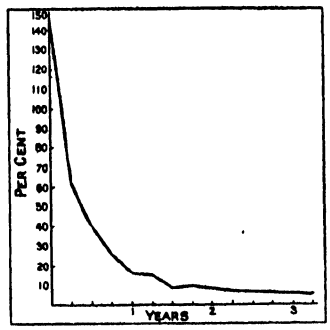
Growth-promoting Substances.—In addition to the raw materials and to the energy which are necessary for growth, a growing organism needs some other substances, which, although they do not contribute building material for the construction of new protoplasm, are nevertheless essential for the carrying out of the processes which result in that construction These substances fall into two classes.—vitamins and internal secretions, which latter may be produced by specialized glands, or by ordinary cells of the body under certain conditions

Vitamins (*q.v.*), or accessory food-factors, are well-known to be necessary in a diet, both for the maintenance of health and for growth The quantity of vitamins necessary to allow of growth is insignificantly small compared with the amount of growth which their presence allows, and it is therefore clear that vitamins act in a manner similar to that characteristic of chemical catalysers It is also known that an organic substance produced by seaweed is necessary for the growth of the microscopic plants called diatoms, and this substance is of importance because diatoms are at the beginning of the food-chain which ends in marketable marine fish In a similar way, fermented peat produces a substance which greatly accelerates the growth of plants

Of the internal secretions or hormones (*q.v.*) produced by special glands, those secreted by the thyroid, the anterior pituitary and the cortex of the adrenal must be mentioned Thyroid secretion raises the rate of metabolism of the tissues, and lack or excess of it may therefore affect a tissue's growth The extent to which this occurs depends on the tissue, for a tadpole deprived of thyroid will grow nevertheless, but a mammal similarly deprived when young will remain small and undeveloped Again, within an animal, the degree of susceptibility to thyroid varies with the tissue, for when excess of thyroid is given to a tadpole, well-defined regions of the body (future limb-buds, lungs and tongue) respond by active growth, while other regions are unaffected, and as a result of the competition for foodstuffs may even be inhibited (*e.g.*, tails) The secretion of the anterior pituitary stimulates the growth of various tissues An excess of this secretion in mammals results in an exaggerated growth of the bones of the limbs and jaws, while a deficiency of it prevents young mammals from growing The secretion of the cortex of the adrenal is mentioned here because, although its function in the body of the vertebrate animal which possesses it is still obscure, it has a powerful growth-stimulating effect when given to such invertebrates as water-fleas (*Daphnia*) and pond-snails (*Limnaea*)

When a piece of tissue is removed from an animal and cultivated *in vitro* (*see* TISSUE-CULTURE) it will not grow well unless a substance obtained from embryos is added to it This substance, which is called embryo-extract, appears to be derived from the embryo's liver, and it is remarkable in that it is not specific in its action, because embryo-extract derived from a bird will promote growth in mammalian tissues Adult tissues are deficient in this substance However, if adult tissue is killed and kept aseptically at body-temperature, disintegrative processes set in, resulting in what is called autolysis, in the course of which a very powerful growth-stimulant is produced This substance, known as autolysed extract, when added to a tissue-culture, produces a violent onset of growth which lasts for about two days and then stops It is probable that this substance is normally concerned in the process of repair of tissues after injury When cells are damaged and killed in the body, they autolyse and produce enough of the autolysed extract to stimulate neighbouring cells to grow, divide and

replace the injured cells. Another interesting feature of autolysed extract is the fact that its effects are similar to those obtained when an extract from a growing tumour is added to a tissue-culture It appears therefore that apart from the already-mentioned difference, as regards glycolysis in the presence of oxygen, between normal tissues and tumours, the former possess the growth-stimulant of autolysed extract only occasionally (*e.g*, after damage), whereas the latter possess it permanently. It is further interesting to notice that extracts from malignant tumours have a more powerful growth-stimulating effect than those from benign tumours. White blood-corpuscles also appear to produce a growth-stimulant, the presence of which is necessary for the cicatrization of a wound



FROM CHILD, "SENESCENCE AND REJUVENESCENCE" (CHICAGO UNIVERSITY PRESS)

FIG. 2 —CURVE OF HUMAN GROWTH FROM BIRTH TO THREE YEARS

This curve, showing the relative rate of growth, is obtained by plotting against time the increments of weight made during a given constant interval of time, expressed as a percentage of the total weight

Experiments on the cultivation of plant tissues *in vitro* have shown that the presence of vascular bundles is necessary for the growth of potato tissue. In the vascular bundles are structures called "companion-cells," and their appearance suggests that they are the source of the growth-promoting substance which is concerned with growth in diameter of the stem Injury to the cells of a plant may also result in the production of growth-stimulating substances called "wound-hormones," which are suggestive of the autolysed extract of damaged animal tissues

There are a few other cases in which the presence of substances or of organisms is known or believed to be responsible for growth Here may be mentioned the effect of tar, which, when applied to the skin of rats, results in the production of tumours The production of galls in plants is in some way associated with the laying of eggs by certain insects, and their development A kind of tumour of the alimentary canal in rats is associated with the presence of a parasitic nematode worm (*Gongylonema*) which infests the cockroach as its alternative host Lastly, there is the virus which is regarded by Gye as one of the factors responsible for the growth of tumours

The Control of Growth.—The stoppage of growth on the part of the tissues of an animal which has a more or less fixed final adult size appears to be due, not to the loss of the power to grow, but to an inhibition Certain lobsters are characterized by the possession of one large and one small claw If the large claw is not lost, the small claw does not grow any more If however the large claw is lost, then the small one grows and becomes large, while a small claw is regenerated on the stump of the lost large claw Some restraining influence is therefore present, and exerted in preventing tissues from growing beyond their normal size When normal tissues are removed from an organism and cultivated *in vitro*, this restraining influence is removed, whereupon they de-differentiate and grow Further, this growth can continue *in vitro* for a period of time longer than the normal length of life of the animal from which the tissues were taken This has been shown in the case of cultures of tissue from chicks, which have been kept growing for over a dozen years, and show no signs of stopping

The nature of the restraining influence is very problematical. It seems that the region of the body where the rate of protoplasmic activity of the tissues is highest (*see* AXIAL GRADIENTS) exerts a physiological dominance over the other regions The case of the sea-squirt *Perophora* is described in the article EXPERIMENTAL EMBRYOLOGY. *Dedifferentiation*, and it is only necessary here to recall the fact that under certain conditions the *Perophora*-individual can stop the growth of its stolon (or stalk) while under other circumstances the stolon grows and absorbs the individual. In plants, the phenomenon known as correlation is in many ways comparable It is found that the growing-point of the stem prevents the buds immediately beneath it from shooting out, and this inhibitory influence extends for a certain distance beneath the growing-point: beneath this zone the buds do grow out unhindered The range of this inhibitory influence can be reduced by subjecting a portion of the stem within the sphere of dominance to conditions which depress vital activities, and it can be abolished altogether by cutting off the growing-point or simply by preventing it from growing by covering it with a plaster cap When this is done, the buds below immediately sprout out But if then the plaster cap is removed from the growing-point, the latter reasserts its influence and the usurping buds are shrivelled up. This remarkable effect can be transmitted across a gap in the stem, bridged by water, and it is therefore likely that this instance of the control of growth of neighbouring regions is maintained by the secretion and diffusion of a chemical substance, as well as by competition for available food-substances. The competition between the *Perophora*-individual and its stolon, or between the growing-point and the neighbouring buds, may be paralleled by the rivalry between an embryo developing in the womb of a female mammal and a growing tumour in her body. during the growth of the embryo, that of the tumour is arrested

It has been mentioned above that growth is antagonistic to histological differentiation, and it is therefore interesting to find that it is in certain cases possible to induce differentiation in a growing tissue Cultures of kidney-tissue when alone, grow as sheets of undifferentiated cells, but if connective tissue is added to the cultures, the kidney-cells proceed to re-form the tubes characteristic of a kidney Similarly, cultures of undifferentiated cells derived from a tumour of the breast, can, by addition of connective tissue, be made to redifferentiate into structures resembling the acini of mammary glands In some cases it is possible to obtain spontaneous redifferentiation *in vitro* by performing the transfer of tissue from one culture to another (the process known as subculturing, which is necessary in order to supply the tissues with fresh food-substances) very carefully, so as to avoid damaging the cells and thereby stimulating them to grow and divide

Mention must be made of substances which definitely stop growth, and which seem to be present in increasing amounts in old animals A substance has been found which stops the growth of tumours It is obtained by repeatedly injecting extracts of the tumour into an animal, the blood of which eventually produces an antiserum This antiserum, when injected into an animal possessing a tumour of this kind, stops its growth

Heterogonic Growth.—Information of great interest is obtained from a study of the *relative* sizes of parts of animals at different *absolute* sizes It is found in the case of the antlers of deer that the ratio between the weight of the antler and the weight of the body is not the same at all sizes it increases with increasing body-weight, both in the individual life-history and also in comparing adult deer, so that the larger the deer the relatively larger are its antlers Another case is that of the width of the abdomen of the common shore-crab (*Carcinus*) In the male crab, the width of the abdomen is proportional to the length of the body at all sizes In the female, however, the width of the abdomen increases relatively to the length of the body at increasing sizes of the latter, throughout life Several other instances might be given of the same phenomenon. the relative increase in the size of the claw in certain male crabs, in the length of the mandibles in male stag-beetles; in the size of the head in neuter ants; in the size of the face in dogs Such organs are said to show *heterogonic* growth. In all these cases, the relative growth-rates of the heterogonic organ and of the rest of the body remain constant during long periods. As a rule, it is found that the weight of the heterogonic organ (y) is proportional to the weight of the rest of the body (x) raised to a power, usually between 1 25 and 2 0 Thus,

$$y = bx^k,$$

where b and k are constants Heterogonic growth is of interest for the following reasons. First, animals showing long-continued heterogonic growth of any part have no definitive shape, since it varies with absolute size Next, when several species of animal in a genus have a heterogonic organ (such as antlers in deer), the species which are absolutely larger will in general have the rela-

ively larger heterogonic organ. The introduction of a constant lifferential growth-rate such as results in positive heterogony, explains the progressive enlargement of an organ during evolution, f for some other reason the absolute size of the body increases (which it often does) This may happen in different groups of elated animals, in each of which the heterogonic organ seems to ppear independently. This phenomenon, which has been attrib-ted to a mysterious process of "orthogenesis," thus receives its explanation for it is a fact that absolute size does increase in such ases, as for instance in the Titanotheria (*q v*). Conversely, nega-ive heterogony, and decrease of body-size, may lead to the reduc-ion and disappearance of structures in evolution.

Growth and Reduction.—While growth is ordinarily held to nean increase in size, it may be mentioned that the opposite ometimes happens, and it is possible for animals or parts of nimals to "grow" smaller. In some cases, the fulfilment of the ordinary course of development entails the reduction in size of ome parts, such as the tail and the gills in the tadpole, and most of the larval body in developing sea-urchins In the case of the *Perophora*-individual and its stolon already mentioned, the growth of the one is accompanied by the reduction of the other Further, ust as function tends to increase the size of the functioning organ, o lack of function results in its reduction and atrophy

Reduction of whole animals is not so common, and is in any ase not be expected in the higher forms which possess a skeleton of non-living material Nevertheless, sea-urchin larvae are capable of reduction under certain conditions, and thereby of unmaking he skeletal struts which support their arms Jelly-fish and hydroid olyps are capable of extreme reduction, and the case of flat-worms is especially interesting, for when owing to starvation their ize is reduced to a fraction of what it was, they are not only maller but younger, as judged by the rate of protoplasmic activi-ies of their tissues In their case, reduction has been accompanied by dedifferentiation and has resulted in rejuvenescence Lastly, t may be mentioned that reduction can take place in an animal is highly organized as is the sea-squirt *Clavellina,* where it results n a small ball of relatively undifferentiated cells, which is never-heless capable of redeveloping into a fully-formed *Clavellina.*

Growth Limits.—An animal with a positive heterogonic struc-ure such as a pair of antlers must not exceed a certain size, or he structure becomes so large as to render it difficult for the nimal to gain a living This appears to have been the case with he now extinct Irish "elk" (really a giant fallow-deer). Numer-ous examples might be given of limits to growth which affect phylogeny rather than ontogeny, *i e*, of limiting factors which do not prevent an animal from growing but which result in its death if it exceeds a certain size, and thereby abolish its chance of leaving offspring In the higher terrestrial animals, the weight of he body is supported by the legs The weight of the body is proportional to its volume, or to the cube of its linear dimensions The strength of the legs, however, is proportional to their cross-sectional area, or to the square of the linear dimensions It follows hat when the absolute size of such animals increases, the weight of the body increases out of proportion to the increased strength of the supporting legs If the skeletal material could be altered from bone to anything stronger, a margin of safety might be retained, but this is of course impossible, and the result is that here is a maximum size beyond which land-animals must not grow, for if they did, their legs would have to be so massive as to be immovable, and such animals could not live The elephants ppear to be close to this maximum limit It is to be noticed that his limiting factor does not apply to animals which live in water nd which are not supported by their limbs The whales therefore have been able to grow to sizes vastly greater than any that would be possible for terrestrial animals

See AXIAL GRADIENTS; CANCER, DEDIFFERENTIATION; ENDOCRINOLOGY IN ANIMALS, EXPERIMENTAL EMBRYOLOGY, GALLS; GRAFTING IN ANIMALS; HORMONES; REGENERATION IN ANIMALS; TISSUE-CULTURE; VITAMINS.

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GROYNE, a framed structure of timber or a low wall of masonry or concrete run out over a foreshore into the sea, in a direction approximately at right angles to the coast line, for the purpose of arresting the lateral travel of sand and shingle and thus raising the foreshore level as a barrier against the encroachment of the sea On the coasts of Holland and Belgium low groynes constructed of fascine mattress-work and rubble stone are commonly employed Groynes similar in form to those used on sea-shores, and also, in many cases, built up of rubble or fascine work, are employed for training the flow of rivers, protecting their banks from erosion, and deepening their channels. Such groynes are built out over the river banks and bed transversely to the flow of the current and are sometimes termed spur-groynes (*see* RIVER ENGINEERING) The word groyne appears to have been used originally to denote any wall run out transversely to the shore In the United States of America the word is spelt *groin* both in architecture and as applied to sea-defence works (*See* COAST PROTECTION AND LAND RECLAMATION) (N G G)

GROZNYI, a town which, though situated in the Chechen autonomous area of the R S F S R, belongs administratively to the North Caucasian Area. It is on the Zunzha river in 43° 20′ N. 45° 42′ E, and is on the railway from Makach-Kala (Petrovsk) to Vladikavkaz. Its population (1926) was 68,677 The naphtha area to the north-west of the town began to be exploited in 1893 and another area to the south-east in 1913; the production in 1926–7 reached 2½ million tons, a higher total than in pre-war times It has a much higher percentage of natural oil fountains than the Baku region, especially in the new area In 1924–5, 60% was obtained from natural fountains, and in 1926–7, 70% Its oil differs in quality from that of Baku giving less kerosene and more paraffin It has naphtha and paraffin refineries and electric sawmills. A pipe line to Tuapse has been constructed and will cheapen the cost of export, and another to Poti is being planned The new plant erected in Groznyi and in Tuapse has considerably increased production Groznyi and Makach-Kala are also connected by pipe, and there are refineries in Makach-Kala The administrative offices for the Chechen Autonomous Area are situated in Groznyi, and a training college for Chechen teachers was recently established in the town

GRUDZIANZ (Ger *Graudenz*), a town of Poland in the province of Pomorze, on the right bank of the Vistula near the Prussian frontier Pop (1921) 33,800 It was formerly an important German fortress It possesses three Roman Catholic and two Protestant churches, and a synagogue. It was founded by the Teutonic knights in the 13th century, and came under the rule of Poland by the Peace of Thorn in 1466 In 1772 it was seized by Prussia at the first partition of Poland

GRUIFORMES, an order of birds, the best-known members of which are the cranes (*q v*). (*See* also ORNITHOLOGY, SUN-BITTERN, TRUMPETER)

GRUMBACH, WILHELM VON (1503–1567), German adventurer, born on June 1, 1503, chiefly known through his connection with the so-called "Grumbach feuds" (*Grumbachsche Handel*), the last attempt of the German knights to destroy the power of the territorial princes. He was attached to the court of Casimir, prince of Bayreuth (d 1527), and fought against the peasants during the rising in 1524 and 1525 About 1540 Grumbach became associated with Albert Alcibiades, prince of Bayreuth, whom he served both in peace and war After the conclusion of the peace of Passau in 1552, Grumbach assisted Albert in his career of plunder in Franconia and was thus able to take some revenge upon his enemy, Melchior von Zobel, bishop of Wurzburg Grumbach held his lands in fief from the bishops of Wurzburg, and had held office at the court of Conrad of Bibra, who was bishop from 1540 to 1544 Albert's career, however, was

checked by his defeat at Sievershausen in July 1553 and his subsequent flight into France, and the bishop seized Grumbach's lands The knight obtained an order of restitution from the imperial court of justice (*Reichskammergericht*), but he was unable to execute it; and in April 1558 some of his partisans seized and killed the bishop Grumbach fled to France. Returning to Germany he pleaded his cause, unsuccessfully, before the diet at Augsburg in 1559. He had found a new patron in John Frederick, (*q v*) duke of Saxony, whose father, John Frederick, had been obliged to surrender the electoral dignity to the Albertine branch of his family. Grumbach suggested to the duke a general rising of the German knights as a means to the recovery of the electorate Magical charms were employed against the duke's enemies, and communications from angels were invented which helped to stir up the zeal of the people. In 1563 Grumbach attacked Wurzburg, seized and plundered the city and compelled the chapter and the bishop to restore his lands. He was consequently placed under the imperial ban, but John Frederick refused to withdraw his protection. Meanwhile Grumbach planned the assassination of the Saxon elector, Augustus, proclamations were issued calling for assistance; and alliances both without and within Germany were concluded. In Nov 1566 John Frederick was placed under the ban, which had been renewed against Grumbach earlier in the year, and Augustus marched against Gotha. A mutiny led to the capitulation of the town Grumbach was tortured, and barbarously executed at Gotha on April 18, 1567 John Frederick was imprisoned for life

See F Ortloff, *Geschichte der Grumbachschen Handel* (Jena, 1868–70), and J Voigt, *Wilhelm von Grumbach und seine Händel* (Leipzig, 1846–47).

GRUMENTUM, an ancient town in Lucania, 33 m S of Potentia by direct road through Anxia, and 52 m by the Via Herculia, at the point of divergence of a road eastward to Heraclea It seems to have been native Lucanian, not a Greek settlement. In 215 B C the Carthaginian general Hanno was defeated under its walls, and in 207 B C. Hannibal made it his headquarters In the Social War its strong fortress seems to have been held by both sides at different times Its site is a ridge on the right bank of the Aciris (Agri) about 1,960 ft above sea-level, ½ m below the modern Saponara, which lies much higher (2,533 ft) Its ruins (all of the Roman period) include those of its enceinte in *opus reticulatum,* with scanty traces of a large amphitheatre (arena 205 by 197 ft), the only one in Lucania, except that at Paestum

GRÜN. HANS BALDUNG (*c* 1480–1545), commonly called Grun, a well-known German painter, was born at Weyersheim am Turm near Strasbourg His family derived from Gmund in Swabia In 1509 Grun purchased the freedom of the city of Strasbourg, and resided there till 1512, when he moved to Freiburg-im-Breisgau There he painted his masterpiece, which was placed on the high altar of the Freiburg cathedral in 1516 He purchased anew the freedom of Strasbourg in 1517, resided in that city, and died a member of its town council 1545

Though nothing is known of Grun's education, it may be inferred from his style that he was no stranger to the school of which Durer was the chief, his work is however more baroque and fantastic than Durer's Grun's prints were often mistaken for those of Durer, and Durer himself was well acquainted with Grun's woodcuts and copper-plates in which he traded during his trip to the Netherlands (1520) Grun was a great draughtsman, his line was sure and his form plastic, many of his drawings have survived, including a complete sketchbook in the print room at Carlsruhe As a portrait painter he is well known His portrait of the Margrave of Baden is in the Munich gallery The National Gallery, London, and the Vienna Gallery also possess portraits by him Like Durer and Cranach, Grun became a hearty supporter of the Reformation He was present at the diet of Augsburg in 1518, and one of his woodcuts represents Luther under the protection of the Holy Ghost, which hovers over him in the shape of a dove

BIBLIOGRAPHY —A complete list of Grun's paintings and drawings is given in G. V Terey, *Studien zur Deutschen Kunstgeschichte* · Hans Baldung Gen Grien (1894), his engravings and woodcuts in J A. V. Bartsch, *Peintre-Graveur,* vol. vii (1803–21) and in J D. Passavant, *Peintre-Graveur,* vol iii (1860); the sketch book at Carlsruhe was published by M. Rosenberg, *Hans Baldung Grun* (1889). *See* also H. Curjel, *Hans Baldung Grien* (Munich, 1923).

GRÜNBERG, a town in Prussian Silesia, situated on an affluent of the Oder, and on the railway from Breslau to Stettin via Kustrin, 36 m. N.W. of Glogau Pop. (1925) 24,857. There are manufactures of cloth, paper, machinery, sugar and shoddy. The prosperity of the town depends chiefly on the vine culture, for besides manufacturing wine it exports grapes.

GRUNDTVIG, NIKOLAI FREDERIK SEVERIN (1783–1872), Danish poet, statesman and divine, was born at the parsonage of Udby in Zealand on Sept. 8, 1783 At the close of his university life at Copenhagen he made Icelandic his special study, until in 1805 he took the position of tutor in a house on the island of Langeland The next three years were spent in the study of Shakespeare, Schiller and Fichte His cousin, the philosopher Henrik Steffens, had returned to Copenhagen in 1802 full of the teaching of Schelling, and his lectures and the early poetry of Ohlenschlager opened the eyes of Grundtvig to the new era in literature His first work, *On the Songs in the Edda,* attracted no attention Returning to Copenhagen in 1808 he achieved greater success with his *Northern Mythology,* and again in 1809–11 with a long epic poem, the *Decline of the Heroic Life in the North*

The boldness of the theological views expressed in his first sermon in 1810 offended the ecclesiastical authorities, and he retired to a country parish as his father's assistant for a while. From 1812 to 1817 he published five or six works, of which the *Rhyme of Roskilde* is the most remarkable From 1816 to 1819 he was editor of a polemical journal entitled *Dannevirke,* and in 1818 to 1822 appeared his Danish paraphrases (6 vols) of Saxo Grammaticus and Snorri.

In 1825 he published a pamphlet, *The Church's Reply,* against H N Clausen, who was professor of theology in the university of Copenhagen Grundtvig was publicly prosecuted and fined, and for seven years he was forbidden to preach, years which he spent in publishing a collection of his theological works, in paying two visits to England, and in studying Anglo-Saxon In 1832 he obtained permission to preach again, and in 1839 he became priest of the church of Vartov hospital, Copenhagen, a post he continued to hold until his death In 1837–41 he published *Songs for the Danish Church,* a rich collection of sacred poetry, in 1838 he brought out a selection of early Scandinavian verse, in 1840 he edited the Anglo-Saxon poem of the *Phoenix,* with a Danish translation He visited England a third time in 1843. From 1844 until after the first German war Grundtvig took a prominent part in politics In 1861 he received the titular rank of bishop, but without a see

The chief characteristic of his theology was the substitution of the authority of the "living word" for the apostolic commentaries, and he desired to see each congregation a practically independent community His patriotism was almost a part of his religion, and he established popular schools where the national poetry and history should form an essential part of the instruction His followers are known as Grundtvigians He was married three times, the last time in his 76th year He died on Sept 2, 1872

Grundtvig holds a unique position in the literature of his country, he has been styled the Danish Carlyle He was above all things a man of action, not an artist; and the formless vehemence of his writings, which have had a great influence over his own countrymen, is hardly agreeable or intelligible to a foreigner The best of his poetical works were published in a selection (7 vols , 1880–89) by his eldest son, Svend Hersleb Grundtvig (1824–83), who was an authority on Scandinavian antiquities, and made an admirable collection of old Danish poetry (*Danmarks gamle Folkeviser,* 1853–83, 5 vols ; completed in 1891 by A Olrik).

His correspondence with Ingemann was edited by S Grundtvig (1882), his correspondence with Christian Molbech by L Schröder (1888), *see* also F Winkel Horn, *Grundtvigs Liv og Gjerning* (1883), an article by F Nielsen in Bricka's *Dansk Biografisk Lexikon;* and F Grönning, *R F S Gruntvig* (8 vols , 1907–14).

GRUNDY, SYDNEY (1848–1914), English dramatist, was born at Manchester on March 23, 1848, son of Alderman Grundy He was educated at Owens college, Manchester, and was called to the bar in 1869, practising in Manchester until 1876. He

became well known as an adapter of plays, his early successes being *The Snowball* (Strand theatre, 1879) from *Oscar, ou le mari qui trompe sa femme* by MM. Scribe and Duvergne, and *In Honour Bound* (1880) from Scribe's *Une Chaîne*. Among his most successful adaptations was the charming *Pair of Spectacles* (1890) from *Les Petits Oiseaux* of MM. Labiche and Delacour Grundy died on July 4, 1914.

GRUNDY, MRS., the name of an imaginary English character, who typifies the disciplinary control of the conventional "proprieties" of society over conduct, the tyrannical pressure of the opinion of neighbours on the acts of others The name appears in a play of Thomas Morton, *Speed the Plough* (1798), in which one of the characters, Dame Ashfield, continually refers to what her neighbour Mrs Grundy will say as the criterion of respectability Mrs Grundy is not a character in the play, but is a kind of "Mrs Harris" to Dame Ashfield

GRÜNEWALD, MATHIAS, German painter, active between 1500 and 1530, at Frankfurt, Mainz, Aschaffenburg and in Upper Alsace Although he was one of the greatest artists of his time, and was ranked by Melanchthon with Durer and Cranach, very little is known of his life He was an overpowering personality, the last and greatest representative of the German Gothic, for although he lived at a time when the Italian Renaissance was penetrating into Germany, his forms and figures are conceived as expressions of strong accentuated feelings rather than as rhythmic parts of a co-ordinated organic unity His representations of the Crucifixion are among the most passionate and moving scenes produced in art His colour is rich and glowing, and his effects of chiaroscuro seem to presage the art of Rembrandt His earliest work extant is the "Flagellation," dated 1503 in Munich Of the same period are the "Crucifixion" in Basle, and his great masterpiece in the Colmar museum, which consists of nine paintings forming part of a large four-winged altarpiece which also contained carved figures by another artist In 1517 he was commissioned to paint an altarpiece for the Maria Schnee chapel at Aschaffenburg The centrepiece representing the Virgin is now in the church of Stuppach near Mergentheim, and the right wing with the "Foundation of S Maria Maggiore" is in the museum at Freiburg Soon afterwards Grünewald became court painter to Albrecht of Brandenburg, cardinal and elector of Mainz.

Grünewald's powerful and expressive drawings are to be seen in the galleries of Berlin, Dresden, Vienna, Karlsruhe, Oxford, Paris, Stockholm and Erlangen A whole book of his drawings was recently discovered in the possession of the Savigny family, and was acquired by the Berlin museum

See H A Schmid, *Gemalde und Zeichnungen von M Grunewald* (1907–11); O Hagen, *M Grunewalde* (1919), M J Friedländer, *Der Isenheimer Altar* (1908), *Die Grunewalde Zeichnungen der Sammlung Savigny* (1926), and *Die Zeichnungen von M Grunewalde* (1927). *See* also J K Huysman's appreciation in his novel, *La Bas* (1891)

GRUNTER, GRUNT or **DRUM,** names applied to fishes of the family Scidenidae, on account of the noise, of uncertain origin, they emit under water The best-known species is *Pogonias chromis* of the Atlantic coast of America, from Uruguay northwards, which may reach a weight of 100 lb This heavily built fish feeds mainly on molluscs and is a great pest of the oyster fisheries (*see* OYSTER) The fresh-water drum (*Aplidonotus grunniens*) is common in the Mississippi valley, where it is esteemed for food

GRUTER or **GRUYTERE, JAN** (1560–1627), a critic and scholar of Dutch parentage by his father's side and English by his mother's, was born at Antwerp To avoid religious persecution his parents while he was still young came to England, and for some years he studied at Cambridge, after which he went to Leyden. In 1586 he was appointed professor of history at Wittenberg, but as he refused to subscribe the *Formula concordiae* he was unable to retain his office From 1589 to 1592 he taught at Rostock, after which he went to Heidelberg, where in 1602 he was appointed librarian to the university

Gruter's chief works were his *Inscriptiones antiquae totius orbis Romani* (Heidelberg, 1603), and *Lampas, sive fax artium liberalium* (Frankfurt, 1602–34).

GRUYÈRE (Ger. *Greyerz*), a district in the south-eastern portion of the Swiss canton of Fribourg, famed for its cattle and its cheese It is composed of the middle reach (from Montbovon to beyond Bulle) of the Sarine or Saane valley, with its tributary glens of the Hongrin, the Jogne and the Trême It forms an administrative district of the canton of Fribourg, its population being mainly French-speaking and Romanists From Montbovon (11 m by rail from Bulle) there are mountain railways leading S W past Les Avants to Montreux (14 m), and E up the Sarine valley to Saanen or Gessenay (14 m), and by a tunnel to the Simme valley and Spiez on the Lake of Thun The modern capital of the district is the small town of Bulle (Ger *Boll*), with a 13th-century castle and 4,373 inhabitants But the historical capital is the town of Gruyères, on a steep hill above the left bank of the Sarine, at a height of 2,713 ft above sea-level and with an old castle The town has 1,711 inhabitants The castle was the seat of the counts of the Gruyère, first mentioned in 1073 The name is said to come from the word *gruyer*, meaning the officer of woods and forests, but the counts bore the canting arms of a crane (*grue*), which are seen all over the castle and the town In 1555 the domains were sold to Bern and Fribourg Bern took the upper Sarine valley, while Fribourg took the rest of the county, which it added to Bulle and Albeuve (taken in 1537 from the bishop of Lausanne), and to the lordship of Jaun in the Jaun or Jogne valley (bought in 1502–04 from its lords), in order to form the present administrative district of Gruyère

GRYNAEUS, SIMON (1493–1541), German scholar and theologian, son of Jacob Gryner, a Swabian peasant, was born at Vehringen, and studied at Vienna In 1524 he became professor of Greek at Heidelberg; from 1526 onwards he also held the chair of Latin His religious views drove him from Heidelberg in 1529 After some years as professor of Greek at Basle, he reorganized the University of Tubingen, returning to Basle before 1536, when he assisted in drafting the so-called First Helvetic Confession He represented the Swiss divines at the Worms Conference (1540) between Catholics and Protestants He died of plague at Basle on Aug 1, 1541. A brilliant scholar, a mediating theologian, and personally of lovable temperament, his influence was great and wisely exercised Erasmus and Calvin were among his correspondents His chief works were Latin versions of Plutarch, Aristotle and Chrysostom

See Bayle, *Dictionnaire;* W T Streuber in Hauck's *Realencyklopädie* (1899), and for bibliography, Streuber, *S Grynaei epistolae* (1847)

GRYPHIUS, ANDREAS (1616–1664), German lyric poet and dramatist, was born on Oct 11, 1616, at Grossglogau, Silesia, where his father was a clergyman The family name was Greif, latinized, according to the prevailing fashion, as Gryphius Left early an orphan and driven from his native town by the troubles of the Thirty Years' War, he received his schooling in various places In 1634 he became tutor to the sons of the jurist Georg von Schonborn (1579–1637), imperial count-palatine (*Pfalzgraf*) Schonborn, who recognized Gryphius's genius, crowned him *poeta laureatus*, gave him the diploma of master of philosophy, and bestowed on him a patent of nobility, though Gryphius never used the title After Schönborn's death Gryphius went to Leiden, where he remained six years, both hearing and delivering lectures Here he fell under the influence of the great Dutch dramatists, Pieter Cornelissen Hooft and Joost van den Vondel After travelling in France, Italy and South Germany, Gryphius settled in 1647 at Fraustadt, where he began his dramatic work, and was syndic of Glogau from 1650 until his death on July 16, 1664

Gryphius was a man of morbid disposition, and his melancholy temperament, fostered by the misfortunes of his childhood, is largely reflected in his lyrics, of which the most famous are the *Kirchhofsgedanken* (1656) His best works are his comedies, one of which, *Absurda Comica, oder Herr Peter Squentz* (1663), is based on the episode of Pyramus and Thisbe in *The Midsummer Night's Dream Die geliebte Dornrose* (1660), written in a Silesian dialect, is simple and graceful, and ranks high among the comparatively small number of German dramas of the 17th century *Horribilicribrifax* (1663), founded on the *Miles gloriosus*

of Plautus, is a rather laboured attack on pedantry. Besides these three comedies, Gryphius wrote five tragedies, modelled on Seneca and Vondel They are *Carolus Stuardus* (1649), *Leo Armenius* (1646), *Katharina von Georgien* (1657), *Cardenio und Celinde* (1657), the only bourgeois tragedy earlier than Lessing, and *Papinianus* (1663). No German dramatic writer before him had risen to so high a level, nor had he worthy successors until about the middle of the 18th century

A complete edition of Gryphius's dramas and lyric poetry was published by H. Palm in the Stuttgart Literarische Verein (3 vols, 1878, 1882, 1884).

See O Klopp, *Andreas Gryphius als Dramatiker* (1851); J Hermann, *Über Andreas Gryphius* (1851), T. Wissowa, *Beitrage zur Kenntniss von Andreas Gryphius' Leben und Schriften* (1876), J Wysocki, *Andreas Gryphius et la tragédie allemande au XVIIe siècle*, V. Mannheimer, *Die Lyrik des Andreas Gryphius* (1904); and W Flemming, *Andreas Gryphius und die Buhne* (1921).

GSTAAD (3,450 ft), a health resort and centre for winter sports in the canton of Berne, Switzerland, on the upper Saane It has a station on the railway Montreux–Bernese Oberland It is the starting point of the route over the Col-de-Pillon to Diablerets. Gstaad belongs to the commune of Saaner, which has a total population of 4,534 Protestant, German-speaking inhabitants.

GUACO, HUACO or **GUAO,** also Vejuco and Bejuco, terms applied to various Central and South American and West Indian plants, in repute for curative virtues. What is most commonly recognized in Colombia as guaco is *Mikania amara* (*Pl équinox.* ii. 84, pl 105, 1809), a climbing plant of the tribe *Eupatoriaceae* of the Compositae, affecting moist and shady situations, and having a much-branched and deep-growing root, variegated, serrate, opposite leaves and dull-white flowers in axillary clusters The whole plant emits a disagreeable odour It is stated that the Indians of Central America take guaco and boldly catch dangerous snakes, which writhe in their hands as though touched by a hot iron (B. Seemann, *Hooker's Journ. of Bot.* v 76, 1853) The odour alone of guaco has been said to cause in snakes a state of stupor and torpidity, and Humboldt, who observed that the near approach of a rod steeped in guaco-juice was obnoxious to the venomous *Coluber corallinus,* was of opinion that inoculation with it imparts to the perspiration an odour which makes reptiles unwilling to bite The drug is not used at all in modern therapeutics

GUADALAJARA, a province of central Spain, formed in 1833 of districts from New Castile; bounded north by Segovia, Soria and Saragossa, east by Saragossa and Teruel, south by Cuenca and west by Madrid. The estimated population (Dec 31, 1925) was 206,004 Area 4,676 sq. miles The province forms part of the uptilted north-eastern edge of the Meseta, and consequently the high ground is in the north, while the southern section of the province slopes into the plateau basin of New Castile The northern highlands reach almost 7,000 ft in places, as in La Cebollera (6,955 ft) and Ocejon (6,775 ft) in the Guadarrama mountains The Sierra de Albarracin form an important group on the extreme south-east of the province. The ways through the northern mountains are few, the main pass being over the Sierra Ministra, which carries the railway from Madrid to Calatayud and the north The southern section, composing part of the Tagus basin, is watered by its tributaries, the Tajuna, Henares, Jarama and Gallo The climate of this area, as of Castile, is continental in type, marked by the severity of its winter cold and summer sun The soil varies very much in quality from place to place, but is fertile in many regions, notably in the cornlands of Alcarria towards the south Few of the cork and oak forests which formerly covered the mountains have escaped destruction, and the higher lands are mainly pasture for sheep and goats Grain, olive oil, wine, saffron, silk and flax are produced, but agriculture naturally suffers in this difficult country. Common salt and silver are mined, while deposits of iron, lead and gold were worked by the Romans. The manufacture of coarse cloth and pottery are a typical feature of the towns and villages. The Madrid-Saragossa railway traverses the province for 70 m, but the roads are naturally difficult. Guadalajara (*q.v*) is the capital, and the only town of any considerable size Molina de Aragon, a fortified town built at the foot of the Parameras de Molina (2,500–3,500 ft), and on the right bank of the Gallo, is of some importance as an agricultural centre Siguenza, on the railway, is an episcopal city, with a fine Romanesque cathedral dating from the 11th century It is probably the ancient *Segontia,* founded in 218 B C, by refugees from Saguntum Statistics of the Spanish Government reveal that the population of the province numbers only 44 to the square mile, but has risen somewhat since 1900, when the figure was 200,186; this, however, was a decrease on the 1887 figure, viz., 205,040. Poverty in the past has caused much emigration

GUADALAJARA, the capital of the Spanish province of Guadalajara, on the left bank of the river Henares, and on the Madrid-Saragossa railway, 35 m E N E of Madrid Pop. (1920) 13,536 Guadalajara is a picturesque town, occupying a somewhat sterile plain, 2,100 ft above the sea Under Roman and Visigothic rule it was known as *Arriaca* or *Caraca;* its present name, which sometimes appears in mediaeval chronicles as *Godelfare,* represents the *Wad-al-hajarah,* or "Valley of Stones," of the Moors, who occupied the town from 714 until 1081, when it was captured by Alvar Yañez de Minaya, a comrade of the more famous Cid The church of Santa Maria contains the image of the "Virgin of Battles," which accompanied Alphonso VI of Castile (1072–1109) on his campaigns against the Moors The palace of the ducal house del-Infantado is in the Mudejar style, and the *panteon,* or mausoleum of the Mendoza family, added between 1696 and 1720 to the 13th-century church of San Francisco, is remarkable for the rich sculpture of its tombs Manufactures of soap, leather and woollen fabrics have superseded the original cloth-weaving industry for which Guadalajara was long celebrated, there is also a considerable trade in agricultural produce

GUADALAJARA, an inland city of Mexico and capital of the State of Jalisco, 275m (direct) W N W of the Federal capital, in lat 20° 41′ 10″ N, long 103° 21′ 15″ W Pop (1910) 123,506, (1921) 143,376 Guadalajara is served by the Mexican Central railway and the Southern Pacific of Mexico running from Nogales on the American border The city is in the Antemarac valley near the Río Grande de Santiago, 5,092ft. above sea-level Its climate is dry, mild and healthy, though subject to sudden changes The city is well built, with straight and well-paved streets, numerous plazas, public gardens and shady promenades Its public services include tramways and electric lighting, the Juanacatlán falls of the Río Grande near the city furnishing the electric power Guadalajara is an episcopal see, and its cathedral, built between 1571 and 1618, is one of the largest and most elaborately decorated churches in Mexico The Government palace, which, like the cathedral, faces upon the *plaza mayor,* is generally considered one of the finest specimens of Spanish architecture in Mexico Other institutions are the university, the mint, built in 1811, the modern national college and high schools, a public library of over 28,000 volumes, an episcopal seminary, an academy of fine arts, the Teatro Degollado, and the large modern granite building of the penitentiary There are many interesting churches and 11 conventual establishments in the city Charitable institutions of a high character are also prominent, among which are the Hospicio, which includes an asylum for the aged, infirm, blind, deaf and dumb, foundlings and orphans The city has a good water-supply, derived from springs and brought in through an aqueduct 8m long Guadalajara is surrounded by a fertile agricultural district and is an important commercial town It is also widely known for the artistic pottery manufactured by the Indians of the city and of its suburb, San Pedro Among other prominent industries are the manufacture of cotton and woollen goods, leather, furniture, hats and sweetmeats. Guadalajara was founded in 1531 by Nuño de Guzmán, and became the seat of a bishop in 1549 The Calderón bridge near the city was the scene of a serious defeat of the revolutionists under Hidalgo in Jan 1811 The severe earthquake of May 31, 1818, partially destroyed the two cathedral steeples; and that of March 11, 1875, damaged many of the larger buildings.

GUADALQUIVIR (ancient *Baetis*, Moorish *Wadi al Kebir*, "the Great River"), a river of southern Spain. What is regarded as the main stream rises 4,475 ft above sea-level between the Sierra de Cazorla and Sierra del Pozo, in the province of Jaen. It does not become a large river until it is joined by the Guadiana Menor on the left, and the Guadalimar on the right Below Coria it traverses the series of broad fens known as Las Marismas, the greatest area of swamp in the Iberian Peninsula. Below Sanlúcar the river enters the Atlantic after a total course of 360 m It drains an area of 21,865 square miles In the time of the Moors it was navigable up to Cordova, but owing to the accumulation of silt in its lower reaches it is now only navigable up to Seville by vessels of 1,200 to 1,500 tons. Navigation has now been facilitated by the new cut, known as the Corte de Tablada, and swing-open bridge.

GUADELOUPE, French colony, West Indies, between Montserrat on the N , and Dominica on the S , between 15° 59′ and 16° 20′ N and 61° 31′ and 61° 50′ W It consists of two entirely distinct islands, separated by a narrow arm of the sea, Rivière Salée (Salt river), 100 ft to 400 ft wide and navigable for small vessels The western island, a rugged mass of ridges, peaks and lofty uplands, is called Basse-Terre, while the eastern and smaller island, the real low-land, is known as Grande-Terre A sinuous ridge runs through Basse-Terre from N to S In the north-west Grosse Montagne (2,370 ft), radiates sharp spurs in all directions, near the middle of the west coast are the twin heights of Les Mamelles (2,536 ft and 2,368 ft). Farther south is La Soufrière (4,900 ft) In 1797 this volcano was active, and in 1843 its eruptions laid several towns in ruins, but a few thermal springs and solfataras are now its only activity In the extreme south is the jagged Caraibe (2,300 ft) Basse-Terre is extremely beautiful, with cloud-capped mountains clothed in luxuriant vegetation Grande-Terre rises to only 450 ft , and has extensive sugar plantations The plain is composed mainly of limestone and a conglomerate of sand and broken shells known as *maçonne du bon dieu*, much used for building The bay between the two sections of Guadeloupe on the north is called Grand Cul-de-Sac Marin, that on the south Petit Cul-de-Sac Marin Basse-Terre (364 sq m) is 28 m long by 12 m to 15 m wide; Grande-Terre (255 sq m) is 22 m long from N to S , of irregular shape, with a long peninsula, Chateaux Point, stretching from the south-eastern extremity Basse-Terre has several streams, which flood suddenly in the rainy season, but Grande-Terre has very few springs, and depends on ponds and cisterns

Basse-Terre has old eruptive rocks covered by recent great volcanic cones, together with deposits derived from denudation of the older rocks Grande-Terre has nearly horizontal limestones conformable upon a series of fine tuffs and ashes, the whole belonging probably to the Eocene and Oligocene Occasional late Pliocene marl and limestone rest unconformably upon these older beds, and near the coast there are raised modern coral reefs

The mean annual temperature is 78° F, and the minimum 61° F, and the maximum 101° F From July to November heavy rains fall, the annual average on the coast being 86 in , while in the interior it is much greater Guadeloupe is subject to violent storms In 1825 a hurricane destroyed the town of Basse-Terre, and Grand Bourg in Marie Galante suffered similarly in 1865 The soil is rich and fruitful, 30% is cultivated and half of this is planted with sugar. The other crops include cereals, cocoa, cotton, manioc, yams and rubber, tobacco, vanilla, coffee and bananas are grown, but in smaller quantities St Anne, Pointe-à-Pitre and Le Moule and Basse-Terre have sugar *usines* The forests of the island of Basse-Terre are valuable but, being difficult of access, are not worked Salt and sulphur are the only minerals extracted, and there are factories for rum, liqueurs, chocolate, besides fruit-canning works and tanneries Exports (1925) 154,871,706 francs, imports 132,566,419 fr ; the commerce is chiefly with France

Guadeloupe has a few white officials and planters, a few East Indian immigrants from the French possessions in India, and the rest negroes and mulattoes. These mulattoes are famous for their grace and beauty of both form and feature Women greatly outnumber men, and illegitimate births are very numerous Pop (1921) 197,105.

The governor is assisted by a privy council, à director of the interior, a procurator-general and a paymaster, and an elected legislative council of 30 members. The colony, a department of France, is represented in the French parliament by a senator and two deputies Elections show the mulatto gaining power

The seat of government, of the Apostolic administration and of the court of appeal is at Basse-Terre (8,313), on the south-west of that island, a picturesque, healthy town on an open roadstead Pointe-à-Pitre (27,679), the largest town, lies in Grande-Terre near the mouth of the Rivière Salée Its excellent harbour has made it the chief port and commercial capital of the colony Le Moule (15,279) on the east coast of Grande-Terre has a good export trade in sugar, despite its poor harbour Of the other towns, St. Anne (10,033), Morne à l'Eau (8,742), Petit Canal (7,000), St François (5,670), Petit Bourg (5,650) and Trois Rivières (5,372), are the most important

Round Guadeloupe are grouped La Desirade, 6 m E , a narrow rugged island 10 sq m in area, Marie Galante, 16 m S E ; Les Saintes, a group of seven small islands, 7 m S , one of the strategic points of the Antilles, with a magnificent naval harbour, St Martin, 142 m. N N W , and St Bartholomew, 130 m N N W

History.—Guadeloupe was discovered by Columbus in 1493, who named it from the monastery of S Maria de Guadalupe at Estremadura in Spain In 1635 l'Olive and Duplessis took possession in the name of the French Company of the Islands of America, and l'Olive exterminated the Caribs with great cruelty Four chartered companies were ruined in their attempts to colonize the island, and in 1674 it passed to the French crown and long remained a dependency of Martinique After failures in 1666, 1691 and 1703, the British captured the island in 1759, and held it for four years Guadeloupe was finally separated from Martinique in 1775, but it remained under the governor of the French Windward Islands In 1782 Rodney defeated the French near the island, and the British again took it in April 1794, but in the following summer they were driven out by Victor Hugues with the assistance of slaves freed for the purpose In 1802 Bonaparte, then first consul, sent an expedition to the island in order to re-establish slavery, but, after a heroic defence, many of the negroes preferred suicide to submission In 1810, the British once more occupied the island, but, in spite of its cession to Sweden by the treaty of 1813 and a French invasion in 1814, they did not withdraw till 1816 Between 1816 and 1825 the code of laws peculiar to the island was introduced Municipal institutions were established in 1837, and slavery was finally abolished in 1848 Guadeloupe, with much of the West Indies and Florida, was devastated by a tropical hurricane in the middle of September, 1928 Plantations were wrecked and buildings destroyed in the towns The French government recorded 660 deaths in the island

GUADET, MARGUERITE ELIE (1758–1794), French Revolutionist, was born at St Emilion near Bordeaux on July 20, 1758, and became a lawyer He was elected to the Legislative Assembly, and was largely instrumental in forcing the king to accept the Girondist ministry of March 15, 1792 As president of the Assembly, he vigorously opposed the insurrectionary Commune of Paris on Aug 10 As deputy to the Convention (Sept) he voted for an appeal to the people at the trial of Louis XVI , and for the death sentence, but with a respite pending appeal In March 1793 during the war in La Vendée he refused to co-operate with Danton, whom he held responsible for the September massacres He was involved in the fall of the Girondists, and guillotined on June 17, 1794

See J Guadet, *Les Girondins* (1889) , and F A Aulard, *Les Orateurs de la législative et de la convention* (2nd ed , 1906)

GUADIANA (anc *Anas*, Moorish *Wadi Ana*), a river of Spain and Portugal The Guadiana was long believed to rise in the lowland known as the Campo de Montiel, where a chain of small lakes, the Lagunas de Ruidera, are linked together by the Guadiana Alto or Upper Guadiana This stream flows north-westward from the last lake and vanishes underground within 3 m of the river Zancara or Giguela About 22 m S W of the point of disappearance, the Guadiana Alto was believed to re-emerge in the form of several large springs, which form numerous lakes near the Zancara and are known as the "eyes of the Guadiana"

(*los ojos de Guadiana*). The stream which connects them with the Zancara is called the Guadiana Bajo or Lower Guadiana. It is now known that the Guadiana Alto has no such course, but flows underground to the Zancara itself, which is the true "Upper Guadiana." The Zancara rises near the source of the Júcar, in the east of the tableland of La Mancha; thence it flows westward, assuming the name of Guadiana near Ciudad Real, and reaching the Portuguese frontier 6 m. S.W. of Badajoz. In piercing the Sierra Morena it forms a series of foaming rapids, and begins to be navigable only at Mertola, 42 m. from its mouth. From the neighbourhood of Badajoz it forms the boundary between Spain and Portugal as far as a point near Monsaraz, where it passes into Portuguese territory, with a southerly direction. At Pomarão it again becomes a frontier stream and forms a broad estuary 25 m. long. It enters the Gulf of Cadiz between the Portuguese town of Villa Real de Santo Antonio and the Spanish Ayamonte, after a total course of 510 m. Its mouth is divided by sandbanks into many channels. The Guadiana drains an area of 31,940 square miles. Its principal tributaries are the Zujar, Jabalón, Matachel and Ardila from the left; the Bullaque, Ruecas, Botoa, Degebe and Cobres from the right.

GUADIX, a city of southern Spain, in the province of Granada, on the left bank of the river Guadix, a subtributary of the Guadiana Menor, and on the Madrid-Valdepeñas-Almería railway. Pop. (1921), 16,141. Guadix occupies part of an elevated plateau among the northern foothills of the Sierra Nevada. Guadix el Viejo, 5 m. N.W., was the Roman *Acci*, and, according to tradition, the seat of the first Iberian bishopric, in the 2nd century. After 711 it rose to some importance as a Moorish fortress and trading station, and was renamed *Wad Ash*, "Water of Life." It was surrendered without a siege to the Spaniards, under Ferdinand and Isabella, in 1489. Guadix is surrounded by ancient walls, and was formerly dominated by a Moorish castle. It is an episcopal see of great antiquity. The cathedral was built in the 18th century on the site of a mosque. The city was once famous for its cutlery. It has some trade in wool, cotton, flax, corn and liqueurs. The warm mineral springs of Graena, much frequented during the summer, are 6 m. W.

GUADUAS, a town of the department of Cundinamarca, Colombia, 53 m. N.W. of Bogotá on the old road between that city and the Magdalena river port of Honda. Pop. (1918) 12,878, chiefly Indians or of mixed blood. It stands in a narrow and picturesque valley formed by spurs of the Eastern Cordillera, and on a small stream bearing the same name, which is that of the South American bamboo (*guaduas*), found in great abundance along its banks. Sugar-cane and coffee are cultivated in the vicinity, and fruits of various kinds are produced in great abundance. The elevation of the town is 3,353 ft. above the sea, and it has a remarkably uniform temperature throughout the whole year. Guaduas has a pretty church facing upon its *plaza*, and an old monastery now used for secular purposes. Guaduas was founded in 1614.

GUAHIBAN, an independent linguistic stock of South American Indians, so called from the Guahibas, one of its most important tribes. The tribes composing this stock occupy or once occupied a large area in eastern Colombia, which extended from the Orinoco river westward between the Meta and Vichada rivers to the eastern slopes of the Andes. Some outlying tribes, however, such as the Churoyas, Cofanes and Macas, were much farther south, extending as far as the upper Caqueta and Aguarico rivers. The Guahibas (Guaybas) and the closely affiliated Chiricoas are described as a purely nomadic hunting and fishing folk, going almost naked. They are wandering traders, thievish, and adepts at cheating, and were likened by the early writers to gipsies. No adequate modern studies of these tribes appear to have been made.

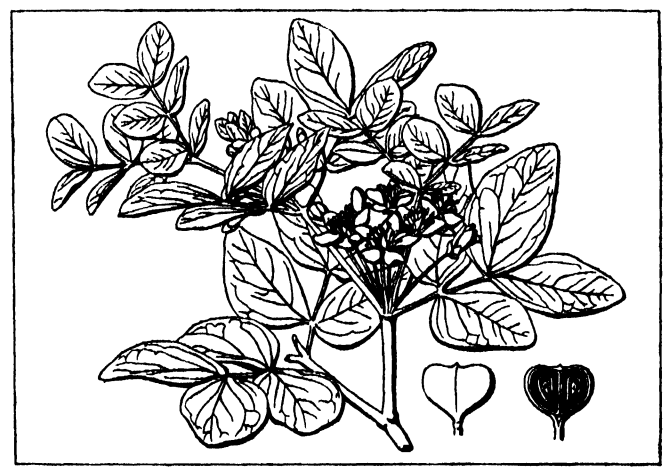
See J. Rivero, *Historia de las Misiones de los Llanos de Casanare*, etc. (1736, new ed. Bogota, 1883); J. Chaffanjon, *L'Orenoque et le Caura* (Paris, 1889).

GUAIACOL, $CH_3O\,C_6H_4\,OH$, the monomethyl ether of catechol (*q.v.*) and a constituent of beechwood-tar.

GUAIACUM (gwī ą-kŭm), a genus of trees of the order *Zygophyllaceae*. The guaiacum or lignum vitae tree *G. officinale*, is a native of the West Indies and the north coast of South America, where it attains a height of 20ft. to 30ft. Its branches are numerous, flexuous and knotted; the leaves opposite and pinnate, with caducous stipules, and entire, glabrous, obovate or oval leaflets, arranged in two or, more rarely, three pairs; the flowers are in axillary clusters (cymes), and have five oval pubescent sepals, five distinct pale-blue petals three times the length of the sepals, 10 stamens, and a two-celled superior ovary. The fruit is about ¾in. long, with a leathery pericarp, and contains in each of its two cells a single seed (*see* fig. 1). *G. sanctum* grows in the Bahamas and Cuba, and at Key West in Florida. It is distinguished from *G. officinale* by its smaller and narrow leaflets, which are in four to five pairs, by its shorter and glabrous sepals, and five-celled and five-winged fruit. *G. arboreum*, the guaiacum tree of Colombia, is found in the valley of the Magdalena up to altitudes 800 metres (2,625ft.) above sea-level, and reaches considerable dimensions. Its wood is of a yellow colour merging into green, and has an almost powdery fracture; the flowers are yellow and conspicuous; and the fruit is dry and four-winged.

The lignum vitae of commerce, so named on account of its high repute as a medicinal agent in past times, is procured from *G. officinale*, and in smaller amount from *G. sanctum*. It is exported in large logs or blocks, generally divested of bark, and presents in transverse section very slightly marked concentric rings of growth, and scarcely any traces of pith; with the aid of a magnifying glass the medullary rays are seen to be equidistant and very numerous. The outer wood is pale yellow and devoid of resin, the inner which is by far the larger proportion, is dark greenish-brown, contains in its pores 26% of resin, and has a specific gravity of 1.333, and therefore sinks in water. Owing to the diagonal and oblique arrangement of the successive layers of its fibres, the wood cannot be split; and on account of its hardness, density and durability it is much valued for the manufacture of ships' pulleys, rulers, skittle-balls, mallets etc.

Chips or turnings of the heartwood of *G. officinale* (*lignum guaiaci*) are employed in the preparation of the *liquor sarsae compositus concentratus* of British pharmacy. They may be recognized by being either yellow or greenish-brown in colour, and by turning bluish-green when treated with nitric acid, or when heated with corrosive sublimate, and green with solution of chloride of lime. Guaiacum resin is obtained from the wood as a natural exudation; by heating billets about 3ft. in length, bored to permit of the outflow of the resin; or by boiling chips and raspings in water to which salt has been added to raise the temperature of ebullition. It occurs in rounded or oval tears, or in large brownish or greenish-brown masses, translucent at the edges; fuses at 85°C., is brittle, and has a vitreous fracture, and a slightly balsamic odour, increased by pulverization and by heat, and is at first tasteless when chewed, but produces subsequently a sense of heat in the throat. It is readily soluble in alcohol,



FLOWERING BRANCH OF THE LIGNUM VITAE TREE (GUAIACUM OFFICINALE). SMALL FIGURES SHOW AN ENTIRE FRUIT AND A LONGITUDINAL SECTION

ether, chloroform, creosote, oil of cloves and solutions of caustic alkalies; with glycerine it gives a clear solution, and with nitrous ether a bluish-green gelatinous mass. It is blued by various oxidizing agents, *e.g.* ozone. The chief constituents are three distinct resins *guaiaconic acid*, $C_{19}H_{20}O_6$ (70%), *guaiac acid*, which is closely allied to benzoic acid, and *guaiaretic acid*. Like all resins, these are insoluble in water, soluble in alkalies, but precipitated on neutralization of the alkaline solution.

Guaiacum wood was first introduced into Europe by the Spaniards in 1508 but the first edition of the *London Pharmacopoeia* in which the resin is mentioned is that of 1677 Guaiacum resin is given medicinally in doses of 5–15 grains Its important preparations in the British Pharmacopoeia are the *mistura guaiaci* (dose ½–1oz), the ammoniated tincture of guaiacum (dose ½–1 drachm), in which the resin is dissolved by means of ammonia, and the trochiscus or lozenge, containing three grains of the resin This lozenge is undoubtedly of value when given early in cases of sore throat, especially of rheumatic origin. Guaiacum resin differs pharmacologically from other resins in being less irritant, so that it is absorbed from the bowel and exerts remote stimulant actions, notably upon the skin and kidneys. The drug is useful both in acute and chronic sore throat, in chronic constipation and chronic gout and other forms of chronic arthritis

The tincture of guaiacum is universally used as a test for the presence of blood, or rather of haemoglobin, in urine or other secretions A *single drop* of the freshly-prepared tincture should be added to, say, an inch of urine in a test-tube The resin is at once precipitated, yielding a milky fluid If "ozonic ether" (an ethereal solution of hydrogen peroxide) be now poured gently into the test-tube, a deep blue coloration is produced along the line of contact if haemoglobin be present The reaction is due to the oxidation of the resin by the peroxide of hydrogen—such oxidation occurring only if haemoglobin be present to act as an oxygen-carrier

GUALDO TADINO, a town and episcopal see of Umbria, Italy (anc. *Tadinum,* on the Via Flaminia, 1 m to the W), 1,755 ft above sea-level, province of Perugia, 22 m N of Foligno by rail Pop (1921), town, 3,616, commune, 11,570 The cathedral has a good rose-window; and the picture gallery contains 15th century paintings by Umbrian artists The town is still surrounded by walls Art pottery is made here In the plain below, near the ancient Tadinum, Narses defeated and slew Totila in 552

GUALEGUAY, a town on the river of the same name in Argentina, 32 m above the confluence of the Gualeguay river with the Ibucuy branch of the Paraná, and about 120 m. N.N.W of Buenos Aires The port of Gualeguay is Puerto Ruíz, 5 m below, with which Gualeguay is connected by tramway It is also on a branch of the Entre Rios railway It is a stock-raising centre, its establishment dating from 1783 Pop (1925) 16,485. The town has a meat-chilling plant, tanneries, shoe factories, soap factories and flour mills Wheat, maize and flax-seed are produced in the tributary region Gualeguay is to be distinguished from Gualeguaychu, which is some 50 m north-east

GUALEGUAYCHU, a town and river port of the Province of Entre Rios, Argentina, on the river of the same name, 11 m above its confluence with the Uruguay and about 130 m N W of Buenos Aires Pop (1925) 21,622, the tributary territory having 55,627 inhabitants. It is the centre of an important cattle-raising country, and meat is chilled and beef extract manufactured in the town There are also tanneries and shoe factories. Gualeguaychu is on a branch of the Entre Rios railway, and is also served by river steamers

GUALO, CARDINAL (*fl* 1216), was sent to England by Pope Innocent III in 1216. He supported John with all the weight of papal authority After John's death he crowned the infant Henry III., and as representing the pope, Henry's suzerain, he claimed the regency and divided the chief power with William Marshal, earl of Pembroke. He proclaimed a crusade against the French, and, after the peace of Lambeth, forced Louis to make a public profession of penitence (1217). He ruled the church with an absolute hand until he made his departure from England in 1218.

GUAM, the largest and most populous of the Marianas islands, in the North Pacific, in 13° 26′ N. lat. and 144° 39′ E. long , about 1,823 m E by S. of Hong Kong, about 1,506 m. E. of Manila, and 5,053 m. W by S of San Francisco Guam extends about 30 m from north to south, has an average width of about 7 m , and has a land area of 210 sq miles. The entire island is governed as a naval station of the United States.

Physical Features.—The northern portion is a plateau from 200 to 500 ft. above the sea, lowest in the interior and highest along the east and west coasts, where it terminates abruptly in bluffs and headlands, Mt Santa Rosa, toward the northern extremity, has an elevation of 840 feet The southern part of the island is high and mountainous A chain of hills ranging in altitude from 700 to 1,300 ft begins near the bay of Pago and crosses to the west coast near Agana, the ridge follows near that coast to the extreme southern part of the island The highest peak is Lamlam, which attains an elevation of 1,334 feet. Between the foot of the steep western slope of these hills and the sea is a belt of rolling lowland, and to the east the surface is broken by the valleys of five rivers with a number of tributaries, has a general slope toward the sea, and terminates in a coastline of bluffs Apra (formerly San Luis d'Apra), on the middle west coast, is the only good harbour; it is about 3½ m across, has a depth of 4 to 27 fathoms and is divided into an inner and outer harbour by a peninsula and an island It serves as a naval station and as a port of transit between America and the Far East Piti, the landing place of Apra harbour and the port of entry, is connected with the deep-water anchorage by a shallow channel. Some of the highest points of the island are nearly bare of vegetation, and the more elevated plateau surface is covered with sword grass, but in the valleys and on the lower portions of the plateau there is valuable timber The lowlands, especially on the west coast, have a rich soil of decomposed limestone The climate is agreeable and healthy The mean annual temperature is 81° F, and is nearly constant throughout the year The yearly rainfall is about 81 in From December to June the north-east trade winds prevail and the rainfall is relatively light, during the other six months the monsoon blows and produces the rainy season. Destructive typhoons and earthquakes sometimes visit Guam

Population.—The population of Guam, exclusive of the U.S naval station personnel, was 11,806 in 1910 and 13,275 in 1920. By June 30, 1924, the native population had increased to 15,160, according to the census taken by the naval governor On the same date there were also living on the island 550 non-natives, besides the personnel of the naval establishment amounting to 814 Agana (*q v*), the chief city and capital, had with its suburbs, in 1920, a population of 7,423 The natives are of the Chamorro (Indonesian) stock, strongly intermixed with Philippine Tagals and Spaniards, their speech is a dialect of Malay, corrupted by Tagal and Spanish The aboriginal native was of a very dark mahogany or chocolate colour, but few if any full-blood Chamorros remain

Government.—The administration is directly under the navy department, and the governor, who is appointed by the secretary of the navy, is a naval officer with the rank of captain He is also commandant of the naval station The island is divided into six administrative districts, each with a commissioner as its executive head There are a court of appeals, a court of first instance and police courts The governor has full power and authority to make laws for the Government of the island, from which there is no appeal He is assisted by a native congress which has only advisory power

Finances and Education.—The revenues for the fiscal year 1923–24 amounted to $137,805, and expenditures to $152,781 The sources of revenue included land taxes, licences, court fees and fines, customs and revenue collections and productive industries About 40% of the public receipts are expended on education The only banking institution is the bank of Guam which was established by the Naval Government in 1915, for general banking business and as a depository of the Naval Government of Guam

Education has made remarkable progress since the island came under American administration. The schools are operated on a

ten month basis, and attendance is compulsory between the ages of 7 and 12. There were, in 1924, 16 primary schools, one intermediate school, one high-school and one school for Americans, besides two private schools. The total enrolment was 2,833, of whom 2,676 were in public schools. Fourteen of the 90 teachers were Americans. All teaching is in English: industrial courses and athletics are a recognized part of the curriculum

Industry and Trade.—Agriculture is the chief occupation, but only a small part of Guam is under cultivation, and most of this lies along the south-west coast The U S agricultural experiment station in Guam is making efforts to develop the agricultural resources, so that the island may be more nearly self-supporting Copra is the chief crop and about the only export, the normal crop being about 800 tons. Vegetables, maize, rice, mangoes, breadfruit and a few other products are grown sufficient for local consumption. The island is capable of producing excellent tobacco and coffee; cacao, pineapples and tabasco peppers do well. Fish are plentiful in the waters surrounding the island, but the fishing industry has never been developed to its full capacity.

The balance of trade is heavily against Guam. Imports and exports for the year ending June 30, 1924, were $853,383 and $113,754, respectively. This condition is explained in part by the fact that the vast majority of the imports are for the naval and marine forces, a non-producing part of the population In 1924 Guam exported 476,844 lb of copra to Japan and 2,110,010 lb of copra and 54,414 lb. of coconut oil to the United States The commercial needs of Guam are served by the navy and army transports, which stop on their westerly trips to the Philippines, by the station ship, which makes frequent trips to Manila; by vessels of the Dollar Steamship company, and by vessels of a Japanese firm Transportation on the island is confined to highways built by the Naval Government

History.—Guam was discovered by Magellan in 1521 and because of the thievery of the natives he named the group, to which it belongs, the Ladrone islands During the century and a half which elapsed before the coming of the first Spanish missionaries in 1668, the island was frequently visited by vessels seeking a water-supply but no attempt was made at conquest Opposition to Christian practices led, in 1670, to a struggle between Spain and the natives which was not finally concluded until 1696 after most of the native men had been killed Guam continued under Spanish rule from the time of its conquest until captured by the U S cruiser "Charleston" in June 1898. By the Treaty of Paris, Dec 10, 1898, it became a possession of the United States and Congress placed the government of the island under the department of the navy; in the spring of 1899 the first naval governor was appointed

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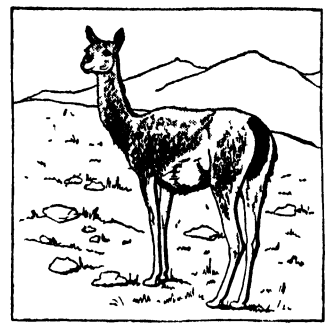
GUAN, the name applied to members of the *Penelopinae,* closely allied to the *Cracinae* or curassows They comprise a number of genera of which *Penelope* and *Ortalis* are the largest Nearly all have a bare throat, from which, in many forms, hangs a wattle Save for a few which extend to Central and North America and the Antilles, the guans are confined to the South American continent. Like curassows, guans are in great measure of arboreal habit They readily become tame, but the cases in which they have been induced to breed in confinement are few

GUANABACOA (an Indian name meaning "site of the waters"), a town of Cuba, in Havana province, about 6 m E of Havana Pop (1919) 16,352 Guanabacoa is served by railway to Havana, with which it is connected by the Regla ferry across the bay; a good motor road connects it with the capital It is picturesquely situated amid woods, on high hills which furnish a fine view There are medicinal springs in the town, and deposits of liquid bitumen in the neighbouring hills The town is essentially a residential suburb of the capital, and has some rather pretty streets and squares and some old and interesting churches (including Nuestra Señora de la Asuncion, 1714–21). Just outside the city is the church of Potosí with a famous "wonder-working" shrine and image. An Indian pueblo of the same name existed here before 1555, and a church was established in 1576. Already at the end of the 17th century Guanabacoa was the fashionable summer residence of Havana. It enjoyed its greatest popularity in this respect from the end of the 18th to the middle of the 19th century. The Key West cable now lands at Little Morro, the port of Guanabacoa, which was taken by the English in 1762.

GUANACO or **HUANACA,** the larger of the two wild representatives in South America of the camel tribe, the other being the vicuña. The guanaco (*Lama huanacus*), stands nearly 4ft. at the shoulder, with gracefully curved neck and long slender legs, the hind pair bearing two naked patches. The hair is long and soft, of a fawn colour above and white beneath. Guanaco are found throughout the southern half of South America, from Peru to Cape Horn. They live in herds, usually of from six to thirty, and are exceedingly timid and difficult of approach. Their cry is something between the belling of a deer and the neigh of a horse The chief enemies of the guanaco are the Patagonian Indians and the puma, as it forms the principal food of both Its flesh is palatable although wanting in fat, while its skin forms the chief clothing material of the Patagonians Guanaco are easily domesticated They take readily to the water They regularly deposit their droppings on the same spot—a habit appreciated by the Peruvian Indians, who use these deposits for fuel Guanaco also have favourite localities in which to die, as appears from the great heaps of their bones found in particular spots



BY COURTESY OF THE N Y ZOOLOGICAL SOCIETY

GUANACO, A SOUTH AMERICAN REPRESENTATIVE OF THE CAMEL TRIBE

GUANAJAY, a town of western Cuba, in Pinar del Rio province, about 36m (by rail) S W of Havana Pop (1919 census) 6,545. Guanajay is served by the west branch of the United railways of Havana, of which it is the west terminus The town lies among hills, has an excellent climate, and in colonial times was an acclimatization station for troops, it now has considerable repute as a health resort

GUANAJUATO or **SANTA FE DE GUANAJUATO,** a city of Mexico and capital of the State of the same name 155m. (direct) N W of the Federal capital Pop (1910) 35,682; (1921) 19,408 The city is built in the Cañada de Marfil at the junction of three ravines about 6,500ft above the sea, and its narrow, tortuous streets rise steeply as they follow the ravines upward to the mining villages clustered about the opening of the mines in the hillsides Enclosing the city are the steep, barren mountain sides honeycombed with mines The climate is semi-tropical and is considered healthful The noteworthy public buildings and institutions are an interesting old Jesuit church with arches of pink stone and delicate carving, eight monasteries, the Government palace, a mint dating from 1812, a national college, the fine Teatro Juárez, and the Panteón, or public cemetery, with catacombs below. The Alhóndiga de Granaditas, originally a public granary, was used as a fort during the war of independence, and is celebrated as the scene of the first battle (1810) in that long struggle Mining is the principal interest and occupation of the people and the population fluctuates with the activity of the mines The silver mines of the vicinity were long considered the richest in Mexico, the celebrated Veta Madre (mother lode) even being described as the richest in the world The railway outlet for the city consists of a short branch of the Mexican Central, which joins the trunk line at Silao Guanajuato was founded in 1554 It attained the dignity of a city in 1741

GUANAJUATO or **GUANAXUATO,** an inland State of Mexico; area, 11,808 sq. miles. It is one of the most densely populated States of the republic, pop. (1910) 1,081,651, (1921)

860,683. The State lies wholly within the limits of the great central plateau of Mexico, and has an average elevation of about 6,000 feet. The surface of its northern half is broken by the Sierra Gorda and that of the centre by the Sierra de Guanajuato, but its southern half is covered by fertile plains, called the *"Bajío,"* largely devoted to agriculture. It is drained by the Río Grande de Lerma and its tributaries, which in places flow through deeply eroded gorges. The climate is semi-tropical and healthy, and the rainfall, 20 to 30in., and coming in the summer, is sufficient to ensure good results in agriculture and stock-raising. Indian corn, beans, barley and wheat are grown. The principal industry of the State is mining, the mineral wealth being enormous. Among its mineral products are silver, gold, tin, lead, mercury, copper and opals. Silver has been extracted since the early days of the Spanish conquest, over $800,000,000 having been taken from the mines during the subsequent three and a half centuries. Some of the more productive of these mines, or groups of mines, are the Veta Madre (mother lode), the San Bernabé lode, and the Rayas mines of Guanajuato, and the La Valenciana mine, the output of which is said to have been $226,000,000 between 1766 and 1826. The industrial establishments include flour mills, tanneries and leather factories, cotton and woollen mills, distilleries, foundries and potteries. The Mexican Central and the Mexican National railway lines cross the State from north to south, and the former operates a short branch from Silao to the State capital and another westward from Irapuato to Guadalajara The capital is Guanajuato, and other important cities and towns are León or León de las Aldamas (pop. [1921] 53,639); Celaya (pop. [1910] 23,062; [1921] 24,035), an important railway junction 22m. by rail W. from Querétaro, and known for its manufactures of broadcloth, saddlery, soap and sweetmeats; Irapuato (pop. [1910] 21,469; [1921] 20,657), a railway junction and commercial centre, 21m S by W of Guanajuato; Silao (pop. [1910] 14,059, [1921] 12,943), a railway junction and manufacturing town (woollens and cottons), 14m S W. of Guanajuato; Salamanca (pop [1910] 13,497; [1921] 9,922) on the Mexican Central railway and Lerma river, 25m S by E of Guanajuato, with manufactures of cottons and porcelain, and Acámbaro (pop [1910] 11,080; [1921] 15,317), a prosperous town of the plain, 76m. S.S.E. of Guanajuato.

GUANCHES, the aboriginal inhabitants of the Canary islands Strictly the Guanches were the primitive inhabitants of Teneriffe, where they seem to have preserved racial purity to the time of the Spanish conquest, but the name came to be applied to the indigenous populations of all the islands. The Guanches, now extinct as a distinct people, were an offshoot of the Berbers of northern Africa They are of the Cro-Magnon type (Boule, *Fossil Man,* 1923. p 288). The Carthaginians under Hanno found the archipelago uninhabited, but saw ruins of great buildings This suggests that the Guanches were not the first inhabitants, and that this extreme westerly migration of Berbers took place between the time of which Pliny wrote and the conquest of northern Africa by the Arabs. Many of the Guanches fell in resisting the Spaniards, many were sold as slaves, and many conformed to the Roman Catholic faith and married Spaniards.

Such remains as there are of their language, a few expressions and the proper names of ancient chieftains still borne by certain families, connect it with the Berber dialects. In many of the islands signs are engraved on rocks In the ravines of Las Balos are some genuine Libyan inscriptions. The rock inscriptions are Numidic In two of the islands (Teneriffe and Gomera) the Guanche type has been retained with more purity than in the others No inscriptions have been found in these two islands, perhaps because the true Guanches did not know how to write In the other islands numerous Semitic traces are found, and in all of them are the rock-signs.

The political and social institutions of the Guanches varied In some islands hereditary autocracy prevailed; in others the government was elective. In Teneriffe all the land belonged to the chiefs who leased it to their subjects. In Grand Canary suicide was regarded as honourable, and on a chief inheriting, one of his subjects threw himself over a precipice In Lanzarote polyandry was practised; elsewhere monogamy. But everywhere the women were respected, an insult offered any woman by an armed man being a capital offence. The Guanches generally wore garments of goat-skins, and others of vegetable fibres, which have been found in the tombs of Grand Canary. Ornaments, necklaces of wood, bone and shells, worked in different designs, beads of baked earth, cylindrical and of all shapes, with smooth or polished surfaces, mostly black and red in colour, were chiefly in use. They painted their bodies; the *pintaderas,* baked clay objects like seals in shape, having been used solely for painting the body in various colours. They manufactured rough pottery, mostly without decorations, or ornamented by means of the finger-nail. The polished battle-ax was more used in Grand Canary, while stone and obsidian, roughly cut, were commoner in Teneriffe. They had, besides, the lance, the club, sometimes studded with pebbles, and the javelin, and they seem to have known the shield They lived in natural or artificial caves in the mountains In districts where cave-dwellings were impossible, they built small round houses and even practised rude fortification In Palma the old people were at their own wish left to die alone. After bidding their family farewell they were carried to the sepulchral cave, nothing but a bowl of milk being left them The Guanches embalmed their dead, many mummies have been found in an extreme state of desiccation, each weighing not more than 6 or 7 lb The process of embalming varied In Teneriffe and Grand Canary the corpse was simply wrapped up in goat and sheep skins, while in other islands a resinous substance was used to preserve the body, which was then placed in a cave difficult of access, or buried under a tumulus The work of embalming was reserved for a special class, women for female corpses, men for male. Bodies were often simply hidden in caves or buried

There was a general belief in a supreme being, called Acoran, in Grand Canary, Achaman in Teneriffe, Eraoranzan in Hierro, and Abora in Palma The women of Hierro worshipped a goddess called Moneiba According to tradition the male and female gods lived in mountains whence they descended to hear the prayers of the people. In other islands the natives venerated the sun, moon, earth and stars. A belief in an evil spirit was general The demon of Teneriffe was called Guayota and lived in the peak of Teyde, which was the hell called Echeyde. In times of drought the Guanches drove their flocks to consecrated grounds, where the lambs were separated from their mothers in the belief that their plaintive bleatings would melt the heart of the Great Spirit During the religious feasts all war and even personal quarrels were stayed

See "Harvard African Studies" vol vii (1925); E. A. Hooton, *Canary Islands.*

GUANIDINE, a colourless, deliquescent, crystalline solid readily soluble in water or alcohol, it occurs in both vegetable and animal kingdoms Guanidine, $HN\ C(NH_2)_2$, is found in the juice of sugar beet, in etiolated vetch seedlings and in the embryo of the chick It was first prepared by A. Strecker, who oxidized guanine with potassium chlorate and hydrochloric acid, and is also formed by oxidizing egg albumin or gelatin with a soluble permanganate. Many synthetic processes have been devised for the preparation of guanidine of which the best known is the heating of ammonium thiocyanate to 180–190° C; thiourea, formed as an intermediate product, changes into guanidine thiocyanate with elimination of hydrogen sulphide. E. A Werner and J Bell recommend the heating to 120° C of an intimate mixture of ammonium thiocyanate and dicyanodiamide (obtained commercially from calcium cyanamide). After heating for several hours, the melted mass is extracted with water, and the concentrated aqueous extracts give 90% yields of guanidine thiocyanate (1920) Guanidine has strongly alkaline properties: it absorbs carbon dioxide from the air and forms well-defined crystalline salts with mineral and organic acids. Its relationship with the more complex products of animal metabolism is shown by the fact that when its carbonate is condensed with methylglycine (sarcosine) it yields creatine and creatinine

Guanidine has played an important part in the development of the chemistry of nitrogen compounds Mixed with nitric and sul-

phuric acids it furnishes nitroguanidine, $HN:C(NH_2)\cdot NH\cdot NO_2$ (colourless needles decomposing at 230°), which on reduction with zinc dust and acetic acid gives rise to aminoguanidine, $HN:C(NH_2)\cdot NH\cdot NH_2$. This amino compound undergoes hydrolysis with dilute acids or alkalis in two stages, yielding first semicarbazide, $O:C(NH_2)\cdot NH\cdot NH_2$ (colourless prisms, m.p. 96° C), a valuable reagent for aldehydes and ketones, and secondly carbon dioxide, ammonia and hydrazine. The final stage of hydrolysis is of special interest as being one of the earlier methods adopted for the preparation of hydrazine, $NH_2\cdot NH_2$ (J. Thiele, 1892). By the action of nitrous acid on aminoguanidine nitrate, diazoguanidine nitrate is produced, $NH:C(NH_2)\cdot NH\cdot N_2\cdot NO_3$. This diazo-compound is decomposed by caustic alkalis into cyanamide and an alkali salt of hydrazoic acid, N_3H, another of the nitrogen hydrides

See "Guanidine," Thorpe, *Dictionary of Applied Chemistry* (1922); E. Abderhalden, *Biochemisches Handlexikon*, vol. iv., 783; vol. ix., 187 (1911 and 1915).

GUANO (a Spanish word from the Peruvian *huanu*, dung), the excrement of birds, found as large deposits on certain islands off the coast of Peru, and on others situated in the southern ocean and off the west coast of Africa The large proportions of phosphorus in the form of phosphates and of nitrogen as ammonium oxalate and urate renders it a valuable fertilizer. Bats' guano, composed of the excrement of bats, is found in certain caves in New Zealand and elsewhere; it is similar in composition to Peruvian guano.

GUANTA, a port on the Caribbean coast of the State of Anzoátegui, Venezuela, 12 m N E of Barcelona, with which it is connected by rail. It dates from the completion of the railway to the coal mines of Naricual and Capiricual nearly 12 m beyond Barcelona, and was created for the shipment of coal. The harbour is horseshoe-shaped, with its entrance, 1,998 ft. wide, protected by an island less than 1 m. off the shore The entrance is easy and safe; the harbour affords secure anchorage for large vessels, with deep water along the new cement wharf. Pop. (1924 census), 2,320 Guanta has become the best port on this part of the coast, and the trade of Barcelona and that of a large inland district have been transferred to it. A prominent feature in its trade is the shipment of live cattle Among its other exports are sugar, coffee, cacao, tobacco and fruit.

GUANTÁNAMO, a town and United States naval base, 40 m. east of Santiago near the eastern end of the south coast of Cuba It possesses a land-locked harbour of two basins, about 4 m. wide and 10 m. long from north to south A narrow entrance gives protection from storms and safety from surprise attacks by sea. The port is actually the town of Caimanera, on the harbour, and Guantánamo is 20 m. north, on the Guantánamo and Western railway. Pop (1925) 20,000, and the rich tributary valley of Guantánamo brings this up to 60,000. Guantánamo is 572 m. from Havana, with which it is connected by the United railroads and the Cuba railway, and also by the Central highway. Guantánamo bay is held by the United States as a naval base under treaty The railway and highway connection to Havana and the route through the Straits of Florida to the mainland constitute an important factor in the strategy of the Caribbean sea (*q v.*). The region around Guantánamo is a rich sugar and banana country.

Guantánamo bay was named Cumberland bay in 1741 when Admiral Edward Vernon and Gen Thomas Wentworth landed an English force to attack Santiago After their retirement, fortifications were begun, and the bay has since been recognized as of great strategic importance. At the end of the 18th century French refugees from Haiti landed, and in 1822 founded the town of Guantánamo These French families still dominate the life of the town Sugar and the American naval base have, since the Spanish-American War, changed the atmosphere and character of the town and region, to one of activity and industry, as contrasted with the old French-Creole atmosphere which in earlier days brought the fashionable residents of Havana to Guantánamo for the summer season

GUARANA, the plant *Paullinia Cupana* (or *P. sorbilis*) of the natural order *Sapindaceae*, indigenous to the north and west of Brazil. It has a smooth erect stem; large pinnate alternate leaves with five oblong-oval leaflets; narrow panicles of short-stalked flowers, and ovoid fruit about as large as a grape, and containing usually one seed shaped like a minute horse-chestnut. Guarana, guarana bread, or Brazilian cocoa, is prepared from the seeds as follows. In October and November, when ripe, the seeds are sun-dried, to admit of the ready removal by hand of the white aril; ground in a stone mortar or deep dish or hard sandstone; the powder, moistened with water, is made into a paste with a certain proportion of whole or broken seeds, and worked up usually into rolls 5–8in. in length, and 12–16 oz. in weight. After drying by heat, the guarana is packed between broad leaves in sacks or baskets. Thus prepared, it is of extreme hardness, has a brown hue, a bitter astringent taste, and an odour faintly resembling that of roasted coffee. An inferior kind is manufactured by admixture of cocoa or cassava. Rasped or grated into sugar and water, guarana forms a popular beverage in South America.

The properties of guarana as a nervous stimulant and restorative are due to the presence of caffeine or theine In addition, guarana yields the glucoside saponin, with tannin, starch, gum, three volatile oils and an acrid green fixed oil.

GUARANIS, a group of South American Indian tribes, forming an important subdivision of the Tupian (*q v*) linguistic stock. At the time of the first arrival of Europeans, the Guarani tribes were spread over the region east of the Paraguay river in what is now Paraguay and the adjacent Argentine states of Corrientes and Missiones, and extended eastwards along the upper Uruguay river some distance into the Brazilian states of Santa Catarina and Rio Grande do Sul. In the early portion of the sixteenth century, in part at least owing to Spanish attacks, a considerable body left their homes and migrated westward to Bolivia, where, as the Chiriguanos and Guarayos, they settled in the Andean foothills and edge of the Chaco, expelling the older Chane and other Arawakan tribes.

The Guaranis, originally a very numerous people, were sedentary agriculturists, living in large palisaded villages of wood and thatch houses, and presented a strong contrast to the nomad hunting tribes to the west and south The Guaranis became widely known as a result of the activities of the Jesuit missions —the Doctrinas de Guaranies—founded among them in the early years of the seventeenth century. The Missions comprised in all some thirty settlements, where the Jesuits, in spite of attacks by slave-raiders from the Portuguese territories (who in 1628–30 alone carried off 60,000 Indians) built up a community of great interest, which lasted until the expulsion of the Order in 1768. In their primitive state the Guaranis often went entirely naked, and wore as their most characteristic ornament a long pendant labret in the lower lip. Although essentially agricultural, raising corn, manioc and sweet potatoes, they had a bad reputation for killing and eating prisoners taken in war They appear to have had trade with the border regions of the Inca empire, whence they secured small quantities of gold ornaments and metal objects, which through them reached the Atlantic coast, where a few examples were found in the possession of the people by the earliest European explorers.

See P. de Charlevoix, *The History of Paraguay* (1769); P. Hernández, *Organización Social de las Doctrinas Guaranies de la Compañia de Jesús* (Barcelona, 1913), M. S. Bertoni, *La Civilizacion Guarani* (Puerto Bertoni, 1922).

GUARANTEE. In law, a guarantee is a contract to answer for the payment of some debt, or the performance of some duty, in the event of the failure of another person who is primarily liable for such payment or performance. In order that there may be a contract of guarantee there must be a primary liability, present or future, of a principal debtor, and a promise made for valuable consideration by a third party (called the "surety" or "guarantor") to the creditor to discharge that liability if the principal debtor does not. The promise of the surety must be such that liability only arises in the event of the failure of the principal debtor to meet his obligations.

A contract of guarantee must be distinguished from a contract of indemnity. If A says to B, who is about to sell goods to C,

"Let C have the goods; if he does not pay you, I will," this is an offer of a guarantee on the part of A. But if A says to B, "Let C have the goods; I will see you paid," A's promise to pay is an original liability to indemnify B against any loss which he may incur in letting C have the goods, and not a promise to answer for C's debt (*Birkmyr* v. *Darnell*, 1704, I Sm. L.C. 12th ed. p. 335) So "if a man says to another, 'If you will at my request put your name to a bill of exchange, I will save you harmless', that is a contract of indemnity. It is not a responsibility for the debt of another. It amounts to a contract by one that, if the other will put himself in a certain situation, the first will indemnify him against the consequences" (*per* Pollock, C B in *Batson* v. *King*, 1859, 4 H. & N at p 740). The distinction is important, for a contract of guarantee is not enforceable unless it is evidenced by some note or memorandum in writing, whereas no written note or memorandum of the agreement is required in the case of a contract of indemnity.

The common law requisites of a contract of guarantee in no way differ from those essential to the formation of any other contract That is to say, they comprise the mutual consent of the parties, competency to contract, and, unless the guarantee be under seal, valuable consideration. The consideration may consist of some advantage given to, or conferred on, the principal debtor by the creditor at the surety's request, *e.g*, an advance of money to the principal debtor. Or it may take the form of a forbearance on the part of the creditor at the surety's request to sue the principal debtor. In some guarantees the consideration is given once for all, as where a third person guarantees that, in consideration of a lessor granting a lease, he will be answerable for the lessee paying the rent and performing the covenants; in other cases it is supplied from time to time, as where a guarantee is given to secure the balance of a running account at a banker's, or a balance of a running account for goods supplied (*See* the judgment of Lush, L J. in *Lloyd's* v. *Harper*, 1881, 16 Ch D at pp 319, 320)

The statutory requisites of a contract of guarantee are prescribed by s 4 of the Statute of Frauds 1689 (29 Car II. c 3), which provides that "no action shall be brought whereby to charge the defendant upon any special promise to answer for the debt, default, or miscarriage of another person . . . unless the agreement upon which such action shall be brought, or some memorandum or note thereof, shall be in writing and signed by the party to be charged therewith, or by some other person thereunto lawfully authorized" A promise to give a guarantee is as much within the statute as the guarantee itself But a promise to procure another person to sign a guarantee for the debt of another is not within the statute, though the guarantee would be The statute does not invalidate a verbal contract of guarantee, but only renders it unenforceable by action It may, therefore, be available in support of a defence to an action, and money paid under it cannot be recovered

To satisfy s 4 of the Statute of Frauds, the agreement, or the note or memorandum thereof, must set out all the material terms of the guarantee; it must name or unmistakably identify the parties thereto, and must also state the liability guaranteed and the time during which the guarantee is to continue. It is not necessary that the agreement, or memorandum, should contain any statement of the consideration given to the surety in return for the guarantee (Mercantile Law Amendment Act 1856, s. 3). The agreement, or memorandum, must be signed by the surety or by some duly authorized agent on his behalf. In the case of a joint and several guarantee all the sureties must sign the agreement or memorandum, otherwise none will be liable thereunder (*National Provincial Bank of England* v. *Brackenbury*, 1906, 22 T L R 797).

The promise of a *del credere* agent (*q.v.*) which binds him in consequence of the higher consideration he receives to make no sale on behalf of his principal except to persons who are solvent, and renders him liable for any loss that may result from the nonfulfilment of his promise, is not within the statute, and need not be in writing, for, though such promise may terminate in a liability to pay the debt of another, that is not the *immediate* object for which the consideration is given (*Coutourier* v. *Hastie*, 1852, 8 Exch 40, 56).

A contract of guarantee may be limited to a single transaction, or may cover a number of transactions extending over a period of time—as where a guarantee is given in respect of money to be advanced, or goods to be supplied, to the principal debtor—and remains a standing security until it is revoked either by act of the parties or by death of the surety It is then called a continuing guarantee. A cause of action thereon arises in respect of each item of account (whether principal or interest) as soon as that item falls due and is unpaid, and, consequently, the Statute of Limitations begins to run in the guarantor's favour in respect of each item from that moment (*Parr's Banking Co. Ltd.* v. *Yates*, 1898, 2 Q B 460).

Liability of Surety.—Before the surety can be rendered liable on his guarantee, the principal debtor must have made default. When, however, this has occurred, the creditor, in the absence of express agreement to the contrary, may sue the surety, without even informing him of such default having taken place, or requiring him to pay, and before proceeding against the principal debtor or resorting to securities for the debt received from the latter. The surety's liability is limited to the amount which he has undertaken to pay on default of the principal debtor. This amount may be equal to the sum due from the principal debtor, or it may be less than such sum If the guarantee is one which the surety has entered into jointly with others, he is still liable to pay the whole amount he has agreed to pay on the debtor's default, unless the guarantee otherwise expressly provides His right of contribution against his co-sureties may be a partial indemnity, but cannot, in the absence of agreement binding the creditor, compel the creditor to proceed against the other sureties. Should the surety become bankrupt, either before or after default has been made by the principal debtor, the creditor will have to prove against his estate. This right of proof is regulated by s 30 of the Bankruptcy Act 1914, which is most comprehensive in its terms.

Rights of Surety Against Principal Debtor.—The surety can recover, with interest, from the principal debtor all money properly paid when due on account of the guarantee, provided of course that the guarantee was made with the principal debtor's consent In the event of the principal debtor's bankruptcy, the surety can, if the creditor has not already proved in respect of the guaranteed debt, prove against the bankrupt's estate, not only in respect of payments made before the bankruptcy of the principal debtor, but also, it seems, in respect of the contingent liability to pay under the guarantee The surety is also entitled to enforce against the debtor the rights which the creditor enjoyed with respect to the debt in question Moreover, a surety has the right *before* payment to compel the principal debtor to relieve him from his liability by paying off the debt, if the debt is actually due and the surety admits liability In such a case it is not necessary to prove that the creditor has refused to sue the principal debtor (*Ascherson* v. *Tredegar Dry Dock and Wharf Co Ltd*, 1909, 2 Ch. 401).

Rights of Surety Against the Creditor.—The surety, on payment of the debt, is entitled to the benefit of the securities in the hands of the creditor, whether he knew of them or not at the time of contracting; including all securities which the creditor may have acquired since the date of contracting; and where, by the default or laches of the creditor, such securities have been lost or rendered otherwise unavailable, the surety is discharged *pro tanto*. If the surety is surety for part of the debt only, his rights to the securities also are but partial (*Goodwin* v. *Gray*, 1874, 22 W R 312) On this subject the Mercantile Law Amendment Act 1856, s. 5, provides that "every person who, being surety for the debt of another, or being liable with another for any debt or duty, shall pay such debt or perform such duty, shall be entitled to have assigned to him, or to a trustee for him, every judgment, specialty, or other security which shall be held by the creditor in respect of such debt or duty, whether such judgment, specialty, or other security shall or shall not be deemed at law to have been satisfied by the payment of the debt or per-

formance of the duty, and such person shall be entitled to stand in the place of the creditor, and to use all the remedies, and if need be, and upon a proper indemnity, to use the name of the creditor in any action or other proceeding, at law or in equity, in order to obtain from the principal debtor, as the case may be, indemnification for the advances made and loss sustained by the person who shall have so paid such debt or performed such duty; and such payment or performance so made by such surety shall not be pleadable in bar of any such action or other proceeding by him; provided always, that no co-surety, co-contractor, or co-debtor, shall be entitled to recover from any other co-surety, co-contractor, or co-debtor, by the means aforesaid, more than the just proportion to which, as between those parties themselves, such last-mentioned person shall be justly liable"

Right of Surety Against Co-sureties.—A surety on payment of the debt, or more than his proportion, is entitled to contribution from his co-sureties in respect of the excess. This right is not founded originally upon contract, but upon a principle of equity, though it is now established to be the foundation of an action. It exists whether the sureties are bound jointly, or jointly and severally, and whether they are bound by the same or different instruments. If the principal debtor makes default, all must contribute equally, if each is a surety to an equal amount, and if not equally, then proportionately to the amount for which each is a surety (*Ellesmere Brewery Co* v *Cooper and Others* 1896, Q. B. 75). In counting the number of sureties for this purpose, those unable to pay are not reckoned Thus where four sureties are jointly and severally bound in a surety bond, and one of them pays the amount of the bond, but one of the remaining three sureties is insolvent, the right of contribution against the two other sureties is for thirds, not for fourths, of the sum paid (*per* Lord Esher, M R , *ibid* , at p. 80) But a surety is not entitled to call upon his co-sureties for contribution until he has paid more than his proportion, either of the whole debt or of that part which remains unpaid, even though his co-sureties have not been required by the creditor to pay anything (*Ex parte Snowdon,* 1881, 17 Ch D 44) And so where the debt guaranteed is payable by instalments, a surety cannot call on his co-sureties to contribute until he has paid more than his proportion of the entire debt. The fact that he has paid more than his share of the instalments which have come due will not entitle him to contribution (*Stirling* v. *Burdett,* 1911, 2 Ch 418)

A surety against whom judgment has been obtained by the principal creditor for the full amount of the debt can, before paying the amount, maintain an action against his co-sureties to compel them to contribute towards the common liability, and where the principal creditor is a party to the action, the surety may obtain an order directing the co-sureties to pay their proportions to the creditor (*Wolmershausen* v. *Gullick,* 1893, 2 Ch. 514)

The right of contribution is not the only right possessed by a surety against his co-sureties, he is also entitled to a share in every counter-security which his co-sureties may have obtained from the principal debtor, and such security must be brought into hotchpot, in order that the ultimate burden may be distributed between the sureties equally, even though the co-sureties consented to become sureties only upon the terms of having the security (*Steel* v *Dixon,* 1881, 17 Ch D 825)

Discharge of Surety.—The surety will be discharged on any of the grounds which suffice to terminate contracts in general, and also on the following which are peculiar to contracts of guarantee. In the case of a guarantee for the fidelity of a servant, the non-disclosure by the employer to the surety of the fact that the servant had previously been guilty of dishonesty in his employment will avoid the contract although such non-disclosure was not fraudulent (*London General Omnibus Co. Ltd* v. *Holloway,* 1912, 2 K B 72) On the other hand, in the case of a guarantee given to a banker to secure an overdraft, the mere non-disclosure by the banker to the surety of the fact that, at the time when he signed the bond, the customer was already indebted to the banker for the full amount of the credit and payment had been requested by the banker, will not avoid the contract, for the bank cannot reasonably be taken as affirming, by mere silence respecting earlier dealings, the financial ability of the customer whom the surety is asked to guarantee (*Hamilton* v. *Watson,* 1845, 12 Cl. & F. 109). Fraud subsequent to the execution of the guarantee (as where, for example, the creditor connives at the principal debtor's default) will certainly discharge the surety. Again, a material alteration made in the terms of the contract between the creditor and the principal debtor, without the assent of the surety, will discharge the surety, unless it is self-evident that the alteration cannot prejudice the surety; the surety himself being the judge as to the materiality of the alteration (*Holme* v. *Brunskill,* 1878, 3 Q B D 495).

Giving time to the principal debtor without the surety's consent will discharge the surety, and for this reason, because the creditor by giving time deprives the surety of his right to pay off the debt which he has guaranteed and to sue the principal debtor (*Samuel* v *Howarth,* 1817, 3 Mer 272). But to produce this result there must be a binding contract to extend the time for payment, not merely by a forbearance of the creditor to enforce his rights, and the contract must be with the principal debtor A contract with a stranger, or even with a co-surety, to give time to the principal debtor, will not prevent the surety discharging the debt and pursuing his remedy over against the principal debtor, and will not discharge the surety from liability (*Frazer* v *Jordan,* 1858, 8 E & B 303; *Clarke* v. *Birley,* 1889, 41 Ch D 422)

To the rule that time given to a principal debtor discharges a surety there is an important exception. A surety is not released by an agreement to give time to the debtor if the creditor expressly reserves his rights against the surety The reasons why the reservation by the creditor of his rights against the surety does not release the latter are (i) because it rebuts the implication that the surety was meant to be discharged, and (ii) because it prevents the rights of the surety against the principal debtor being impaired, for the principal debtor, by consenting to the creditor reserving his rights, impliedly agrees that the surety shall have recourse against him, and he may, notwithstanding the agreement, pay the creditor and enforce his rights against the debtor (*Kearsley* v *Cole,* 1847, 16 M. & W 128, at p 135) The rule also does not apply where time is given to the principal debtor after a judgment has been recovered by the creditor against both the principal debtor and the surety; the judgment creates a new liability in respect of which the judgment debtors are in the same position (*in re a Debtor,* 1913, 3 K B 11)

An absolute release of the principal debtor will discharge the surety But a covenant not to sue the principal debtor, qualified by a reservation of rights against the surety, allows the surety to retain all his remedies against the principal debtor and will not discharge him from liability (*Price* v *Baker and Another,* 1855, 24 L J Q B 130) A release by the creditor of one of two or more co-sureties will discharge all (*Evans* v *Brembridge,* 1856, 25 L J Ch 334) This is not so, however, if the sureties contract severally (*Ward* v *National Bank of New Zealand,* 1883, 8 App Cas 755)

A surety is discharged if the creditor takes a new security from the principal debtor in lieu of the original one, or by his wilful neglect or default loses the securities which he holds, or deals with the securities in such a way as to deprive the surety of the means of recouping himself by them

A guarantee, the consideration for which is given once for all (as where a third person guarantees that in consideration of the lessor granting a lease, he will be answerable for the lessee paying the rent), cannot be determined by the surety, and does not cease on his death (*Lloyd's* v *Harper,* 1881, 16 Ch D 290) On the other hand, when the consideration for a guarantee is fragmentary, supplied from time to time, and therefore divisible (as where a guarantee is given to secure the balance of a running account at a banker's), the surety may at any time terminate the guarantee, and notice of death of the surety will put an end to his liability (*Coulthart* v. *Clementson,* 1880, 5 Q B D 42). But the death of one of the co-sureties under a joint and several continuing guarantee does not by itself determine the future liability of the sur-

viving co-sureties (*Beckett & Co.* v. *Addyman*, 1882, 9 Q B.D 783). A continuing guarantee given either to a firm or to a third person in respect of the transactions of a firm is, in the absence of agreement to the contrary, revoked as to future transactions by any change in the constitution of the firm (Partnership Act, 1890, s 18). A surety who has executed a guarantee on the faith that another person will also become a surety is wholly discharged from liability if that other person refuses to do so, or for any other reason does not join in the guarantee (*Evans* v *Brembridge*, 1853, 25 L J. Ch. 334) A discharge in bankruptcy of the principal debtor, or the acceptance by his creditors of a composition or scheme, will not release from liability a person who was surety for his debts (Bankruptcy Act 1914, s 28, subs. 4; s 16, subs 20)

The Statutes of Limitation bar the right of action against a surety after 20 years if the guarantee was under seal; and in the case of other guarantees, after six years from the date of the accrual of the cause of action, that is to say from the date on which the creditor might have sued the surety Where, by the express terms of the guarantee, the surety is only liable to pay after demand, time does not begin to run until after demand to pay has been made upon him.

See Sir S A T Rowlatt, *Law of Principal and Surety* (2nd ed., 1926), T Hewitson, *Suretyship, its Origin and History* (1927).

(C. Ga)

THE UNITED STATES

There have been repeated efforts by American courts and legal writers to distinguish a surety from a guarantor; the efforts have failed, since hardly two of them find the same line of distinction; hence, in the United States as in England the two terms are substantially synonymous But in some American States the memorandum of a contract of guarantee still requires to state the consideration, if the contract is to be enforceable Furthermore, laches in the creditor's dealing with any security he may hold, to be sufficient in American law to discharge the creditor's claim against the surety, must either involve affirmative action, or must consist in failing to take simple, standard, business-like precautions such as recording a mortgage, or so presenting a negotiable note as to keep the endorsers from being discharged But mere failure to enforce the security before it depreciates in value will not in the United States be considered such laches, the judicial view being that the surety's remedy is to pay off the debt and then realize on the security himself It is hard to see why the surety should be forced thus to strain his resources; it is equally hard to reconcile the harshness against the surety of this rule with the extreme leniency found in discharging him by reason merely of extension of time to the principal The two lines of precedent grew up separately, and did not come into contact until both were set. Two other divergences from the English law as stated above need notice the periods of the Statute of Limitations differ among the American States, and the fact that a surety stipulated that a co-surety be procured, or other condition be fulfilled, will not, commonly, discharge him as against a creditor who has relied upon surety's signature without notice of stipulation or condition

Corporate Suretyship.—In the United States a great and growing part of suretyship business is now in the hands of professional surety companies, which write surety bonds for a premium calculated on loss-expectancies, and which in cases involving any considerable risk take measures to assure themselves of indemnity, in advance of loss In the case of such "compensated sureties" the courts have tended distinctly to tighten up the law in favour of the creditor, so that the older tendency to construe the contract narrowly, and employ every possible loophole to let the surety out; is now limited to the cases out of which it originally grew those of the friend or family member who has lent his credit, without compensation, in an individual case Hence the bonds of surety companies are approaching, in law as in social function, policies of insurance. They are perhaps of peculiar importance in the field of guaranteeing the fidelity of trusted employes or of public officers (where the check-up system of the bonding companies goes some distance toward anticipatory prevention of frauds) and in that of contracts for building and public works It should be noted that these bonding companies are not, like most corporations, without charter power to enter into binding contracts of suretyship; also that the larger modern business corporations are now commonly being given charter power to become surety at least for their own subsidiaries. Hence guaranteed bonds are becoming familiar in the market To be distinguished from suretyship, in law though not in function, is the growing practice among bankers of accepting negotiable paper (*see* Bill of Exchange) on behalf of their customers for a commission, this is not in strictness suretyship, not only because the customer's obligation in all probability ceases when the banker's is given, but because, in any event, the customer's liability must be conditional on prior dishonour by the banker.

Bail Bonds.—A field of suretyship, finally, which deserves special mention because of the abuses encountered in practice, is that of the bail bonds given to secure the supposedly temporary release of persons charged with crime The bail is forfeited if the accused disappears, this is supposed to force the bondsman to keep a constant eye on the accused But the practice of allowing professional bondsmen to sign bonds totalling far in excess of their available assets, together with the difficulty of getting suit prosecuted against such as are politically influential, has made this phase of suretyship a serious hindrance to convictions

See Arnold, "Suretyship and Guaranty" (1927), *Missouri Crime Survey*, Part V. (1926). (K. N. L)

GUARANTY TRUST COMPANY OF NEW YORK, THE, a large United States trust company, with (Dec 31, 1928) resources of $1,052,211,198 39 and a staff of 4,000 employees, was organized in 1864 as the New York Guaranty and Indemnity Company, with a capital of $100,000 The present name was adopted in 1895 The company absorbed the Fifth Avenue Trust Company and the Morton Trust Company in 1910, and the Standard Trust Company in 1912

The following table indicates the growth of the company from 1898 to 1928, in 10-year periods —

Date	Capital	Surplus and undivided profits	Deposits
June 20, 1898	$ 2,000,000	$ 2,906,823	$ 20,422,521
June 30, 1908	2,000,000	6,760,960	54,079,991
June 30, 1918	25,000,000	26,725,682	563,768,442
June 30, 1928	40,000,000	59,231,743	684,799,110

The offices of the company were first situated on Broad street adjoining the present Stock Exchange, but in 1891 moved to the Mutual Life Insurance building at Pine, Cedar and Nassau streets In 1913 the main office was moved to its present site at 140 Broadway The company operates three offices in New York city, three in London and one in each of the following cities Paris, Havre, Liverpool, Brussels and Antwerp It was the first American bank to open a branch office in Europe Several of its European offices were appointed official depositories for Government funds during the World War During the war, the company's bond department, in four out of five war loan campaigns, placed more subscriptions than any other organization in the United States In 1920 the bond department was incorporated as the Guaranty Company of New York, with capital stock of $5,000,000, owned by the Trust Company The merger in February, 1929, of the Guaranty Trust Company and the National Bank of Commerce, both of New York City, created an institution with resources exceeding $2,000,000,000, the largest bank in the western hemisphere The name Guaranty Trust Company was retained

(H W Ca)

GUARATINGUETA, a city of Brazil in the eastern part of the State of São Paulo, 124 m N E of the city of São Paulo Population of the municipality (1920), 43,101 The city, which was founded in 1651, stands on a fertile plain 3 m from the Parahyba river, and is the commercial centre of one of the oldest agricultural districts of the State The district produces large quantities of coffee, and some sugar, Indian corn and beans The city dwellings are for the most part constructed of rough wooden frames covered with mud, called tapia by the natives, and roofed with curved tiles The São Paulo branch of the Brazilian Central

Railway passes through the city, by which it is connected with Rio de Janeiro on one side and São Paulo and Santos on the other.

GUARAUNAN (WARRAUNAN), an independent linguistic stock of South American Indians, so called from the Warraus (Guaraunos), its most important tribe The tribes of this stock occupied at the time of the first European contact, the coast regions of British Guiana from the Essequibo river westward to the Orinoco delta. At an earlier period, they seem to have extended over a wider territory, having been crowded into their historic habitat as a result of the dislocation of peoples consequent on the Carib invasion The Warraus are a hunting and fishing folk, practising some agriculture and famous as canoemen. Physically they are of short stature. They wear only small bast breechclouts and live in communal houses of thatch, often built on piles or on tree stumps cut off several feet above ground. They thus escape the floods in the Orinoco delta region The bow and spear are their main weapons They make pottery but no textiles. Polygamy is usual and the chiefs often have a large number of wives. These chiefs have considerable power and inherit their position in the matrilineal line Puberty ceremonies for both girls and boys resemble those of the neighbouring Arawakan (*q.v.*) tribes, and involve for the boys, tests of bravery and endurance. The dead are buried, wrapped in a hammock or sometimes sunk in the river until the flesh has been entirely removed by fish, when the bones are packed in a basket, and suspended from the roof of the house. Mimetic dances, in which various animals and birds are represented, play a prominent part in their religious ritual

See Everard Im Thurn, *Among the Indians of British Guiana* (London, 1883); R Schomburgk, *Reisen in Britisch Guiana*, etc (Leipzig, 1848), W L Roth, *An Inquiry into the Animism and Folklore of the Guiana Indians* (*30th Rep Bureau of American Ethnology*); *An Introductory Study of the Arts, Crafts and Customs of the Guiana Indians* (*38th Rep Bureau of American Ethnology*).

GUARDA, an episcopal city of Portugal on the Guarda-Abrantes and Lisbon-Villar Formoso railways Pop. (1911) 6,635 It is 3,370 ft above sea-level, at the north-eastern extremity of the Serra da Estrella, overlooking the fertile valley of the river Côa. It contains a ruined castle, a fine 16th century cathedral and a sanatorium for consumptives Its industries comprise the manufacture of coarse cloth In 1199 Guarda was founded, on the site of the Roman Lencia Oppidana, by Sancho I of Portugal, who intended it to be a "guard" against Moorish invasion The administrative district of Guarda coincides with north-eastern Beira, pop. (1900) 261,030, area, 1,065 sq m

GUARDI, FRANCESCO (1712–1793), Venetian painter, born at Pinzolo, a Tyrolese mountain village He was a pupil of Antonio Canale and excelled in painting views of Venice. Guardi is noticeable for spirited touch, sparkling colour, atmospheric effects and picturesquely sketched figures. Two large pictures in the Museo Correr, Venice, representing a "Masquerade in the Ridotto" and a "Reception Room in a Convent" are remarkable for their harmonious colour, true values and freedom of execution. Many of his works are to be found in England and nine in the Louvre.

See George A Simonson, *Francesco Guardi* (1904); G Fiocco, *Francesco Guardi* (1923).

GUARDIAN. For the position of guardians of the poor *see* POOR LAW, and for the legal relations between a guardian and his ward *see* INFANT, MARRIAGE and ROMAN LAW.

GUARDS AND HOUSEHOLD TROOPS. The practice of maintaining bodyguards is of great antiquity, and possibly is the origin of organized armies Thus there is often no clear distinction between the inner ring of personal defenders and the select corps of trained combatants who are at the chief's entire disposal Famous examples of corps that fell under one or both these headings are the "Immortals" of Xerxes, the Mamelukes, Janissaries, the *Huscarles* of the Anglo-Saxon kings, and the Russian Strelitz (*Stryeltsi*). In modern times the distinction of function is better marked, and the fighting men who are more intimately connected with the sovereign than the bulk of the army can be classified as to duties into "Household Troops," who are in a sense personal retainers, and "Guards," who are a *corps d'élite* of combatants. But the dividing line is not so clear as to any given body of troops. Thus the British Household Cavalry is part of the combatant army as well as the sovereign's escort.

Yeomen of the Guard and Gentlemen-at-Arms.—The oldest of the household or bodyguard corps in the United Kingdom is the King's Bodyguard of the "Yeomen of the Guard" (*q.v.*), formed at his accession by Henry VII. The "nearest guard," the personal escort of the sovereign, is the "King's Bodyguard of the Honourable Corps of Gentlemen-at-Arms," created by Henry VIII. at his accession in 1509 Formed possibly on the pattern of the "Pensionnaires" of the French kings—retainers of noble birth who were the predecessors of the *Maison du Roi* (*see* below)—the new corps was originally called "the Pensioners." The importance of such guards regiments in the general development of organized armies is illustrated by a declaration of the House of Commons, made in 1674, that the militia, the pensioners and the Yeomen of the Guard were the only lawful armed forces in the realm. But with the rise of the professional soldier and the corresponding disuse of arms by the nobles and gentry, the Gentlemen-at-Arms (a title which came into use in James II.'s time, though it did not become that of the corps until William IV's) retaining their noble character, became less and less military. Burke attempted without success in 1782 to restrict membership to officers of the army and navy, but the necessity of giving the corps an effective military character became obvious when, on the occasion of a threatened Chartist riot, it was called upon to do duty as an armed body at St James's Palace The corps was reconstituted on a purely military basis in 1862, and from that date only military officers of the regular services who have received a war decoration are eligible for appointment The office of captain, however, is political, the holder (who is always a peer) vacating it on the resignation of the Government of which he is a member. The corps consists at present of captain, lieutenant, standard bearer, clerk of the cheque (adjutant), sub-officer and 39 Gentlemen-at-Arms

The Royal Company of Archers.—The king's bodyguard for Scotland was constituted in its present form in the year 1676, by an act of the privy council of Scotland An earlier origin has been claimed for the company, some connecting it with a supposed archer guard of the kings of Scotland In the above-mentioned year, 1676, the minutes of the Royal Company begin by stating, that owing to "the noble and usefull recreation of archery being for many years much neglected, several noblemen and gentlemen did associate themselves in a company for encouragement thereof . . and did apply to the privy council for their approbation . . which was granted" For about 20 years at the end of the 17th century, perhaps owing to the adhesion of the majority to the Stuart cause, its existence seems to have been suspended. But in 1703 a new captain-general, Sir George Mackenzie, Viscount Tarbat, afterwards earl of Cromarty, was elected, and he procured for the company a new charter from Queen Anne. The rights and privileges renewed or conferred by this charter were to be held of the Crown for the *reddendo* of a pair of barbed arrows. The history of the Royal Company since 1703 has been one of great prosperity Large parades were frequently held, and many distinguished men marched in the ranks Several of the leading insurgents in 1745 were members, but the company was not at that time suspended in any way

In 1822 when King George IV visited Scotland, it was thought appropriate that the Royal Company should act as his majesty's bodyguard during his stay, especially as there was a tradition of a former archer bodyguard. They thus came to perform the duties usually assigned to the Gentlemen-at-Arms, duties which they have carried out during subsequent State visits

King George IV. authorized the company to take, in addition to their former name, that of "The King's Body Guard for Scotland" and presented to the captain-general a gold stick, thus constituting the company part of the royal household. In virtue of this stick the captain-general of the Royal Company takes his place at a coronation or similar pageant immediately behind the gold stick of England. The lieutenants-general of the company have silver sticks; and the council, which is the executive body of

the company, possess seven ebony ones. George IV. further appointed a full-dress uniform to be worn by members of the company at court, when not on duty as guards, in which latter case the ordinary field dress is used.

Household Cavalry and Foot Guards.—Corps of the gentlemen-at-arms or yeoman type do not of course count as combatant troops—if for no other reason at least because they are armed with the weapons of bygone times. The British Guards and household troops that are armed, trained and organized as part of the army are the Household Cavalry and the Foot Guards.

The Household Cavalry consists of two regiments, and has its origin, as have certain of the Foot Guard regiments, in the ashes of the "New Model" army disbanded at the restoration of Charles II. in 1660. In that year the "1st or His Majesty's Own Troop of Guards" formed during the king's exile of his cavalier followers, was taken on the strength of the army. The 2nd troop was formerly in the Spanish service as the "Duke of York's Guards," and was also a cavalier unit. In 1670, on Monk's death, the original 3rd troop (Monk's Life Guards, renamed in 1660 the "Lord General's Troop of Guards") became the 2nd (the queen's) troop, and the duke of York's troop the 3rd In 1685 the 1st and 2nd troops were styled Life Guards of Horse, and two years later the blue-uniformed "Royal Regiment of Horse," a New Model regiment that had been disbanded and at once re-raised in 1660 was made a household cavalry corps In 1690, being encamped in Ireland, together with some of King William III 's Dutch regiments, the name of "The Oxford Blues"—after Aubrey, earl of Oxford, its colonel—became attached to it as a means of distinction from Lord Portland's Dutch regiment of Blue Guards There were also from time to time other troops of Guards, the best known of which were the 4th (English) Troop, 1686–89, 4th (Dutch) Troop, 1689–99, 4th (Scots) Troop, 1661–1746; 1st Troop of Horse Grenadier Guards, 1693–1788; 2nd (Scots) Troop of Horse Grenadier Guards, 1702–88. The 3rd and 4th Troops were disbanded in 1746.

The whole were reorganized in 1788, the two remaining troops absorbing the two troops of Horse Grenadier Guards, to form the 1st and 2nd Regiments of Life Guards, and as such they remained until 1922, when the two regiments were amalgamated into a composite regiment designated "The Life Guards (1st and 2nd)." From 1750 to 1819 the Blues bore the name of "Royal Horse Guards Blue," which in 1819 was changed to "Royal Horse Guards (The Blues) " The general distinction between the uniforms of the red Life Guard and the blue Horse Guard still exists. The Life Guards wear scarlet tunics with the blue collars and cuffs and the Royal Horse Guards blue tunics with scarlet collars and cuffs. Both wear steel cuirasses on state occasions and on guard duty The head-dress is a steel helmet with drooping horse-hair plume (white for Life Guards, red for Horse Guards). In full dress white buckskin pantaloons and long knee-boots are worn Amongst the peculiarities of these *corps d'élite* is the survival of the old custom of calling non-commissioned officers "corporal of horse" instead of sergeant, and corporal-major instead of sergeant-major, the wearing by trumpeters and bandsmen in full dress of a black velvet cap, a richly laced coat with a full skirt extending to the wearer's knees and long white gaiters

The Foot Guards comprise the Grenadier Guards (three battalions), the Coldstream Guards (three battalions), the Scots Guards (two battalions), the Irish Guards (one battalion) and the Welsh Guards (one battalion) The Grenadiers represent a royalist infantry regiment which served with the exiled princes in the Spanish army and returned at the Restoration in 1660. The Grenadiers, successively the King's Royal Regiment of Guards, the four Foot Guards and the 1st or Grenadier Regiment of Foot Guards, received the title "Grenadier" in 1815, in commemoration of their services at Waterloo

The Coldstream Guards are a New Model regiment, and were originally called the Lord General's (Monk's) regiment of Foot Guards Their popular title, which became their official designation in 1670, is derived from the fact that the army with which Monk restored the monarchy crossed the Tweed into England at the village of Coldstream, and that his troops (which were afterwards, except the two units of horse and foot of which Monk himself was colonel, disbanded) were called the Coldstreamers. The two battalions of Scots (Foot) Guards, which regiment was separately raised and maintained in Scotland after the Restoration, marched to London in 1686 and 1688 and were brought on to the English establishment in 1707 In George III 's reign they were known as the 3rd Guards, and from 1831 to 1877 (when the present title was adopted) as the Scots Fusilier Guards.

The Irish Guards (one battalion) were formed in 1902, after the South African War, as a mark of Queen Victoria's appreciation of the services rendered by the various Irish regiments of the line (The "Irish Guards" of the Stuarts took the side of James II , fought against William III in Ireland and lost their regimental identity in the French service, to which the officers and soldiers transferred themselves on the abandonment of the struggle) The Welsh Guards were formed in 1915 In view of there being a Scots and an Irish regiment the claim of Wales had become obvious, but no opportune moment for their creation had arrived until the World War The dress of the Foot Guards is generally similar in all five regiments, scarlet tunic with blue collars, cuffs and shoulder-straps, blue trousers and high, rounded bearskin cap The regimental distinctions most easily noticed are these. The Grenadiers wear a small white plume in the bearskin, the Coldstreams a similar red one, the Scots none, the Irish a blue-green and the Welsh a green and white one The buttons on the tunic are spaced evenly for the Grenadiers, by twos for the Coldstreams, by threes for the Scots, by fours for the Irish and by fives for the Welsh The band of the modern cap is red for the Grenadiers, white for the Coldstreams, "diced" red and white (chequers) for the Scots, green for the Irish and black for the Welsh Former privileges of Foot Guard regiments, such as higher brevet rank in the army for their regimental officers, are now abolished, but Guards are still subject exclusively to the command of their own officers, and the officers of the Foot Guards, like those of the Household Cavalry, have special duties at court Neither the Household cavalry nor the Foot Guards normally serve abroad in peace time, but with the latter, exceptions have several times been made to meet special circumstances. Guards' brigades served in the Napoleonic Wars and in several subsequent campaigns, whilst a Guards' division was formed in the World War

The sovereigns of France had guards in their service in Merovingian times and their household forces appear from time to time in the history of mediaeval wars Louis XI was, however, the first to regularize their somewhat loose organization, and he did so to such good purpose that Francis I had no fewer than 8,000 guardsmen organized, subdivided and permanently under arms The senior unit of the *Gardes du Corps* was the famous company of Scottish archers (*Compagnie écossaise de la Garde du Corps du Roi*), which was originally formed (1418) from the Scottish contingents that assisted the French in the Hundred Years' War Scott's *Quentin Durward* gives a picture of life in the corps as it was under Louis XI In the following century, however, its regimental history becomes somewhat confused Two French companies were added by Louis XI and Francis I and the *Gardes du Corps* came to consist exclusively of cavalry About 1634 nearly all the Scots then serving went into the "regiment d'Hébron" and thence later into the British regular army (*see* HEPBURN, SIR JOHN) Thereafter, though the titles, distinctions and privileges of the original Archer Guard were continued, it was recruited from native Frenchmen, preference being (at any rate at first) given to those of Scottish descent At its disbandment in 1791 along with the rest of the *Gardes du Corps*, it contained few, if any, native Scots There was also, for a short time (1643–60), an infantry regiment of *Gardes écossaises*

In 1671 the title of *Maison Militaire du Roi* was applied to that portion of the household that was distinctively military It came to consist of four companies of the *Gardes du Corps*, two companies of *Mousquetaires* (cavalry, formed 1622 and 1660), one company of *Chevaux légers* (1570), one of *Gendarmes de la Maison Rouge* and one of *Grenadiers à Cheval* (1676), with one company of *Gardes de la Porte* and one called the *Cent-Suisses*,

the last two being semi-military. This large establishment, which did not include all the guard regiments, was considerably reduced by the count of St. Germain's reforms in 1775, all except the *Gardes du Corps* and the *Cent-Suisses* being disbanded. The whole of the *Maison du Roi,* with the exception of the semi-military bodies referred to, was cavalry.

The *Gardes françaises,* formed in 1563, did not form part of the *Maison* They were an infantry regiment, as were the famous *Gardes suisses,* originally a Swiss mercenary regiment in the Wars of Religion, which was, for good conduct at the combat of Arques, incorporated in the permanent establishment by Henry IV. in 1589 and in the Guards in 1615 At the revolution, contrary to expectation, the French Guards sided openly with the constitutional movement and were disbanded. The Swiss Guards, however, being foreigners, and therefore unaffected by civil troubles, retained their exact discipline and devotion to the court to the day on which they were sacrificed by their master to the bullets of the Marsellais and the pikes of the mob (Aug 10, 1792) Their tragic fate is commemorated by the well-known monument called the "Lion of Lucerne," the work of Thorvaldsen, erected near Lucerne in 1821 The "Constitutional," "Revolutionary" and other guards that were created after the abolition of the *Maison* and the slaughter of the Swiss are unimportant, but through the "Directory Guards" they form a nominal link between the household troops of the monarchy and the corps which is perhaps the most famous "Guard" in history The Imperial Guard of Napoleon had its beginnings in an escort squadron called the Corps of Guides, which accompanied him in the Italian campaign of 1796–97 and in Egypt On becoming first consul in 1799 he built up out of this and of the guard of the Directory a small corps of horse and foot, called the Consular Guard, and this, which was more of a fighting unit than a personal bodyguard, took part in the battle of Marengo The Imperial Guard, into which it was converted on the establishment of the empire, was at first of about the strength of a division As such it took part in the Austerlitz and Jena campaigns, but after the conquest of Prussia Napoleon augmented it, and divided it into the "Old Guard" and the "Young Guard" Subsequently the "Middle Guard" was created, and by successive augmentations the corps of the guard had grown to be 57,000 strong in 1811–12 and 81,000 in 1813. It preserved its general character as a *corps d'élite* of veterans to the last, but from about 1813 the "Young Guard" was recruited directly from the best of the annual conscript contingent The officers held a higher rank in the army than their regimental rank in the Guards. At the first Restoration an attempt was made to revive the *Maison du Roi,* but in the constitutional régime of the second Restoration this semi-mediaeval form of bodyguard was given up and replaced by the *Garde Royale,* a selected fighting corps This took part in the short war with Spain and a portion of it fought in Algeria, but it was disbanded at the July Revolution Louis Philippe had no real guard troops, but the memories of the Imperial Guard were revived by Napoleon III., who formed a large guard corps in 1853–54 This, however, was open to an even greater degree than Napoleon I 's guard to the objection that it took away the best soldiers from the line Since the fall of the empire in 1870 there have been no guard troops in France The duty of watching over the safety of the president is taken in the ordinary roster of duty by the troops stationed in the capital. The "Republican Guard" is the Paris gendarmerie, recruited from old soldiers and armed and trained as a military body.

In Austria-Hungary, before the break-up of the empire, there were only small bodies of household troops (Archer Body Guard, Trabant Guard, Hungarian Crown Guards, etc) analogous to the British Gentlemen-at-Arms or Yeomen of the Guard Similar forces, the "Noble Guard" and the "Swiss Guard," are maintained in the Vatican

In Imperial Russia the Guard was organized as an army corps It possessed special privileges, particularly as regards officers' advancement.

In Germany as an empire the distinction between armed retainers and "Guards" was well marked. The army was for practical purposes a unit under imperial control, while household troops ("castle-guards" as they are usually called) belonged individually to the various sovereigns within the empire. The "Guards," as a combatant force in the army, were those of the king of Prussia and constituted a strong army corps. This had grown gradually from a bodyguard of archers, and, as in Great Britain, the functions of the heavy cavalry regiments of the Guard preserved to some extent the name and character of a body guard (*Gardes du Corps*). The senior foot guard regiment was also personally connected with the royal family. The conversion of a palace-guard to a combatant force was due chiefly to Frederick William I , to whom drill was a ruling passion, and who substituted effective regiments for the ornamental "Trabant Guards" of his father. A further move was made by Frederick the Great in substituting for Frederick William's expensive "giant" regiment of guards, a larger number of ordinary soldiers, whom he subjected to the same rigorous training and made a *corps d'élite* Frederick the Great also formed the body guard alluded to above Nevertheless in 1806 the Guard still consisted only of two cavalry regiments and four infantry regiments, and it was the example of Napoleon's Imperial Guard which converted this corps into a corps of all arms.

GUÁRICO, a large inland State of Venezuela, and having a river of the same name. Pop. (1926), 125,282 It extends across the northern *llanos* to the Orinoco and Apure rivers and is devoted almost wholly to pastoral pursuits, exporting cattle, horses and mules, hides and skins, cheese and some other products The capital is Calabozo, pop (1926), 7,551, and the other principal towns are Camaguán (pop 3,053) on the Portugueza river, Guayabal (pop 4,447), on a small tributary of the Guárico river, and Zaraza (pop 19,804) on the Unare river, nearly 150m S E. of Carácas

GUARIENTO, Italian painter of Padua He is mentioned in Paduan records as early as 1338 In 1365 he was invited by the Venetian authorities to paint a Paradise, and some incidents of the war of Spoleto, in the great council-hall of Venice These works were greatly admired at the time, but disappeared under over-paintings of later periods In 1903 the fresco of "Paradise" was uncovered and transferred on canvas. It is now on view at the Doge's Palace. His works in Padua have suffered much In the church of the Eremitani are allegories of the Planets, and, in its choir, some small sacred histories in dead colour, such as an Ecce Homo; also, on the upper walls, the life of St Augustine, with some other subjects A few fragments of other paintings by Guariento are still extant in Padua In the gallery of Bassano is a Crucifixion by him He is the first Paduan artist to detach himself under the influence of Giotto from the Byzantine tradition He died between 1368 and 1370

See L Testi, *Storia della Pittura Veneta* I (1909)

GUARINI, GIOVANNI BATTISTA (1537–1612), Italian poet, author of the *Pastor fido,* was born at Ferrara on Dec 10, 1537, just seven years before the birth of Tasso. He studied both at Pisa and Padua, and, before he was 20, became professor of moral philosophy in his native city. In 1567 he entered the service of Alphonso II , duke of Ferrara. Guarini aimed at State employment as the serious business of his life, and was sent on various embassies and missions by the duke But he spent his time and money to little purpose, suffered from the spite and ill-will of two successive secretaries to the duke,—Pigna and Montecatini,—quarrelled with his old friend Tasso and at the end of 14 years of service found himself half-ruined, with a large family and no prospects When Tasso was condemned to S. Anna, the duke promoted Guarini to the vacant post of court poet He found the position uncongenial, and retired in 1582 to his ancestral farm, the Villa Guarina, where he wrote the *Pastor fido* In 1585 he was at Turin superintending the first public performance of his drama, whence Alphonso recalled him to Ferrara, and gave him the office of secretary of State This reconciliation did not last long Guarini moved to Florence, then to Rome, and back again to Florence, to the court of Ferdinand de' Medici He found a patron for a time in Francesco Maria of Urbino, and finally took

refuge in his native Ferrara, which, since the death of Alphonso, had devolved to the papal see Here, and at the Villa Guarina, his last years were passed in study, lawsuits and polemical disputes with his contemporary critics, until 1612, when he died at Venice in his 75th year.

The *Pastor fido* (first published in 1590) is a pastoral drama, *tragicommedia pastorale,* composed not without reminiscences of Tasso's *Aminta* Here and there the taste of the 17th century makes itself felt in frigid conceits and forced antitheses, nor does Guarini abstain from sententious maxims which reveal the moralist rather than the poet. Yet these are but minor blemishes in a masterpiece of diction, glittering and faultless like a polished bas-relief of hard Corinthian bronze. That a single pastoral should occupy so prominent a place in the history of literature seems astonishing, until we reflect that Italy, upon the close of the 16th century, expressed itself in the *Pastor fido,* and that the influence of this drama was felt through all the art of Europe till the epoch of the Revolution It is not a mere play The sensual refinement proper to an age of social decadence found in it the most exact embodiment, and made it the code of gallantry for the next two centuries

The best edition of the *Pastor fido* is the 20th, published at Venice (Ciotti) in 1602 A modern edition is that in *Scrittori d'Italia,* ed by Brognoligo (Bari, 1914). For Guarini's miscellaneous *Rime,* the Ferrara edition (4 vols, 1737) may be consulted His polemical writings, *Verato primo* and *secondo,* and his prose comedy called *Idropica,* were published at Venice, Florence and Rome, between 1588 and 1614.

GUARINO, also known as VARINUS, and surnamed from his birthplace FAVORINUS, PHAVORINUS or CAMERS (*c.* 1450–1537), Italian lexicographer and scholar, was born at Favera near Camerino, studied Greek and Latin at Florence under Politian, and afterwards became for a time the pupil of Lascaris. Having entered the Benedictine Order, he devoted himself to Greek lexicography, and in 1496 published his *Thesaurus cornucopiae et horti Adonidis,* a collection of 34 grammatical tracts in Greek For some time he was tutor to Giovanni dei Medici (afterwards Leo X), and also keeper of the Medicean library at Florence In 1514 Leo appointed him bishop of Nocera In 1517 he published a translation of the *Apophthegmata* of Joannes Stobaeus, and in 1523 appeared his *Etymologicum magnum, sive thesaurus universae linguae Graecae ex multis variisque autoribus collectus,* a compilation which has been frequently reprinted

GUARINO (GUARINUS) DA VERONA (1370–1460), one of the Italian restorers of classical learning, was born in 1370 at Verona, and studied Greek at Constantinople, where for five years he was the pupil of Manuel Chrysolaras. On his return to Italy he brought back a number of Greek mss He supported himself as a teacher of Greek, in 1436 he became, through the patronage of Lionel, marquis of Este, professor of Greek at Ferrara, and in 1438 and following years he acted as interpreter for the Greeks at the councils of Ferrara and Florence. He died at Ferrara on Dec 14, 1460

His principal works are translations of Strabo and of some of the *Lives* of Plutarch, a compendium of the Greek grammar, of Chrysolaras, and a series of commentaries on Persius, Juvenal, Martial, and on some of the writings of Aristotle and Cicero *See* Rosmini, *Vita e disciplina di Guarino* (1805–06), Sabbadini, *Guarino Veronese* (1885), Sandys, *Hist Class Schol* II. (1908); *Epistolario de Guarino Veronese* (2 vols and commentary) in *Miscellanea di Storia Veneta,* 8, 11, 14 (1915–19)

GUARNIERI or GUARNERIUS, a celebrated family of violin-makers of Cremona The first was Andreas (*c* 1626–1698), who worked with Antonio Stradivari in the workshop of Nicolo Amati (son of Geronimo). Violins of a model original to him are dated from the sign of "St Theresa" in Cremona His son Giuseppe (1666–*c.*1739) made instruments at first like his father's, but later in a style of his own with a narrow waist; his son, Pietro "of Venice" (b 1695), was also a fine maker. Another son of Andreas, Peter (Pietro Giovanni), commonly known as "Peter of Cremona" (b. 1655), moved from Cremona and settled at Mantua, where he too worked "sub signo Sanctae Teresae" Peter's violins again showed considerable variations from those of the other Guarnieri Hart, in his work on the violin, says, "There is increased breadth between the sound-holes; the sound-hole is rounder and more perpendicular; the middle bouts are more contracted, and the model is more raised"

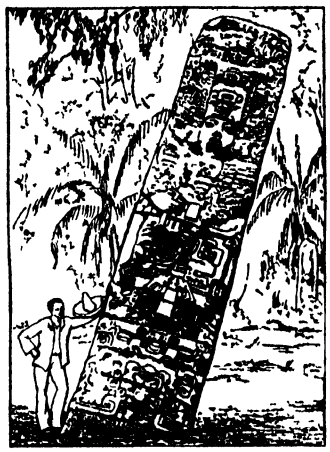
The greatest of all the Guarnieri, however, was a nephew of Andreas, Giuseppe, known as "Giuseppe del Gesù" (1687–1745), whose title originates in the I H S inscribed on his tickets His master was Gaspar di Salo His conception follows that of the early Brescian makers in the boldness of outline and the massive construction which aim at the production of tone rather than visual perfection of form The great variety of his work in size, model, etc, represents his various experiments in the direction of discovering this tone A stain or sap-mark, parallel with the finger-board on both sides, appears on the bellies of most of his instruments. Since the middle of the 18th century spurious instruments ascribed to this master have been abundant It was not until Paganini played on a "Joseph" that the taste of amateurs turned from the sweetness of the Amati and the Stradivarius violins in favour of the robuster tone of the Joseph Guarnerius Paganini's instrument is preserved in the Municipal Palace of Genoa (*See* VIOLIN)

GUASTALLA, a town and episcopal see of Emilia, Italy, province of Reggio, 18 m N by rail of Reggio, on the south bank of the Po, 79 ft. above sea-level It is also connected by rail with Parma and Mantua (via Suzzara) Pop (1921) 3,612 (town); 12,851 (commune) The cathedral dates from the 10th century Guastalla was founded by the Lombards in the 7th century. In 1307 it was seized by Giberto da Correggio of Parma In 1403 it passed to Guido Torello, cousin of Filippo Maria Visconti of Milan In 1539 it was sold by the last female descendant of the Torelli to Ferrante Gonzaga In 1621 it was made the seat of a duchy, but in 1748 it was added to the duchies of Parma and Piacenza

GUATEMALA, the most populous and the second largest country of Central America The name was formerly applied to the captain-generalcy of Spain which included not only the five Central American countries, extending southward to approximately the present northern border of the Republic of Panama, but also included, to the northward, most of the present Mexican State of Chiapas Following the independence from Spain in 1821, and the separation of the Central American countries from the Mexican empire of Iturbide two years later, the name Guatemala was applied to the region formerly included in 10 of the 15 provinces; *i e*, Chiapas was retained by Mexico and the provinces of Honduras, San Salvador, Nicaragua and Costa Rica became individual entities, recognized as such even through the various attempts to form a Central American Union out of the five countries (*See* CENTRAL AMERICA, where, also, the early history of Guatemala is told) The origin of the name, Guatemala, is certainly Indian, but its derivation and meaning are undetermined. Some students suggest that the original form was Quauhtematlan (which would indicate an Aztec rather than a Mayan origin, a thing most unlikely) meaning "land of the Eagle," and others hold its origin was Uhatezmala, meaning "Mountain vomiting water," referring to the so-called Volcano of Water, or "Agua" which destroyed Ciudad Vieja (*q v*), the first Spanish capital of the captain-generalcy

The present republic of Guatemala lies between 13° 42′ and 17° 49′ N, and 88° 10′ and 92° 30′ W Its area is approximately 48,290 sq m, making it thus slightly smaller than Nicaragua, in claimed extent, although it is possible that the actual area of Guatemala is slightly larger (a monograph issued by the department of commerce of the United States in 1927 puts Nicaragua's area as "some 45,000 sq m," and boundary disputes and incomplete surveys make all areas and most population figures extremely "approximate" in Central America) The population of Guatemala is put officially at 2,454,000, or about 46 inhabitants to the square mile; the country has a coast line of about 70 m on the Caribbean and 200 m on the Pacific shores Its boundaries on the north and west, which touch Mexico, were fixed by treaty, finally on May 8, 1899, which set the Suchiate river, from the Pacific inland, as the start of an irregular line which runs generally northwestward until it strikes the parallel of 17° 49′ N, which it follows to the border of Belize or British Honduras The eastern

border, with Belize, follows the meridian of 89° 20′ W., southward to the River Sarstoon, which it follows eastward to the Gulf of Honduras on the Caribbean sea; this boundary was set by the treaty of July 9, 1893. The Gulf of Honduras, an arm of the Caribbean, forms the short shoreline of Guatemala on Atlantic waters. The boundary with Honduras on the east is still in dispute, both countries claiming large areas within the generally accepted limits of the other. Many efforts have been made to adjust this question, the last, in 1928, under the aegis of the United States, resulting in a temporary agreement. The south-eastern boundary with Honduras is generally accepted by the two countries, and the south-eastern line touching on El Salvador is accepted and marked, chiefly along natural lines



MAYAN MONUMENT DISCOVERED IN THE JUNGLES OF GUATEMALA, WHERE IT HAD STOOD FOR OVER A THOUSAND YEARS

Physical Description.—Guatemala is divided into five regions —the lowlands of the Pacific coast; the volcanic mountains of the Sierra Madre; the so-called plateaux immediately north of these; the mountains of the Atlantic versant; the plain of Peten.

(1) The Pacific coastal plains extend along the entire southern seaboard, with a mean breadth of 50 m, and link together the belts of similar territory in Salvador and the district of Soconusco in Chiapas, Mexico. This region is now being developed as a tropical agricultural section of considerable importance.

(2) The precipitous barrier of the Sierra Madre, which closes in the coastal plains on the north, is similarly prolonged into Salvador and Mexico. It is known near Guatemala city as the Sierra de las Nubes, and enters Mexico as the Sierra de Istatan. It forms the main watershed between the Pacific and Atlantic river systems. Its summit is not a well-defined crest, but is often rounded or flattened into a table-land. The direction of the great volcanic cones, which rise in an irregular line above it, is not identical with the main axis of the Sierra itself, except near the Mexican frontier, but has a more southerly trend, especially towards Salvador; here the base of many of the igneous peaks rests among the southern foothills of the range. It is, however, impossible to subdivide the Sierra Madre into a northern and a volcanic chain; for the volcanoes are isolated by stretches of comparatively low country; at least 13 considerable streams flow down between them, from the main watershed to the sea The volcanic cones rise directly from the central heights of the Sierra Madre, above which they tower; for in reality their bases are, as a rule, farther south, east of Tacana, which marks the Mexican frontier, and is variously estimated at 13,976 ft and 13,900 ft, and if the higher estimate be correct is the loftiest peak in Central America. The principal volcanoes are—Tajamulco (13,517 ft); Santa María (12,467 ft) which has been in eruption since 1902, after centuries of quiescence, in which its slopes had been overgrown by dense forests; Atilán (11,719), overlooking the lake of that name; Acatenango (13,615), which disputes the claim of Tacana to be the highest mountain of Central America, Fuego (*i.e.*, "fire," variously estimated at 12,795 ft. and 12,582 ft), which received its name from its activity at the time of the Spanish conquest; Agua (*i.e.*, "water," 12,139 ft) so named in 1541 because it destroyed the former capital of Guatemala with a deluge of water from its flooded crater; and Pacaya (8,390), a group of igneous peaks which were in eruption in 1870.

(3) The so-called plateaux which extend north of the Sierra Madre are in fact high valleys, rather than table-lands, enclosed by mountains A better idea of this region is conveyed by the native name *Altos* or highlands, alhough the section so designated by the Guatemalans includes the northern declivity of the Sierra Madre. The mean elevation is greatest in the west (Altos of Quezaltenango) and least in the east (Altos of Guatemala). A few of the streams of the Pacific slope actually rise in the Altos, and force a way through the Sierra Madre at the bottom of deep ravines. One large river, the Chixoy, escapes northwards towards the Atlantic.

(4) The relief of the mountainous country which lies north of the Altos and drains into the Atlantic is varied by innumerable terraces, ridges and underfalls; but its general configuration has been compared with the appearance of a "stormy sea breaking into parallel billows." The parallel ranges extend east and west with a slight southerly curve towards their centres. A range called here the Sierra de Chama, which, however, changes its name frequently from place to place, strikes eastward towards British Honduras, and is connected by low hills with the Cockscomb mountains; another similar range, the Sierra de Santa Cruz, continues east to Cape Cocoli between the Polochic and the Sarstoon rivers, and a third, the Sierra de las Minas or, in its eastern portion, Sierra del Mico, stretches between the Polochic and the Motagua. Between Honduras and Guatemala the temporarily accepted frontier is that along the Sierra de Merendon.

(5) The great plain of Peten, which comprises about one-third of the whole area of Guatemala, belongs geographically to the Yucatan peninsula, and consists of level or undulating country, covered with grass or forest Its population numbers less than two per square mile, although many districts have a wonderfully fertile soil and abundance of water. The greater part of this region is uncultivated, and only utilized as pasture by the Indians, who form the majority of its inhabitants, and as a source of chicle, the basis of chewing gum Peten was for centuries, however, the site of great cities of the later Maya empire and much of the important archaeological work now being done in Central America is going forward in this region It is also the scene of petroleum prospecting.

Guatemala is well watered, not only on the eastern slopes (as is common along the American continents) but also on the Pacific slope and in the highlands On the western side of the sierras the versant is short, and the streams, while very numerous, are consequently small and rapid, but on the eastern side a number of the rivers attain a very considerable development. The Motagua, whose principal head stream is called the Rio Grande, has a course of about 250 m., and is navigable to within 90 m. of the capital, which is situated on one of its confluents, the Rio de las Vacas. It forms a delta on the south of the Gulf of Honduras. Of similar importance is the Polochic, which is about 180 m. in length, and navigable about 20 m. above the river-port of Telemán Before reaching the Golfo Amatique it passes through the Golfo Dulce, or Lake Izabal, and the Golfete Dulce. A vast number of streams, among which are the Chixoy, the Guadalupe, and the Rio de la Pasion, unite to form the Usumacinta, which in its early stages passes along the Mexican frontier, and then flowing on through Chiapas and Tabasco, falls into the Bay of Campeche. The Chiapas follows a similar course.

There are several extensive lakes in Guatemala. The lake of Peten or Laguna de Flores, in the centre of the department of Peten, is an irregular basin about 27 m long, with an extreme breadth of 13 miles. In an island in the western portion stands Flores, a town well known as the centre of the archaeological work now being carried on. On the shore of the lake is the stalactite cave of Jabitsinal, of local celebrity; and in its depths, according to the popular legend, may still be discerned the stone image of a horse that belonged to the conqueror, Hernando Cortes. The Golfo Dulce is, as its name implies, a fresh-water lake, although it is virtually an arm of the Caribbean; comparable on a smaller scale to Lake Maracaibo in Venezuela. It is about 36 m. long, and would be of considerable value as a harbour if the bar at the mouth of the Rio Dulce did not prevent the upward passage of seafaring vessels. As a contrast the lake of Atitlán is a beautiful land-locked basin encompassed with lofty mountains. About 9 m. south of the capital lies the Lake of Amátitlan (*q.v.*) with the town of the same name. On the borders of Salvador and Guatemala there is the Lake of Guija, about 20 m. long and 12 broad, at a height of 2,100 ft. above the sea. It is connected by the river

Ostuma with the Lake of Ayarza which lies about 1,000 ft. higher, at the foot of the Sierra Madre.

The geology, fauna and flora of Guatemala are discussed in the article CENTRAL AMERICA. The bird-life of the country is remarkably rich; one bird of magnificent plumage, the quetzal (*Trogon resplendens*), has been chosen as the national emblem.

Climate.—The climate is healthy, even on the coasts, where the malarial fever that was so long the curse of the country has been largely conquered by a growing adoption of modern sanitation. The rainy season in the interior lasts from May to October, but on the coast often continues until December. The coldest month is January, and the warmest is May.

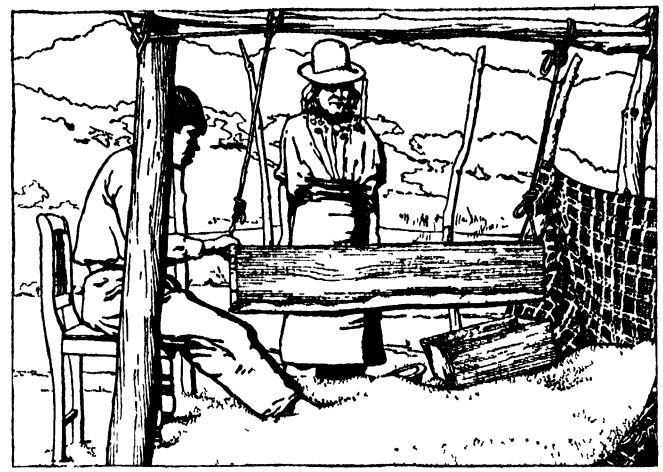
The average rainfall is heavy, especially on the Atlantic slope, where the prevailing winds are charged with moisture from the Gulf of Mexico or the Caribbean sea; at Tual, a high station on the Atlantic slope, it reaches 195 in ; in central Guatemala it is only 27 inches. Towards the Atlantic rain often occurs in the dry season, and there is a local saying near the Golfo Dulce that "it rains 13 months in the year." Fogs are not uncommon In Guatemala, as in other parts of Central America, each of the three climatic zones, cold, temperate and hot, has its special characteristics, described in the article on CENTRAL AMERICA

Natural Products.—The minerals discovered in Guatemala include gold, silver, lead, tin, copper, mercury, antimony, coal, salt and sulphur; but it is uncertain if many of these exist in quantities sufficient to repay exploitation. Gold is obtained at Las Quebradas near Izabal, silver in the departments of Santa Rosa and Chiquimula, salt in those of Santa Rosa and Alta Vera Paz During the 17th century gold-washing was carried on by English miners in the Motagua valley, and is said to have yielded rich profits; hence the name of "Gold Coast" was not infrequently given to the Atlantic littoral near the mouth of the Motagua

The area of forest has not been seriously diminished except in the west, and still amounted to 2,000 sq m in 1925. Besides chicle, and a small quantity of wild rubber of the *Castillao elastica*, it yields many valuable dye-woods and cabinet-woods, such as cedar, mahogany and logwood. Fruits, grain and medicinal plants are obtained in abundance, especially where the soil is largely of volcanic origin, as in the Altos and Sierra Madre Parts of the Peten district are equally fertile, but not greatly developed The vegetable products of Guatemala include coffee, cocoa, sugar-cane, bananas, oranges, vanilla, aloes, agave, ipecacuanha, castor-oil, sarsaparilla, cinchona, tobacco, indigo, chicle, rubber and the wax-plant.

Inhabitants.—Guatemala's population, 2,004,900 by the 1921 census and placed at about 2,454,000 by the U S department of commerce in 1926, is at least 60% Indian, close to 30% mixed blood whites and Indians and less than 5% pure white of Spanish strain, including about 12,000 Europeans and Americans The balance, of roughly 5%, are negroes and mixtures of Indian and negro, the latter proudly calling themselves "Carib Indians" in some sections, and probably, on the Caribbean shores, the descendants of the original Carib and Mosquito Indians and the slaves brought in by the Spaniards The pure negro population is now largely if not entirely an importation from the British West Indies, brought in recent years by the fruit companies to furnish the labour for the banana plantations Prior to the extensive sanitation of the Caribbean lowlands, chiefly in the beginning by the banana companies, the Indians refused to come down to the fever-infested sections where their traditions, as the ruins of earlier civilizations seem to bear out, hold that vast numbers of their ancestors died in tropical plagues in centuries past

The Indian population of Guatemala is more nearly aboriginal in its habits and life than in any similar section of North or probably of South America The existent tribes have been only sketchily studied, for the anthropology and ethnology of Central America are still almost untilled scientific soil, although it is known of course that the living Indians of Guatemala come, in general, from the Maya or from the yet older and less highly developed kindred Quiché strains (*see* MAYA). The Indian country is in the highlands, the "Altos" above described It is estimated that at least 18 different Indian languages are spoken in Guatemala, and in the highland hinterland the tribes, with their distinctive dress, still rigorously maintained and distinguishing village from village as well as tribe from tribe, are sharply separated from one another in manners and language, Spanish being the only common tongue, and that unknown to thousands. The Governments of Guatemala, from the Spaniards down to to-day, have handled the Indians by converting the *caciques*, or tribal and



MAYA-QUICHE INDIANS OF THE UPLANDS ENGAGED IN WINNOWING WHEAT
Wheat is raised by these Indians above an altitude of 8,000 ft. Domestic animals trample the grain, and it is then winnowed in a cradle-like screen

village chieftains, into Government officials, and the control by the central Government of the Indian provinces is virtually feudal in form, the representative of the central authority still being a military official, of varying rank, according to the importance of his post. The Indians, however, form the basis of the army, and many pure blooded Indians have risen high in military rank, the common soldier remaining Indian, however, with his loyalty represented by his affection for his immediate superiors, a trait which has been of considerable importance in time of threatened revolution The barefooted Indian soldier, with his canvas leggings binding his khaki uniform to his bare ankles, remains the basis of Guatemalan Government, so far as the preservation of public order is concerned, and his *caciques*—dignified Indian chieftains dressed in elaborately embroidered robes, with kilts and tartans of their village and with ornate staffs of office—are the representative of an authority more absolute than that wielded by the white or mixed-blood officer who is nominally the political chief of the area

The Indians differ but slightly in physical mien, being of dark copper skin, stocky build, with coarse, straight black hair, high cheek-bones and low forehead, although the suggestion of the oriental type comes in more often than in Mexico, and almost as much as in the Indians of the highlands of Bolivia and Peru, in South America In their tribal life, the Indians are deeply loyal, but outwardly secretive. Nominally belonging to the Roman Catholic faith, they have many strange tribal dances, and the festivals of the church are made the occasion for rites often associated with images either on or quite outside the church altars; an immense folk-lore, with particular reference to witchcraft and disease, has been noted but only partially analysed by local and foreign students

The Indian, forming the chief labour supply of the country (with the exception of the imported negroes who are almost entirely confined to the Caribbean littoral) are handled in feudal fashion by the coffee planters and by the officials who must assist them The abuses of earlier days, in the virtual slavery or peonage on the coffee plantations, have been somewhat ameliorated in recent years, but the wage is still miserably small, the system of debt indenture is widespread, with the Indians evading it by assuming varied Spanish names—their own are so difficult to pronounce or at least to reduce to paper that the landlords encourage the exchange—or by disappearing from their highland villages when the picking season begins on the coffee plantations A practice growing in use amongst the coffee planters is to purchase

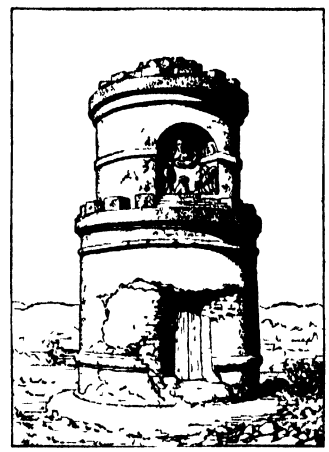
estates in the highlands, where the Indians are given free use of the tiny farming sections in the confined plains between the hills, their only obligation being a guarantee to come and work at the coffee picking at regular wages when the landlord calls upon them.

The chief centres of population are the capital, Guatemala city, with about 115,000 people, Antigua, 40,000; Quezaltenango, 30,000; Totonicapan, 28,000, Chiquimula, 25,000; Coban, 23,000; Sololá, 17,000, Esquintla, 13,000, Hueheutenango, 12,000; Retalhuleu, 7,000, Puerto Barrios, 2,500, Livingston, 2,500, San José, 1,500; Champerico, 1,500 Most of these towns and cities are described under separate headings

Political Organization.—The present constitution of Guatemala dates from Dec 11, 1879, although it was preceded by two others, those of 1851 and 1876, following the separation of Guatemala from the Central American Federation The Government is divided into the three branches, executive, judiciary and legislature. Citizenship is determined either by birth in the republic or Guatemalan parentage, and includes nationals of the other Central American republics who are resident in Guatemala, unless they expressly elect to belong to the country of their original nationality Suffrage is limited to males over 21 who have income or livelihood, and to soldiers over 18 Education is free, compulsory and non-religious The various guarantees in the constitution may be suspended by the executive in time of crisis, with the approval of the council of ministers This "suspension of guarantees" is usually loosely translated into English as "putting the country under martial law," but is not comparable to this situation, as it means primarily the temporary strengthening of the police power by making inactive the usual legal subterfuges by which offenders may avoid arrest or escape penalties. The legislative branch of the national Government consists of one chamber only, with one member for every 20,000 inhabitants of the country The members of this national assembly are elected by popular vote every four years, election of half the body being held biennially. The national assembly also canvasses the vote for president, and may elect the president, in case there is no majority, from the three leading candidates It also chooses the two "designates" who are the virtual vice-presidents, and who succeed the president in case he is incapacitated The assembly also elects five members of the council of State and chooses the permanent commission of seven of its members to act during recess

The executive power rests in the president, who is chosen for six years by popular vote He appoints his cabinet of six secretaries of State, who are responsible officers, and may speak and vote in the national assembly With the five members appointed by the assembly and four named by the president, the cabinet forms the council of State, a body with purely advisory functions, but often of great importance The judiciary consists of a supreme court of five members, six courts of appeal of three members each, and 26 courts of first instance. Judges are chosen by direct popular vote and serve for a term of four years The country, for purposes of administration, is divided into 23 departments, each presided over by a *jefe politico* or prefect appointed direct by the president The municipalities are governed by *alcades* (or mayors) and councils chosen by direct vote of the people; these have the power to assess and collect local revenues The prefect, representing the central government, has the authority to amend the ordinances and enactments of the councils of the towns in his department. The police power is handled both by local constabulary in the towns and by the military, and is generally thoroughly efficient and effective There is some public care of the unfortunate but in general eleemosynary work is left to the religious denominations, chiefly Roman Catholic

Education.—Education, while free laical and compulsory, is still far from efficient, the frank estimate of the Government being that only 10% of the population can read and write In 1927 there were 2,761 Government primary schools, and in addition, some 135 private primary schools including the parochial schools and those operated for the children of foreigners School enrolment was 103,341 and attendance 77,838 in 1925 On all the plantations where there are more than ten children the owners are by law required to furnish teachers and schools, but this rule is not as generally observed as might be wished. In higher education, there is the University of Guatemala, established in 1918, where courses in law, medicine, engineering, art and music are given, chiefly by means of lectures from the eminent professional men of the capital. There are two institutes for the education of teachers in Guatemala city, one for men with about 500 pupils and one for women with about 300. Similar normal schools are maintained at Quezaltenango and at Chiquimula There are 48 professional, normal, secondary and special schools The National library contains about 20,000 volumes



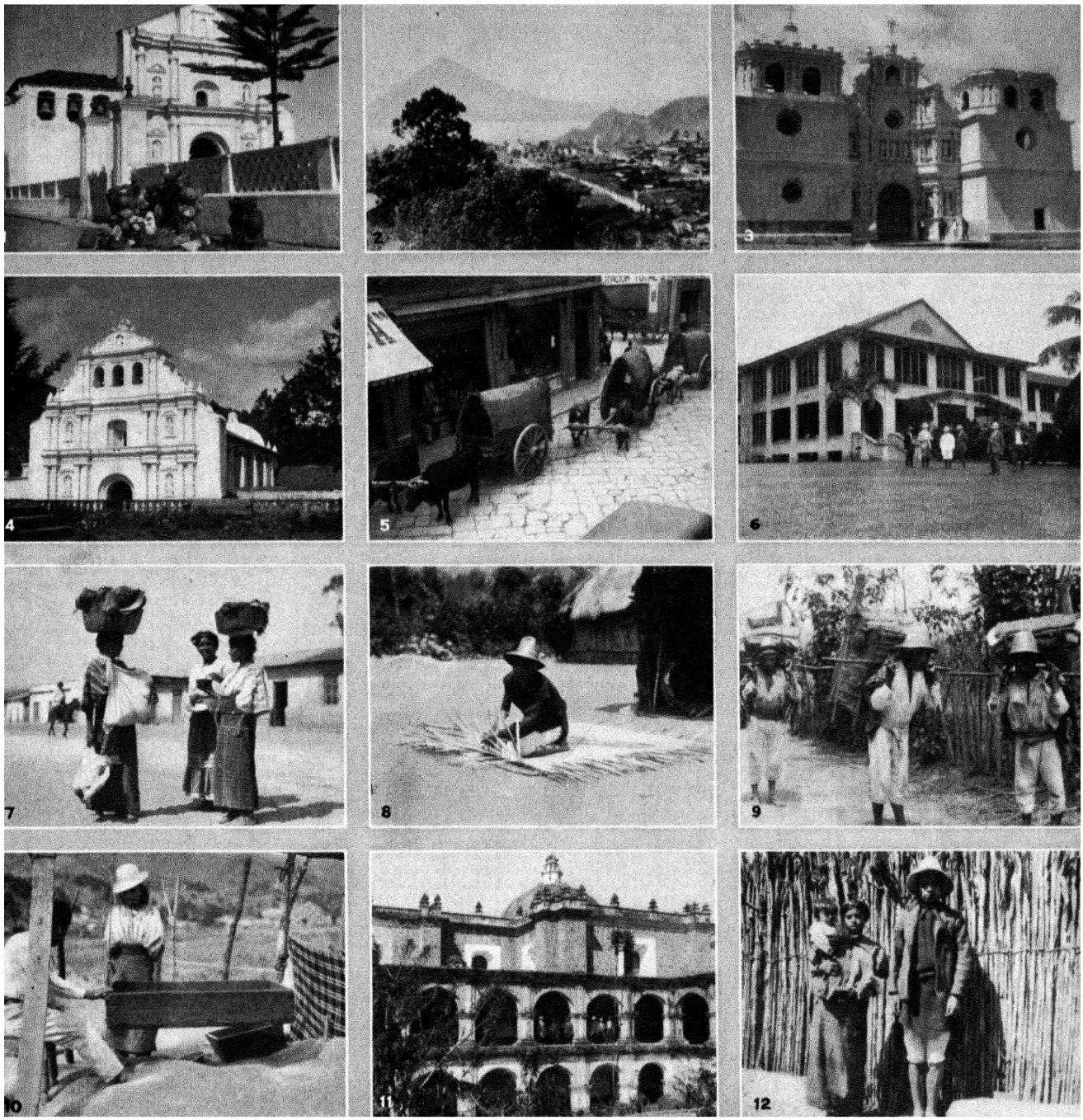
THE TOWER OF THE FIRST CHURCH BUILT IN THE VALLE DE LAS VACAS

Religion.—The prevailing form of religion in Guatemala is Roman Catholic, the church claiming virtually 90% of the population as communicants The archbishop of Guatemala is the primate of Central America and the church influence is very powerful There are some Protestant missionaries and mission schools The Indians are theoretically Roman Catholics, but in some regions their religious practices are influenced by their not always coherent race memories of idolatrous conditions and practices, and some of the great Christian festivals bring out practices not entirely in accord with the strictest tenets of the church On the other hand, much of the white population is notably and frankly religious, and while this is somewhat divided on political lines, and the church has at times been accused of opposing the prevailing liberal Government with serious consequences, the religious attitude of the people of the higher classes has not been greatly affected.

Finance.—Guatemala is on a gold basis, the unit of currency being the "quetzal," named after the national bird of Guatemala, and equal in value to the American dollar The establishment of the gold currency in Nov 1924 followed years of financial chaos in which the old peso, at one time virtually equal to the present quetzal, dropped almost to 1% of its old value, and the stabilization was finally made on the basis of 60 to 1 The depressed value of the paper peso was traceable to heavy loans made by the executive from the local banks, various presidents of the country giving the various banks, in return for the specie taken, the right to issue paper money without the proportionate metallic reserve required by the former laws The Government loans totalled in value, at the exchange rate at the time of stabilization and the creation of the gold quetzal in 1924, about 180,000,000 paper pesos, but in exchange for this debt there were about 400,000,000 paper pesos, in bank notes, in circulation The final arrangement of the Government was the guarantee of these paper pesos at a fixed rate of 60 to the quetzal, and then, on a graduated scale, the retirement of the original debt of about (at the agreed rate of exchange) 3,000,000 quetzales The balance of the paper money in circulation (about 220,000,000 pesos or about 3,700,000 quetzales) is equally guaranteed by the Government and will in time also be retired, through the operation of the national bank of issue arranged in the financial plan The funds for this conversion have been obtained from the revenues of the country, chiefly through a tax of one quetzal per bag of coffee (of 200 lb), a tax which through the recent years of high prices for coffee has been easily paid, until the Guatemalan Government is convinced that it will complete its financial stabilization without recourse to a foreign loan. The sole right to issue paper currency is now vested for ten years in the new Government-controlled Banco Central, under a contract dated June 30, 1926

The foreign gold debt of Guatemala was in 1928 less than £2,000,000 sterling, chiefly held in England and Germany, and paying 4%; the internal debt was approximately the same. The service on the foreign debt in 1926–27 was 242,704 99 quetzales.

The income of the Federal Treasury in the fiscal year 1926–27



PHOTOGRAPHS, THOMAS F. LEE

CITY AND COUNTRY LIFE IN GUATEMALA

1. Church in Textepec near Antigua. Indian pack trains gather morning and evening in the plaza in front of the church
2. Looking down upon Sololá and Lake Atitlán with the volcanic cone of Mt. Atitlán in the distance. The lake, 6,000 ft. above sea level, apparently lies in an ancient crater
3. An old Spanish church in Antigua. One tower which was damaged in the earthquake of 1773 has never been rebuilt
4. A white church on the mountain ridge overlooking Quezaltenango, the place of worship of one of the Indian tribes of the highlands.
5. View of a business street in Guatemala city, showing the pavement laid by the Spaniards centuries ago, and the peaked ox-carts
6. The hospital maintained by the United Fruit Company at Quiragua
7. Women carrying chickens and vegetables to market. The woman at the left is holding a baby in a *reboso* swung from her shoulders
8. Indian weaving a reed mat or *petate,* an indispensable domestic article, used as a bed at night, and as a raincoat, or a covering for any burden at other times
9. Indian carriers of the highlands transporting burdens in *cacastes,* box-like frames balanced on the back by means of a long stick
10. Maya-Quiché Indians of the uplands winnowing wheat in a cradle-like screen. The *zarape* (right) protects the grain from strong winds
11. Ruins of Escuela de Cristo (School of Christ), an imposing Spanish building at Antigua destroyed in the earthquake of 1773
12. A Guatemalan Indian with his wife and child standing against the woven cornstalk fence which surrounds his little garden

was 11,741,348.96 quetzales, and the expenditures during the same period 11,217,358.98 quetzales. Of the receipts, Q5,344,653.88 were from import duties; Q2,237,468.98 from export duties; Q2,339,712 48 from the liquor tax; Q858,380 75 from miscellaneous taxes; Q646,044.09 from consular fees; Q120,210 64 from, and for, special funds; Q292,813.77 from the Federal telegraphs; Q202,213.31 from the post office; Q280,042 43 profits from the coinage of the new silver put into circulation; Q89,741 98 from certain payments by the banks. The telegraphs and the post office were the only branches of the Government which showed a loss

Guatemala is well supplied with banks, the strongest, outside the new central bank of issue, being the six banks which formerly had the right of issue through their contracts with the Government mentioned above, namely, the Banco de Guatemala, International Bank of Guatemala, American Bank, Banco del Occidente, Banco Agrícola Hipotecano and Banco Colombiano Private banks include branches of the Anglo-South American Bank, the Nottebohm Banking Corporation, Pacific Bank and Trust Company, Schlubach Sapper and Co and Rosenthal e Hijos

Defence.—The Guatemalan army is theoretically made up of all the males of the white and mixed population, who are subject to call to arms from the age of 18 onward Under the treaty of Feb. 7, 1923, with the other Central American countries, the army contains 5,200 officers and men, the officers being the product of the official military schools where excellent instruction and training are given, and the rank and file of the army largely made up of Indians. The effective strength of the army subject to call is 57,000 active and 30,000 reserve. The army budget in 1926–27 was Q2,191,711 62

Industries.—Guatemala's chief industry is coffee growing, with an annual production of about 100,000,000 lb , bananas coming second with some 6,000,000 bunches and about 20,000,000 lb of sugar as the third most important item Cotton is grown in some sections, with a total production of about 3,000,000 lb , and there are cotton mills, using the native and imported cotton to make goods of the cheaper qualities to meet local demands Wheat is grown in the highlands, and there are several flour mills Other industries include breweries, distilleries, shoe factories, tanneries, etc There has been some mining, but no great returns come from this industry Various exploring parties have been seeking petroleum, and concessions for drilling have been taken up by some of the great foreign companies Under the new petroleum laws, oil concessions run for 40 years and the sole tax is 10% of the gross oil taken out in two territories near the sea-coast and 8% in two other delimited sections further from transportation

Commerce.—Guatemala exports coffee, sugar and bananas, and some cotton, the total exports of these commodities being approximately equal to the production noted above, with the exception of cotton, whose exports are a small item as yet The imports of Guatemala consist chiefly of machinery, including automobiles, luxuries of various sorts and fabrics of cotton, silk and wool, shoes and furniture Exports average around Q15,000,000 with imports of Q11,000,000 to Q12,000,000, the United States taking over 85% of the exports and furnishing 60% of the imports, Germany being second in the exports taken and Great Britain second as a source of Guatemalan imports

Communications.—The railways of Guatemala are all controlled by the International Railways of Central America, an American company headed by Minor C Keith and operating 597 m of railway, in addition to the Salvador branch from Zacapa, opened in 1929, and the lines in Salvador owned by the same company The International railways cross Guatemala from Puerto Barrios on the Caribbean sea to San José on the Pacific, the capital, Guatemala, being on the main line 198 m from Puerto Barrios and 75 m. from San José From the junction at Santa María, near San José, the line to the Mexican border, paralleling the Pacific, turns off, this line has a branch from Retalhuleu to the Pacific port of Champerico. A considerable portion of the mileage of the International railways on the eastern side cover the banana plantations belonging to or leased by the United Fruit Company This company also has extensive railways of its own in the plantations An electric line from the International railways to Retalhuleu and Quezaltenango, is also in partial operation

The telegraph lines of the Government cover the country effectively, and in addition there are three wireless stations, at Guatemala, Quezaltenango and Puerto Barrios The telephone system in Guatemala city is good, and there are long distance lines controlled by the fruit companies The All America cables enter from the Pacific side, at San José, and are available to the country via the Government telegraph lines.

The highway development in Guatemala is still in its early stages, although the road from Guatemala to Antigua is open virtually all the year, as is the new overland highway, recently graded, which links Guatemala with San Salvador, the capital of the neighbouring republic of El Salvador A highway from Retalhuleu to Quezaltenango and on to Solola is also passable most of the year, and there are many other highways, but there are no hard surfaced roads in Guatemala, and broken rock is used only where necessary The beginnings that have been made indicate, however, an extensive interest, and the funds expended have been wisely and effectively invested The growing importations of automobiles and their increasing use are having a direct effect on the public interest in road building

History.—The history of Guatemala, as linked with Central America in general, has been given under that heading Rafael Carrera (1814–65), the great conservative president of Guatemala, was the leader under whom the separate republic of Guatemala was formed after the dissolution of the Central American Federation, in 1839 In 1851, Carrera defeated the Federalist forces from Honduras and Salvador at La Arada, near Chiquimula, close to the Honduran frontier, and the same year the new constitution was promulgated and Carrera elected president, an office which in 1854 was conferred upon him for life The struggle for the domination of Central America went on, with Carrera as the supporter of the conservative and clerical forces He was aided at one time by Costa Rica and Nicaragua, and occupied San Salvador in the course of a campaign which resulted in his becoming the dominant figure and virtual power behind the Government of all five of the Central American countries Carrera died in office, being succeeded by General Cerna, in April, 1865 The liberal elements of Guatemala grew in strength after Carrera's death and in May, 1871, President Cerna was deposed and later the archbishop and the Jesuits were exiled Justo Rufino Barrios (1835–85), the liberal leader who had directed the opposition to the conservatives, was elected liberal president of Guatemala in 1873 He was a militant advocate of the Central American Union and sought to impose it by arms when his peaceful overtures failed He invaded Salvador in 1885, met his former friend President Zaldivar of Salvador, in battle and Barrios fell in the contest, on April 2, 1885 He was succeeded by Gen Manuel Barillas, who quickly made peace with Salvador and the other three Central American countries

General José María Reina Barrios was elected president in 1892, re-elected in 1897 and assassinated on Feb 8, 1898 Succeeded by Vice-President Morales, the power passed, by election to Manuel Estrada Cabrera (1857–1924) in the fall of the same year. Estrada Cabrera ruled, continued in office by frequent re-elections, until April, 1920, when he was forced to resign in the face of a revolutionary movement which had spread to the national assembly Estrada Cabrera, as dictator of Guatemala, was responsible for many improvements in the line of education, railways and industrial development, but was bitterly opposed by a large proportion of the substantial elements of the country In 1906, his predecessor in the presidency, Gen Manuel Barillas, invaded Guatemala, and soon Salvador, Costa Rica and Honduras were arrayed against Estrada Cabrera, with Nicaragua inactive but unfriendly The situation was saved by the intervention of the United States and a subsequent meeting of representatives of the five republics in Washington, where the treaties of 1907 were drawn up

The Unionist movement of 1920 became, in Guatemala, a movement against Estrada Cabrera, and, as noted, he was forced to resign, after a brief but lively revolutionary campaign, confined solely to the capital The national assembly, naming Carlos Her-

rera, a conservative and unionist, as first designate, he was elevated to the presidency. A man of culture and wide experience, President Herrera began the rehabilitation of the country, and the restoration of the capital from the ruin following the earthquake of 1917–18. On Oct 10, 1921, he signed, with Honduras and Salvador, the pact for the Central American Union

On Dec. 7, 1921, the liberals overthrew the Herrera Government, and in the following March, Gen José María Orellana was elected president for a term of six years. Gen Orellana, leader of the military faction, and a former chief of staff of President Estrada Cabrera, proved himself an able and careful administrator, as well as a firm executive, and Guatemala progressed in stability and peace during his Government, which was ended by his sudden death in Oct 1926.

Gen Lázaro Chacon, known previously chiefly as a soldier, was first designate and became president on the death of Gen Orellana, and in the election which was subsequently called, was elected for a six year term He has carried forward the policies of Gen Orellana, solidified the position of the country and completed the financial reforms described above

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GUATEMALA, GUATEMALA LA NUEVA or **NEW GUATEMALA,** the capital city of the Central American republic of the same name, was founded, on its present site, following an earthquake which in 1773 wrecked the older capital, now known as Antigua (or Ancient) Guatemala (*q v*), the government being formally transferred to the present site in 1779 Guatemala lies at an altitude of 4,877 ft above the sea on a virtually isolated tableland surrounded, except for one side, by deep gullies or *barrancas,* and in the opinion of its founders destined to be free from earthquakes, a hope which was weakened by a destructive tremor in 1874, and blasted when, in 1917–18, the city was virtually razed to the ground by a series of earthquake shocks The site was not abandoned, however, and Guatemala has since been rebuilt on the same streets and building lots as before

Guatemala lies 75 m by railroad from San José, the Pacific port, and 198 m from Puerto Barrios, the Caribbean port and terminus of the International railways of Central America It is also connected by rail with Ayutla, at the Mexican border (180 m distant), and with San Salvador and other cities of the adjoining republic of El Salvador, by an extension of the International railways from the station of Zacapa, on the Guatemala-Barrios line, which was to be opened in 1929 Guatemala City enjoys the excellent climate which characterizes highland cities of the tropics, which have even temperatures of relative coolness The temperature averages 72° F, the highest being 85° and the lowest 50°, on the average The sun, at midday, is glaring and hot, but the city is very comfortable in the shade at all hours

The population, in 1925, was 105,938 It is the largest and most important city in Central America, and is the home of the ambassador of Mexico, ministers of the United States, Great Britain, Germany, France and Spain, as well as consuls-general or consuls of these and other powers It is the commercial centre of the country, the headquarters of the many banks and agencies of foreign banking institutions It is the centre of the Guatemalan coffee trade, the chief source of one of the finest of the so-called "mild" coffees of commerce, and has a number of small industries, including a brewery, shoe and soap factories, furniture and cigar factories and tanneries It has several good hotels and one excellent one, the latter being a recent construction of reinforced concrete, a type of building material which is being used extensively for store and office buildings, clubs and private residences. There are also American, French, German and Spanish operated hostelries which cater for their nationals and visitors.

Guatemala is laid out on the usual gridiron pattern of the Hispanic-American city, comparatively wide streets being included in the plan

Guatemala's streets were paved for many years with flagstones 18 to 24 in square, the stone being cut by hand and brought for a considerable distance Settling and minor earthquakes and the heavy shocks of 1917 and 1918, made these streets extremely rough, as well as painfully glaring, as they had always been, in the sunlight, but in 1928, a new system of waterworks and drainage—the city lies on a gentle slope and has always enjoyed excellent health conditions—was begun, which is to include, ultimately, a new paving system. The city is well lighted with electricity; which is now furnished by an American company at rates which make the use of electricity for cooking a growing practice (W. THO.)

GUATOAN, an independent linguistic stock of South American Indians, made up of the single tribe of the Guatos. The small surviving remnant of the Guatos live on the Bolivian-Brazilian border, along the upper Paraguay river, chiefly about lakes Gaiba and Uberaba. It is probable that formerly they held a larger area. The Guatos are pre-eminently river folk, living most of their life in their dugout canoes They erect small temporary thatched shelters, occupied by a single family and always isolated rather than grouped in villages Their dress consists of a breech-clout and short kilt Their weapons are the bow and spear, and they live mainly on the products of the chase and on fish

See M Schmidt, *Indianer Studien in Zentral-Brazilien* (1905)

GUATUSO, an almost extinct Indian tribe dwelling on the forest-covered plains of San Carlos in northern Costa Rica An aura of romance, now dispelled, has credited them with white skins and red hair Their tongue is a Chibchan dialect, and their culture is of South American type

See Karl Sapper, "Ein Besuch bei den Guatuso in Costa Rica," in *Globus,* Band lxxvi (Braunschweig, 1899).

GUAVA, the name applied to the fruits of species of *Psidium,* a genus of the Myrtle family (Myrtaceae) The species which produces the bulk of the guava fruits of commerce is *P Guajava,* a small tree from 15 to 20 ft high, a native of tropical America and the West Indies It bears short-stalked ovate or oblong leaves, with strongly marked veins, and covered with a soft tomentum or down The flowers are borne on axillary stalks, and the fruits vary much in size, shape and colour, numerous forms and varieties being cultivated The variety of which the fruits are most valued is the white guava (*P Guajava,* var *pyriferum*) The fruits are pear-shaped, about the size of a hen's egg, covered with a thin bright yellow skin filled with soft pulp, also light yellowish and having a pleasant sweet-acid and aromatic flavour *P Guajava,* var *pomiferum,* produces a more globular or apple-shaped fruit, the red guava The pulp of this variety is darker than the former and not of so fine a flavour, therefore the first named is most esteemed for eating, both, however, are used in the preparation of preserves known as guava jelly and guava cheese, which are made in the West Indies and imported thence to England, the fruits are too perishable to allow of their importation in their natural state Both varieties have been introduced into various parts of the East where they have become naturalized

P variabile (also known as *P Cattleyanum*), a tree of from 10 to 20 ft high, a native of Brazil (the Araçá or Araçá de Praya), is the purple or strawberry guava The fruit, which is abundantly produced in the axils of the leaves, is large, spherical, of a fine deep claret colour; the rind is pitted, and the pulp soft, fleshy, purplish, reddish next the skin, but becoming paler towards the middle and in the centre almost or quite white It has an agreeable flavour, which has been likened to that of a strawberry At the time of the Spanish discovery the guava was in cultivation from Peru northward to Mexico In the United States guavas are grown in Florida and California

GUAYAMA, a town situated on a broad and fertile plain some 200ft above sea-level in the southern part of Porto Rico near the Caribbean sea Pop (1928), 10,360 The population of

the municipal district was 14,302 in 1920.

Guayama is an Indian name and means the "Region of Fire," so named because before the Spanish occupancy the prolonged drought season dried the vegetation and fires were frequent Since the American occupation, however, an extensive irrigation service has transformed the district into one of the richest and most prosperous in the island The town has communication north, east and west by first class highways with motor-bus service and daily mail. It has also rail service with Ponce and other sections to the west A branch of the great military highway built by the Spaniards extends from Cayey to Guayama, whose scenic attractions are unsurpassed Sugar is the principal product, the district being one of the largest producers of the island. Fruits, coffee, and tobacco are also produced The town has first-class schools, hospitals, waterworks and electric lights. (H. M. T)

GUAYAQUIL or **SANTIAGO DE GUAYAQUIL,** a city and port of Ecuador, capital of the province of Guayas, on the right bank of the Guayas river, 33 m above its entrance into the Gulf of Guayaquil, in 2° 1′ 18″ S, 79° 51′ 46 25″ W Pop (1928) about 100,000 The city is on a comparatively level plain, extending southward from the base of three low hills called Santa Carmen de la Cruz, between the river and the partially filled waters of the Estero Salado It is about 30 ft above sea-level, the lower parts of the town are partially flooded in the rainy season, but this has recently been improved by raising and paving streets. The old town is the upper or northern part, and is inhabited by the poorer classes, its streets being badly paved, crooked and pestilential The great fire of 1896 destroyed a large part of the old town, and some of its insanitary conditions were improved in rebuilding The southern part is the business and residential quarter of the better classes The buildings were chiefly of wood and the streets only surface drained, but sewerage systems have been installed and in some sections only stone or concrete may be used for building An imposing governor's palace has recently been built of concrete Other public buildings are the bishop's palace, town-hall, cathedral and nine churches, national college, episcopal seminary and schools of law and medicine, theatre, two hospitals, custom-house, several asylums and charitable institutions and a new concrete municipal building containing a library and museum Guayaquil is also the seat of a university with faculties of law and medicine The upper floors in business streets project over the walks, forming covered arcades

The year is divided into a wet (Jan to May) and a dry season. During the former the hot days are followed by nights of drenching rain The mean annual temperature is about 82° to 83° F, malarial and bilious fevers are common, the latter being known as "Guayaquil fever." Yellow fever has been eliminated by the Rockefeller Foundation The dry or summer season is considered pleasant and healthful

The water-supply is brought in iron mains from the Cordilleras 53 m distant The mains pass under the Guayas river and discharge into a distributing reservoir on Santa Ana hill, north of the city The street railways belong to two companies The Empresa Eléctrica del Ecuador operates 7 21 m and has 28 electric cars, carrying (1926) 13,000,000 passengers It was started about 1913 by the Empresa de Luz y Fuerza Eléctrica, controlled by local capital In 1925 the local company was purchased by the Electric Bond and Share company of New York. In July 1926 the tramway business under the name of "Tranvías de Guayaquil" was separated from that of the electric supply. In addition 21 m of street railway are operated by the Empresa de Carros Urbanos, in 1926 this company carried 5,574,299 passengers, mules draw its cars.

Guayaquil has telephone and electric light services, and telegraph communication is through the "All America Cables, Inc" whose cable lands at the small port of Salinas about 100 m west A railway is being constructed to this port, which is a good summer resort with fine sea bathing and dry climate Railway connection was established with Quito (278 m) in 1908 Steamboats go to the producing districts of the province along the Guayas river and its tributaries, on which boats run regularly as far up as Babahoyo (80 m) in the dry season, and for a distance of 40 m. on the Río Daule. Smaller boats navigate about 200 m of this river system Nearly all the exports of Ecuador are shipped through the port of Guayaquil. The Guayas river is navigable up to Guayaquil for steamers drawing 22 ft; larger vessels anchor at Puna, 40 m below Guayaquil, where cargoes and passengers are transferred to lighters and tenders. At Guayaquil there is a quay along the river front but the water alongside does not exceed 18 ft and steamers anchor a considerable distance out in the Guayas The principal exports are described in the article ECUADOR

Santiago de Guayaquil was founded on July 25, 1535 by Sebastián de Benalcazar at the mouth of the Río Babahoyo, then moved to the "estero" (at that time named Dima) and finally located on its present site by Francisco de Orellana in 1537 It was captured and sacked several times by pirates and freebooters in 1624 (by the Dutchman Jacob Heremite Clark), in 1683 (Edward David's crew) and in 1709 Owing to the flimsy construction of its buildings Guayaquil has been repeatedly burned, the greater fires occurring in 1707, 1764, 1865, 1896 and 1899 The city was made the see of a bishop in 1837.

GUAYAS or **EL GUAYAS,** a coast province of Ecuador Pop (1920 estimate) 210,100, area, 11,504 sq miles It is very irregular in form and comprises the low alluvial districts surrounding the Gulf of Guayaquil between the western Cordilleras and the coast It includes (since 1885) the Galápagos islands, lying 600m off the coast The province of Guayas is heavily forested and traversed by numerous rivers, for the most part tributaries of the Guayas river, which enters the gulf from the north This river system has a drainage area of about 14,000 sq m and an aggregate of 200m of navigable channels in the rainy season Its principal tributaries are the Daule and Babahoyo or Chimbo (also called Bodegas), and of the latter the Vinces and Yaguachi The climate is hot, humid and unhealthy, bilious and malarial fevers being prevalent The rainfall is abundant, the soil is deep and fertile. Agriculture and the collection of forest products are the chief industries The staple products are cacao, coffee, sugar-cane, cotton, tobacco and rice The cultivation of cacao is the principal industry, the exports forming about one-tenth of the world's supply. Stock-raising is also carried on to a limited extent. Among forest products are ivory nuts, cinchona bark, toquilla fibre and rubber The manufacture of so-called Panama hats from the fibre of the toquilla palm (commonly called *jipijapa,* after a town in Manabí famous for this industry) is a long-established domestic industry among the natives of this and other coast provinces, the humidity of the climate greatly facilitating the work of plaiting the delicate straws, which would be broken in a dry atmosphere Guayas is the chief industrial and commercial province of the republic, about four-fifths of the commerce of Ecuador passing through the port of its capital, Guayaquil There are no land transport routes in the province except the Quito and Guayaquil railway, which traverses its eastern half The sluggish river channels which intersect the greater part of its territory afford excellent facilities for transporting produce, and a large number of small boats are regularly engaged in that traffic. There are no large towns in Guayas other than Guayaquil Durán, on the Guayas river opposite Guayaquil, is the starting point of the Quito railway and contains the shops and offices of that line. The port of Santa Elena on a bay of the same name, about 65m W of Guayaquil, is a landing-point of the West Coast cable, and a port of call for some of the regular steamship lines. Its exports are chiefly Panama hats, hides and salt

GUAYCURUAN, an independent linguistic stock of South American Indians, so called from the Guaycurus, its best known tribe The tribes of this stock lived in the Argentine Chaco in the region west of the Paraná and Paraguay rivers, from a little above Santa Fé nearly to the mouth of the Pilcomayo and extending westward north of the Salado river, nearly to the foothills of the Andes After the early period of Spanish settlement, the Guaycuruan tribes expanded eastward some distance across the Parana below Corrientes, and further north, penetrated into southern Matto Grosso in Brazil The Toba are the best known tribe of the

stock to-day, the Abipones (*q v*), made famous by the missionary Dobrizhoffer in the 18th century, being now extinct.

See D. G. Brinton, "The Linguistic Cartography of the Chaco Region" (*Proc Amer Philos Soc* vol xxxvii); L Kersten, "Die Indianerstamme des Gran Chaco," etc (*Internat Archiv fur Ethnographie,* vol xvii pp 1–75)

GUAYMAS or **SAN JOSÉ DE GUAYMAS,** a seaport of Mexico, in the State of Sonora, on a small land-locked bay opening into the Gulf of California a few miles west of the mouth of the Yaqui river, in lat 27° 58′ N, long 110° 58′ W Pop (1921) 8,558 The harbour is one of the best on the west coast of Mexico, and the port is a principal outlet for the products of the large State of Sonora The town stands on a small, arid plain, nearly shut in by mountains, and has a very hot, dry climate It is connected with the railways of the U S by a branch of the Southern Pacific of Mexico from Nogales, Sonora, and is 265m S by W of the frontier town of Nogales, where that line enters Mexico The exports include gold, silver, hides and pearls

GUAYMI, an Indian tribe who inhabit the mountains of western Panama between the Chiriqui volcano and the river Belen, and linguistically allied to the Chibcha of South America During the Spanish colonial epoch they were dominated by missionaries, but have since reverted to their natural living conditions The ancestors of the Guaymi are regarded as the makers of gold images and ceramics found in ancient graves throughout western Panama

See H Pittier, "Little-known parts of Panama," in *National Geographic Magazine,* vol xxiii, No 7 (1912).

GUBBIO, a town and episcopal see of Umbria, Italy (anc *Iguvium, q v ;* med *Eugubium*) province of Perugia, 23 m N N E from Perugia by road, by rail 13 m N W of Fossato di Vico (on the line between Foligno and Ancona) and 70 m E S E of Arezzo Pop (1921) 6,284 (town); 30,450 (commune) Gubbio is at the foot and on the steep slopes of Monte Calvo, 1,568 to 1,735 ft above sea-level, at the entrance to the gorge which ascends to Scheggia, probably on the site of the ancient Umbrian town The Palazzo dei Consoli, on the north side of the Piazza della Signoria, is a huge two-storied Gothic edifice with a tower (1332–1346) It contains the famous *Tabulae Iguvinae,* and a collection of paintings of the Umbrian school, of furniture and of majolica Being on the slope, palace and piazza are raised on arched substructures On the south side of the piazza is the Palazzo Podestà, begun in 1349

Above the Piazza della Signoria, at the highest point of the town, is the Palazzo Ducale, erected by the dukes of Urbino in 1474–1480, the Palazzo Beni, lower down The Palazzo Accoramboni is a Renaissance structure, with a fine entrance arch Opposite the Palazzo Ducale is the 12th cent cathedral of SS Mariano e Jacopo The interior contains some good pictures by Umbrian artists, a fine episcopal throne in carved wood, and a fine Flemish cope given by Pope Marcellus II (1555) in the sacristy The whole town is full of specimens of mediaeval architecture On May 15 three colossal wooden pedestals, each over 30 ft high, and crowned by statues of SS Ubaldo, Antonio and Giorgio, are carried through the town, and then, in a wild race, up to the church of S Ubaldo on the mountain-side (2,690 ft) (*See* H M Bower, *The Elevation and Procession of the Ceri at Gubbio,* London, 1897)

After its reconstruction with the help of Narses (*see* IGUVIUM) the town remained subject to the exarchs of Ravenna, and, after the destruction of the Lombard kingdom in 774, formed part of the donation of Charlemagne to the pope In the 11th century struggles it was generally on the Ghibelline side In 1151 it repelled an attack of several neighbouring cities, and formed from this time a republic governed by consuls In 1155 it was besieged by the emperor Frederick I, but saved by the intervention of its bishop, S Ubaldo, and was granted privileges by the emperor In 1203 it had its first podestà In 1387, after various political changes, it came under the dukes of Urbino until, in 1624, the whole duchy was ceded to the pope

Gubbio was the birthplace of Oderisio, a famous miniature painter (1240–1299), mentioned by Dante as the honour of his native town In the 14th and 15th centuries a branch of the Umbrian school of painting flourished here, the most famous masters of which were Guido Palmerucci (1280–1345) and several members of the Nelli family, particularly Ottaviano (d 1444), whose best work is the "Madonna del Belvedere" in S Maria Nuova at Gubbio (1404) Another work by him is the group of frescoes including a large "Last Judgment," and scenes from the life of St Augustine, in the church of S Agostino

Gubbio occupies a far more important place in the history of majolica. In a decree of 1438 a *vasarius vasorum pictorum* is mentioned, who probably was not the first of his trade The art was brought to perfection by Giorgio Andreoli, generally known as Maestro Giorgio (*see* CERAMICS).

See A. Colasanti, *Gubbio* (Bergamo, 1905), L. McCracken, *Gubbio* (1905)

GUBEN, a town in the Prussian province of Brandenburg, at the confluence of the Lubis with the Neisse, 28 m S S E of Frankfort-on-Oder, at the junction of railways to Breslau, Halle and Forst Pop (1925) 40,612 Guben, of Wendish origin, is mentioned in 1207 and received civic rights in 1235 It was surrounded by walls in 1311, about which time it came into the possession of the margrave of Brandenburg, from whom it passed to Bohemia in 1368 In 1635 it came into the possession of the elector of Saxony, and in 1815 it was, with the rest of Lower Lusatia, united to Prussia The principal industries are the spinning and weaving of wool, dyeing and the manufacture of pottery ware, hats, cloth, paper and machinery The vine is cultivated in the neighbourhood to some extent, and there is also some trade in fruit and vegetables

GUBERNATIS, ANGELO DE, COUNT (1840–1913), Italian man of letters, was born at Turin on April 7, 1840, and educated there and at Berlin, where he studied oriental languages In 1862 he was appointed professor of Sanskrit at Florence, but having married a cousin of the anarchist Bakunin and become interested in his views he resigned He was reappointed in 1867, and in 1891 he was transferred to the University of Rome He founded several important reviews, and in 1887 became director of the *Giornale della società asiatica* In 1878 he started the *Dizionario biografico degli scrittori contemporanei* His oriental and mythological works include the *Piccola enciclopedia indiana* (1867), the *Fonti vediche* (1868), a famous work on *Zoological Mythology* (in English, 1872), and another on plant mythology, *Mythologie des plantes* (1878) He also edited the encyclopaedic *Storia universale della letteratura* (18 vols, 1882–85) His work in verse includes the dramas *Cato, Romolo, Il re Nala, Don Rodrigo, Savitri,* etc, and his critical and biographical work, *Ariosto* (1905) and *Torquato Tasso* (1908) He died on Feb 27, 1913, at Rome

GUCHKOV, ALEXANDER (1862–), Russian politician, was born in Moscow He studied at the universities of Moscow and Berlin and, after leading an adventurous life of travel, entered politics He helped to found the Russian "Octobrist" party in the hope that the Tsar's Government would work with the moderate Liberals of the Zemstvo, while safeguarding the monarchical principle In 1910 Guchkov was elected president of the Duma, but as Stolypin became more reactionary, the Octobrists lost their *raison d'être,* and Guchkov eventually resigned the presidentship of the Duma In the elections to the fourth Duma he failed to secure a seat During the World War he was in charge of the Red Cross organization on the German front, and devoted his energies to refitting the army on the technical side When the March Revolution of 1917 broke out Guchkov became Minister of War, but he was powerless against the increasing demoralization in the army, and resigned on May 5 Emigrating, he found himself without influence, and later took refuge in Paris.

GUDBRANDSDAL, a district of southern Norway, comprising the upper course of the river Lougen from Lillehammer at the head of Lake Mjosen to its source in Lake Lesjeskogen and tributary valleys Lillehammer is the centre of a rich timber district The railway from Oslo reaches as far as Damaas Several tracks run westward into the wild district of the Jotunheim From Otta routes run across the watershed and descend the western slope, where the scenery is incomparably finer than in Gudbrandsdal itself—(*a*) past Sörum, with the 13th-century

churches of Vaage and Lom, Aanstad and Polfosen, with beautiful falls of the Otta river, to Groth, where roads diverge to Stryn on the Nordfjord, and to Meraak on the Geirangerfjord, (*b*) past Damaas (with branch road north to Storen near Trondhjem, skirting the Dovrefjeld), over the watershed formed by Lesjeskogen Lake, which drains in both directions, and down through the magnificent Romsdal

GUDEMAN, ALFRED (1862–), American classical scholar, was born in Atlanta, Ga , on Aug 26, 1862 He graduated at Columbia university in 1883 and in 1888 took his Ph D degree at the University of Berlin From 1890 to 1893 he was reader in classical philology at Johns Hopkins university, from 1893 to 1902 professor in the University of Pennsylvania and from 1902 to 1904 professor in Cornell university In 1904–16 he was assistant editor of the *Thesaurus linguae Latinae*—a unique distinction for an American Latinist, as was also the publication of his critical edition, with German commentary, of Tacitus's *Agricola* in 1902 by the Weidmannsche Buchhandlung of Berlin

GUDGEON (*Gobio gobio*, sometimes called *G fluviatilis*), a cyprinid fish inhabiting Europe and northern Asia It rarely exceeds a length of 8 in ; it has a barbel at each corner of the mouth, and a row of blackish spots along the side of the body, it frequents sandy or gravelly shallows Other species of *Gobio* inhabit China and Japan

GUDRUN (KUDRUN), a Middle High German epic, written probably in the early 13th century, not long after the *Nibelungenlied*, the influence of which may be traced upon it It is preserved in a single ms which was prepared for Maximilian I , and was discovered in 1820 in the castle of Ambras in Tirol The author was an unnamed Austrian poet, but the story itself belongs to the cycle of Scandinavian sagas The epic falls into three parts—the adventures of King Hagen of Ireland, the romance of Hettel, king of the Hegelingen, who woos and wins Hagen's daughter Hilde, and the more or less parallel story of how Herwig, king of Seeland, wins, in opposition to her father's wishes, Gudrun, the daughter of Hettel and Hilde Gudrun is carried off by a king of Normandy, and her kinsfolk, who are in pursuit, are defeated in a great battle on the island of Wulpensand off the Dutch coast The finest parts of the epic are those in which Gudrun, a prisoner in the Norman castle, refuses to become the wife of her captor, and is condemned to do the most menial work of the household Here, 13 years later, Herwig and her brother Ortwin find her washing clothes by the sea, on the following day they attack the Norman castle and carry out the long-delayed retribution

Gudrun is composed in stanzas similar to those of the *Nibelungenlied*, except that the last line of each stanza does not contain the extra accented syllable characteristic of the *Nibelungen* metre

The best editions are by K Bartsch (4th ed , 1880), B Symons (1883), and E Martin (2nd ed , 1901) A translation into English by M P Nichols appeared at Boston, U S A , in 1889

GUÉBRIANT, JEAN BAPTISTE BUDES, COMTE DE (1602–1643), marshal of France, was born near St Brieuc on Sept 2, 1602 of an old Breton family In the Thirty Years' War he commanded (1638–39) the French contingent in the army of Bernard of Saxe-Weimar Upon the death of Bernard he received the command of his army, and tried, in conjunction with J Baner (1596–1641), the Swedish general, a bold attack upon Regensburg (1640). His victories of Wolfenbuttel (1641) and Kempen (1642) won for him the marshal's bâton He was mortally wounded at Rottweil on Nov 17, 1643

See A. Brinzinger in *Wurttembergische Vierteljahrschrift fur Landesgeschichte* (1902); Vicomte de Noailles, *Le Maréchal de Guébriant* (1913).

GUEBWILLER (Ger *Gebweiler*), capital of an arrondissement in the department of Haut Rhin (Alsace-Lorraine), France, at the foot of the Vosges, on the Lauch, 13 m S of Colmar Pop (1926) 11,366 From the 8th century it belonged to the religious foundation of Murbach In 1789, at the outbreak of the Revolution, the monastic buildings were laid in ruins, and, though the archives were rescued and removed to Colmar, the library perished

The church of St Leodgar dates from the 12th century, the old Dominican convent is now used as a market and concert hall The chief industries are spinning and dyeing, and manufacture of cloth and machinery; quarrying is carried on and the town is celebrated for its white wines It has a sub-prefecture

GUELDER ROSE, so called from Guelderland, its supposed source, is known botanically as *Viburnum Opulus*, a shrub or small tree of the honeysuckle family (Caprifoliaceae), a native of Britain, and widely distributed in the temperate and colder parts of Europe, Asia and North America It is common in Ireland, but rare in Scotland In height it is from 6 to 12 ft , and it thrives best in moist situations The leaves are smooth, 2 to 3 in broad, with 3 to 5 unequal serrate lobes, and glandular stipules adnate to the stalk In autumn the leaves change from bright green to pink or crimson The flowers, which appear in June and July, are small, white, and arranged in cymes 2 to 4 in in diameter The outer blossoms in the wild plant have an enlarged corolla, $\frac{3}{4}$ in in diameter, and are devoid of stamens or pistils, in the common cultivated variety all the flowers are sterile and the inflorescence is globular, hence the term "snow ball tree" applied to the plant The guelder rose bears juicy, red, elliptical berries, $\frac{1}{2}$ in long, which ripen in September, and contain each a single compressed seed In northern Europe these are eaten, and in Siberia, after fermentation with flour, they are distilled for spirit The plant has, however, emetic, purgative and narcotic properties, and Taylor (*Med Jurisp*, 1873) has recorded an instance of the fatal poisoning of a child by the berries Both they and the bark contain valerianic acid

The fruit of the North American form (*V Opulus* var *americanum* or *V trilobum*), commonly called cranberry-bush or high-bush cranberry, found from New Brunswick to British Columbia and southward to New Jersey and Oregon, is prized for jams and jellies, especially in the northern parts of its range, and choice fruiting strains are sparingly cultivated (*See* VIBURNUM)

GUELPH, a city of Ontario, Canada, 45 m W of Toronto, on the river Speed and the Canadian National steam and electric and Canadian Pacific railways Pop (1921) 18,128 It is a fine agricultural centre, and exports grain, fruit and live-stock It contains the Ontario Agricultural college The river affords abundant waterpower for flour-mills, saw-mills, woollen-mills and numerous factories The city contains the only linen mill in the Dominion of Canada

GUELPHS AND GHIBELLINES, originally the names of two German parties formed in the 12th century around the families to which respectively belonged the dukes of Saxony and Bavaria and the lords of Hohenstaufen The rivalry between these two families determined much of the history of Germany (*q v*) in the 12th century, and the names in question were employed at an early date in Italy, where the Ghibellines formed the party of the emperor Frederick I (*q v*), and the Guelphs formed the party opposed to him In the next century the terms acquired a wider sense, the Ghibellines still formed the Imperialist party, but the term Guelph lost all trace of its original association with dynastic rivalries in Germany and became applied to the supporters of the papacy in its struggle against the empire. Long after this struggle had become a matter of history these ancient names survived in Italian civic politics, often denoting factions whose origin had no real connection with the rivalry of empire and papacy in an earlier age

Of the terms themselves, Guelph represents the old German personal name *Hwelp*, originally perhaps a nickname (it corresponds to the English word "whelp"), but borne by many persons of rank, notably Welf duke of Bavaria in the 11th century Ghibelline is a form of the place-name Waiblingen, an ancient possession of the lords Hohenstaufen, and not far from the castle of that name

GUENEVERE, the wife of King Arthur Geoffrey of Monmouth, who calls her Guanhumara, makes her a Roman lady, but the general tradition is that she was of Cornish birth and daughter to King Leodegrance Wace, who, while translating Geoffrey, evidently knew and used popular tradition, combines these two, asserting that she was of Roman parentage on the mother's side but cousin to Cador of Cornwall, by whom she was brought up The tradition relating to Guenevere is decidedly confused the Welsh

Triads know no fewer than three Gwenhwyfars Giraldus Cambrensis, relating the discovery of the royal tombs at Glastonbury, states that the body found was that of Arthur's second wife. The prose *Merlin* gives Guenevere a bastard half-sister of the same name, who strongly resembles her, and the prose *Lancelot* relates how this lady, trading on the likeness, persuades Arthur that she is the true Guenevere, and the queen the bastard supplanter This episode of the false Guenevere is very perplexing The relations with early Irish tradition, where the name Findabhair (Guenevere) adds another element to the confusion

To the majority of English readers Guenevere is best known in connection with her liaison with Lancelot, a story which forms no part of the early Arthurian tradition The Lancelot-Guenevere romance took form and shape in the latter part of the 12th century, amid the artificial atmosphere encouraged by such patronesses of literature as Eleanor of Aquitaine and her daughter Marie, Comtesse de Champagne (for whom Chrétien de Troyes wrote his *Chevalier de la Charrette,* where Lancelot first appears as Guenevere's lover), and reflects the low social morality of a time when love between husband and wife was declared impossible The tradition of Guenevere's infidelity is, however, of much earlier date, and probably formed part of the genuine Arthurian tradition The stories vary; sometimes she is the unwilling victim of an abduction, sometimes she figures in a guilty flight with her lover The *Vita Gildae* relates how she was carried off by Melwas, king of Aestiva Regis (Somerset), to Glastonbury, whither Arthur, at the head of an army, pursued the ravisher A fragment of a Welsh poem seems to confirm this tradition, which certainly lies at the root of the story of her abduction by Meleagant, told by Malory In the *Lanzelet* of Ulrich von Zatzikhoven the abductor is Falerîn, a magician The story in these forms represents an other-world abduction A curious fragment of Welsh dialogue, printed by Sir John Rhys, appears to represent Kay as the abductor In the chronicles, and the romances based upon them, the abductor is Mordred, and the queen is no unwilling victim On the final defeat of her lover she retires to a convent, where she takes the veil and is no more heard of; Wace says, emphatically.

> *ne fu oie ne véue,*
> *ne fu trovée, ne séue,*
> *por la vergogne del mesfait*
> *et del pecié qu'ele avoit fait* (11, 13,627–30)

Layamon, who certainly utilized insular tradition, says that she was reported to have drowned herself, and that her memory and that of Mordred were hateful in every land, so that none would offer prayer for their souls The truth seems to be that we are dealing here with a mixture of mythic elements and pseudo-historic tradition The story of Guenevere's abduction belongs to the former, that of her betrayal of her husband, with a near relative, and consequent flight, to the latter

See Sir J Rhys, *Studies on the Arthurian Legend* (1891); J L. Weston, *The Legend of Sir Lancelot* (1901); R. S Loomis, *Celtic Myth and Arthurian Romance* (1928) (J L W)

GUENON (gā̤'-nŏn̤), the name applied to the monkeys of the African genus *Cercopithecus,* the Ethiopian representatives of the Asiatic macaques

GUÉRET, a town of central France, capital of the department of Creuse, situated 48 m N E of Limoges on the Orleans railway Pop. (1926) 6,119. Guéret grew up round an abbey founded in the 7th century, and in later times became the capital of the district of Marche The Hôtel des Monneyroux (used as a prefecture), a mansion of the 15th century, is the only building of importance It is the seat of a prefect and a court of assizes, and has a tribunal of first instance, and a chamber of commerce The industries include leather-making and the manufacture of basket-work, tiles, hosiery and wooden shoes, and there is trade in agricultural produce and cattle.

GUEREZA, a long-tailed black and white Abyssinian monkey, *Colobus guereza,* characterized by a long pendent mantle of white hair, the name is sometimes extended to embrace all the African thumbless monkeys of the genus *Colobus.* These are the African representatives of the Indo-Malay langurs (*Semnopithecus*), with which they agree in their slender build, long limbs and tail, although differing by the rudimentary thumb.

GUERICKE, OTTO VON (1602–1686), German natural philosopher, was born at Magdeburg, in Prussian Saxony, on Nov 20, 1602 Having studied law and mathematics in Germany and at Leyden, he visited France and England, and in 1636 became engineer-in-chief at Erfurt In 1627 he was elected alderman of Magdeburg, and in 1646 mayor of that city and a magistrate of Brandenburg His leisure was devoted to scientific pursuits, especially in pneumatics. Incited by the discoveries of Galileo, Pascal and Torricelli, he attempted the creation of a vacuum. After a number of partially successful experiments he invented the air-pump (1650) Besides investigating other phenomena connected with a vacuum, he constructed an electrical machine which depended on the electrification of a rotating ball of sulphur, and he made successful researches in astronomy, predicting the periodicity of the return of comets. In 1681 he gave up office, and retired to Hamburg, where he resided until his death on May 11, 1686

His principal observations are given in his work, ***Experimenta nova, ut vocant, Magdeburgica de vacuo spatio*** (Amsterdam, 1672). He is also the author of a *Geschichte der Belagerung und Eroberung von Magdeburg* *See* F. W. Hoffmann, *Otto von Guericke* (1874).

GUÉRIDON, a small table to hold a lamp or vase, supported by a tall column or a human or mythological figure This piece of furniture, often very graceful and elegant, originated in France towards the middle of the 17th century. In the beginning the table was supported by a negro or some exotic figure, and there is some reason to believe that it took its name from the generic appellation of the young African groom or "tiger," who was generally called "Guéridon," or as we should say in English "Sambo"

GUERILLA: *see* GUERRILLA.

GUÉRIN, PIERRE NARCISSE, BARON (1774–1833), French painter, was born at Paris on May 13, 1774, a pupil of Jean Baptiste Regnault "Marcus Sextus" (Louvre), exhibited at the Salon of 1799, brought him before the public and excited enthusiasm partly due to the subject,—a victim of Sulla's proscription returning to Rome to find his wife dead and his house in mourning—in which an allusion was found to the actual situation of the *émigrés* In 1802 Guérin produced "Phaedra and Hippolytus" (Louvre); in 1810, after his return to Paris from Rome where he studied two years he again achieved a great success with "Andromache and Pyrrhus" (Louvre) Guérin's success was ensured by the skilful selection of highly melodramatic situations, treated with the strained and pompous dignity proper to the art of the first empire He died on July 16, 1833

See Julius Meyer, *Geschichte der franzosischen Malerei* (1867).

GUÉRIN DU CAYLA, GEORGES MAURICE DE (1810–1839), French poet, was born at the château of Le Cayla in Languedoc He joined for a short time the group formed by Lamennais (*q v*) at La Chênaie Early in 1833 he went to Paris, where he taught at the Collège Stanislas In Nov 1838 he married a Creole lady of some fortune He died on July 19, 1839 In the *Revue des deux mondes* for May 15, 1840, there appeared a notice of Maurice de Guérin by George Sand, to which she added two fragments of his writings—one a composition in prose entitled the *Centaur,* and the other a short poem His *Reliquiae* (2 vols, 1861), including the *Centaur,* his journal, a number of his letters and several poems, was edited by G. S. Trébutien, and accompanied with a biographical and critical notice by Sainte-Beuve A new edition, with the title *Journal, lettres et poèmes,* followed in 1862; and an English translation of it was published at New York in 1867 Though Maurice de Guérin was essentially a poet, his prose is more striking and original than his poetry Its peculiar and unique charm arises from his strong and absorbing passion for nature, a passion of pagan intensity

The name of EUGÉNIE DE GUÉRIN (1805–48), sister of Maurice de Guérin, was closely associated with her brother's work Her *Journals* (1861, Eng trans, 1865) and her *Lettres* (1864, Eng trans, 1865) indicated the possession of gifts of as rare an order as his, though of a different kind In her case mysticism assumed a form more strictly religious, and she continued to

mourn her brother's loss of his early Catholic faith. She died on May 31, 1848.

See the notices by George Sand and Sainte-Beuve referred to above; Sainte-Beuve, *Causeries du lundi* (vol. xii) and *Nouveaux Lundis* (vol iii), G Merlet, *Causeries sur les femmes et les livres* (1865), Selden, *L'Esprit des femmes de notre temps* (1864), Marelle, *Eugénie et Maurice de Guérin* (Berlin, 1869); Harriet Parr, *M and E de Guérin, a monograph* (1870), and Matthew Arnold's essays on Maurice and Eugenie de Guérin, in his *Essays in Criticism.*

GUERNIERI or **WERNER** (*fl.* 1350), a celebrated mercenary captain, was a member of the family of the dukes of Urslingen He served the Pisans (1340–43), but afterwards collected a troop of adventurers which he called the Great Company, and with which he plundered Tuscany and Lombardy He then entered the service of Louis I the Great, king of Hungary and Poland, whom he assisted to obtain possession of Naples When dismissed from this service his ravages culminated in the dreadful sack of Anagni in 1358 Guernieri is said to have worn a breastplate with the inscription, "The enemy of God, of pity and of mercy"

GUERNSEY, the second largest of the Channel islands, and the westernmost of the important members of the group, its chief town, St Peter Port, on the east coast (in 2° 33′ W, 49° 27′ N) being 30 m from the nearest French coast to the east The island, roughly triangular in form, is 9¼ m long from N E to S W and has an extreme breadth of 5¼ m and an area of 24 5 sq m Pop (1921) 38,283

The island is flat and low in the north, but rises gradually to a plateau (height above 300 ft) in the south The fracturing of the granitic rocks has resulted in steep-sided valleys and rectangular bays, separated from one another by rocky headlands The scenery of the south coast, with the bays of Moulin Huet, Saints and Petit Bot is noted The west side of the island has a gradual slope and longer, wider valleys with a low, rocky coast and open bays (Rocquaine, Perelle, Vazon, Cobo, etc) exposed to the Atlantic On the sheltered eastern side are the two ports, St Peter Port and St Sampson, the harbour of St Sampson being the remnant of an arm of the sea, which formerly isolated the Vale and L'Ancresse in the north-east from the rest of the island

The soil is generally a light sandy loam, overlying an angular gravel which rests upon the weathered granite Its fertility was formerly maintained by the use of "vraic" or sea-weed This plant has its place in the folk-lore and traditional festivals of the island and the cutting of it, both for manure and fuel, is still regulated by law The climate is mild and equable and the annual sunshine record is high, averaging 1,905 hours

The typical form of settlement in Guernsey is that of separate farms, but there are old hamlets in the valleys and around some churches which were formerly related to open fields with communal cultivation The origin of settlement in the island is obscure, but it is a region rich in megalithic monuments of Armorican type and most of the churches are definitely on sites of prehistoric sanctity Celtic saints have left their trace in legend and dedication, there is also a Norse element in the population About the 11th century, most of the land was apportioned to Norman manors, but the usual organization became modified owing to absentee lords Fishing supplemented cultivation, and in the 17th and 18th centuries, Guernsey developed maritime adventure, including privateering for the English kings against the French during the frequent wars The introduction of root crops (parsnips) and, with them, of a deep plough and associated agricultural co-operation, brought agricultural prosperity, but the end of privateering with the peace of 1815, meant a crisis for Guernsey in spite of its ships and shipyards and its utilization as a place for storage and maturation of southern wines In the mid-19th century, a great local effort led to building of harbours preluding the development of rapid communications Owing to its slope northward and its somewhat exposed position, Guernsey is just not warm enough in summer to grow grapes and tomatoes intensively in the open It therefore specializes in cultivation under glass and large areas are covered with glass-houses Nearly 34% of the population are gardeners Guernsey has a separate herd of dairy cattle of great value. Some stone, which is quarried in the neighbourhood of St. Sampson, is shipped from that port, but the stone trade is on the decline

For administrative purposes Guernsey is united with Alderney, Sark, Herm and the adjacent islets to form the bailiwick of Guernsey, separate from Jersey (*see* CHANNEL ISLANDS for constitution) Guernsey is divided into ten parishes with St. Peter Port, its chief town, as one The population of St Peter Port in 1921 was 16,215 The population of the bailiwick of Guernsey nearly doubled between 1821 and 1901 There is good Romanesque work in the church of St Michael, Vale, and the church of St Peter Port is a notable building Remains of monastic buildings are seen at Vale and on Lihou island, north of Rocquaine bay

GUERRAZZI, FRANCESCO DOMENICO (1804–1873), Italian publicist and patriot, born at Leghorn on Aug. 12, 1804, was educated for the law at Pisa, and began to practise in his native place Mazzini made his acquaintance, and with Carlo Bini they started a paper, the *Indicatore,* at Leghorn in 1829, which was quickly suppressed Guerrazzi himself had to endure several terms of imprisonment for his activity in the cause of Young Italy, and his most famous novel *Assidio di Firenze* (1834) was written in prison He was the most powerful Liberal leader at Leghorn, and in 1848 became a minister, with some idea of exercising a moderating influence in the difficulties with the grand-duke of Tuscany In 1849, when the latter fled, he was first one of the triumvirate with Mazzini and Montanelli, and then dictator, but on the restoration he was arrested and imprisoned for three years His *Apologia* was published in 1852 He was exiled to Corsica On his return he became a deputy at Turin (1862–1870) He died at Leghorn on the 25th of September 1873 His works include the novels *Isabella Orsini* (1845) and *Beatrice Cenci* (1854) His *Opere* were collected at Milan (1868)

See Carducci's edition of his letters (1880–82, 2 vols); Guastalla, *La vita e le opere di F D. Guerrazzi, 1804–35* (1903), and Busolli, *F D Guerrazzi* (1912)

GUERRERO, FRANCISCO (*c.* 1528–1599), Spanish composer, was born at Seville about 1528 He became a pupil of Morales and was one of the most important of the Spanish group who came under Italian influence in the second half of the 16th century At eighteen he was made maestro de capilla at Jaen His next appointment was at Malaga, and in 1554 he became maestro de capilla of Seville cathedral He died on Nov 8, 1599 Many of his works have been preserved, the most important being a volume of *Sacrae cantiones* for 4 and 5 voices (1555), *Magnificats* (Louvain 1563), *Liber primus Missarum F Guerrero Hispalensis Odei phonasco autore* (Paris, Du Chemin 1566), containing 4 masses in 5 parts, 5 masses in 4 parts, motets in 5 and 6 parts and a *Pater noster* in 8 parts (a copy of this is in the Imperial library, Vienna), motets, published in Vienna 1570, 1589; masses, published in Rome 1582 Eslava's famous collection *Lira sacro-hispana* (1869) contains Guerrero's Passion according to St Matthew for four voices and the Passion according to St John for five voices, 3 motets for 5 voices and a four-part mass For a complete list, *see* Eitner *Quellenlexikon* *See* also the article *Guerrero* by J R Sterndale-Bennett in Grove's Dictionary

GUERRERO, a Pacific coast State of Mexico, bounded north-west by Michoacán, north by Mexico (State) and Morelos, north-east and east by Puebla and Oaxaca, and south and west by the Pacific Area, 25,887 sq miles Pop, largely composed of Indians and mestizos (1921), 566,836 The State is roughly broken by the Sierra Madre del Sur and its spurs, which cover its entire surface with the exception of the low coastal plain (averaging about 20m in width) on the Pacific The valleys are usually narrow, fertile and heavily forested, but difficult of access The State is divided into two distinct zones—the *tierras calientes* of the coast and lower river courses where tropical conditions prevail, and the *tierras templadas* of the mountain region where the conditions are sub-tropical The latter is celebrated for its agreeable and healthy climate, and for the variety and character of its products The principal river of the State is the Rio de las Balsas or Mescala, which, having its source in Tlaxcala, flows entirely across the State from west to east, and then southward to the Pacific on

the frontier of Michoacán This river is 429m. long and receives many affluents from the mountainous region through which it passes, but its course is very precipitous and its mouth obstructed by sand bars. The agricultural products include cotton, coffee, tobacco and cereals, and the forests produce rubber, vanilla and various textile fibres Mining is undeveloped, although the mineral resources of the State include silver, gold, mercury, lead, iron, coal, sulphur and precious stones The capital, Chilpancingo or Chilpancingo de los Bravos (pop [1921] 5,955), is a small town in the Sierra Madre about 110m from the coast and 200m S of the Federal capital It is a well-built town on the old Acapulco road, and is celebrated in the history of Mexico as the meeting-place of the revolutionary congress of 1813, which issued a declaration of independence Chilpancingo was badly damaged by an earthquake in January 1902 and 1907. Other important towns are Tixtla de Guerrero, formerly the capital (pop [1921] 5,512), 3m N E. of Chilpancingo, Chilapa (pop [1921] 7,510), Iguala (pop [1921] 10,855) and Acapulco (*q v.*).

GUERRILLA, a term currently used to denote war carried on by bands in any irregular and unorganized manner, erroneously written "guerilla," being the diminutive of the Span *guerra,* war The position of irregular combatants was one of the subjects dealt with at the Peace Conference of 1899, and the rules there adopted were reaffirmed at the conference of 1907 They provide that irregular bands in order to enjoy recognition as belligerent forces shall (*a*) have at their head a person responsible for his subordinates, (*b*) wear some fixed distinctive badge recognizable at a distance, (*c*) carry arms openly and (*d*) conform in their operations to the laws and customs of war The rules, however, also provide that in case of invasion the inhabitants of a territory who on the approach of the invading enemy spontaneously take up arms to resist it, shall be regarded as belligerent troops if they carry arms openly and respect the laws and customs of war, although they may not have had time to become organized in accordance with the above provisions These rules were borrowed almost word for word from the project drawn up at the Brussels international conference of 1874, which, though never ratified, was practically incorporated in the army regulations issued by the Russian government in connection with the war of 1877–78 *Cf* BRIGANDAGE (T B)

SCIENCE OF GUERRILLA WARFARE

This study of the science of guerrilla, or irregular, warfare is based on the concrete experience of the Arab Revolt against the Turks 1916–1918 But the historical example in turn gains value from the fact that its course was guided by the practical application of the theories here set forth

The Arab Revolt began in June, 1916, with an attack by the half-armed and inexperienced tribesmen upon the Turkish garrisons in Medina and about Mecca They met with no success, and after a few days' effort withdrew out of range and began a blockade This method forced the early surrender of Mecca, the more remote of the two centres Medina, however, was linked by railway to the Turkish main army in Syria, and the Turks were able to reinforce the garrison there The Arab forces which had attacked it then fell back gradually and took up a position across the main road to Mecca

At this point the campaign stood still for many weeks The Turks prepared to send an expeditionary force to Mecca, to crush the revolt at its source, and accordingly moved an army corps to Medina by rail Thence they began to advance down the main western road from Medina to Mecca, a distance of about 250 miles The first 50 miles were easy, then came a belt of hills 20 miles wide, in which were Feisal's Arab tribesmen standing on the defensive next a level stretch, for 70 miles along the coastal plain to Rabegh, rather more than half-way Rabegh is a little port on the Red Sea, with good anchorage for ships, and because of its situation was regarded as the key to Mecca Here lay Sherif Ali, Feisal's eldest brother, with more tribal forces, and the beginning of an Arab regular army, formed from officers and men of Arab blood who had served in the Turkish Army As was almost inevitable in view of the general course of military thinking since Napoleon, the soldiers of all countries looked only to the regulars to win the war Military opinion was obsessed by the dictum of Foch that the ethic of modern war is to seek for the enemy's army, his centre of power, and destroy it in battle. Irregulars would not attack positions and so they were regarded as incapable of forcing a decision.

While these Arab regulars were still being trained, the Turks suddenly began their advance on Mecca They broke through the hills in 24 hours, and so proved the second theorem of irregular war—namely, that irregular troops are as unable to defend a point or line as they are to attack it This lesson was received without gratitude, for the Turkish success put the Rabegh force in a critical position, and it was not capable of repelling the attack of a single battalion, much less of a corps

In the emergency it occurred to the author that perhaps the virtue of irregulars lay in depth, not in face, and that it had been the threat of attack by them upon the Turkish northern flank which had made the enemy hesitate for so long The actual Turkish flank ran from their front line to Medina, a distance of some 50 miles but, if the Arab force moved towards the Hejaz railway behind Medina, it might stretch its threat (and, accordingly, the enemy's flank) as far, potentially, as Damascus, 800 miles away to the north Such a move would force the Turks to the defensive, and the Arab force might regain the initiative Anyhow, it seemed the only chance, and so, in Jan 1917, Feisal's tribesmen turned their backs on Mecca, Rabegh and the Turks, and marched away north 200 miles to Wejh

This eccentric movement acted like a charm The Arabs did nothing concrete, but their march recalled the Turks (who were almost into Rabegh) all the way back to Medina There, one half of the Turkish force took up the entrenched position about the city, which it held until after the Armistice The other half was distributed along the railway to defend it against the Arab threat For the rest of the war the Turks stood on the defensive and the Arab tribesmen won advantage over advantage till, when peace came, they had taken 35,000 prisoners, killed and wounded and worn out about as many, and occupied 100,000 square miles of the enemy's territory, at little loss to themselves However, although Wejh was the turning point its significance was not yet realized For the moment the move thither was regarded merely as a preliminary to cutting the railway in order to take Medina, the Turkish headquarters and main garrison

Strategy and Tactics.—However, the author was unfortunately as much in charge of the campaign as he pleased, and lacking a training in command sought to find an immediate equation between past study of military theory and the present movements—as a guide to, and an intellectual basis for, future action The text books gave the aim in war as "the destruction of the organized forces of the enemy" by "the one process battle" Victory could only be purchased by blood This was a hard saying, as the Arabs had no organized forces, and so a Turkish Foch would have no aim. and the Arabs would not endure casualties, so that an Arab Clausewitz could not buy his victory These wise men must be talking metaphors, for the Arabs were indubitably winning their war and further reflection pointed to the deduction that they had actually won it They were in occupation of 99% of the Hejaz The Turks were welcome to the other fraction till peace or doomsday showed them the futility of clinging to the window pane This part of the war was over, so why bother about Medina? The Turks sat in it on the defensive, immobile, eating for food the transport animals which were to have moved them to Mecca, but for which there was no pasture in their now restricted lines They were harmless sitting there; if taken prisoner, they would entail the cost of food and guards in Egypt. if driven out northward into Syria, they would join the main army blocking the British in Sinai On all counts they were best where they were, and they valued Medina and wanted to keep it Let them!

This seemed unlike the ritual of war of which Foch had been priest, and so it seemed that there was a difference of kind Foch called his modern war "absolute" In it two nations professing

incompatible philosophies set out to try them in the light of force. A struggle of two immaterial principles could only end when the supporters of one had no more means of resistance An opinion can be argued with. a conviction is best shot The logical end of a war of creeds is the final destruction of one, and Salammbo the classical textbook-instance These were the lines of the struggle between France and Germany, but not, perhaps, between Germany and England, for all efforts to make the British soldier hate the enemy simply made him hate war. Thus the "absolute war" seemed only a variety of war, and beside it other sorts could be discerned, as Clausewitz had numbered them, personal wars for dynastic reasons, expulsive wars for party reasons, commercial wars for trading reasons

Now the Arab aim was unmistakably geographical, to occupy all Arabic-speaking lands in Asia In the doing of it Turks might be killed, yet "killing Turks" would never be an excuse or aim If they would go quietly, the war would end If not, they must be driven out but at the cheapest possible price, since the Arabs were fighting for freedom, a pleasure only to be tasted by a man alive The next task was to analyse the process, both from the point of view of strategy, the aim in war, the synoptic regard which sees everything by the standard of the whole, and from the point of view called tactics, the means towards the strategic end, the steps of its staircase In each were found the same elements, one algebraical, one biological, a third psychological The first seemed a pure science, subject to the laws of mathematics, without humanity It dealt with known invariables, fixed conditions, space and time, inorganic things like hills and climates and railways, with mankind in type-masses too great for individual variety, with all artificial aids, and the extensions given our faculties by mechanical invention It was essentially formulable

In the Arab case the algebraic factor would take first account of the area to be conquered A casual calculation indicated perhaps 140,000 square miles How would the Turks defend all that—no doubt by a trench line across the bottom, if the Arabs were an army attacking with banners displayed but suppose they were an influence, a thing invulnerable, intangible, without front or back, drifting about like a gas? Armies were like plants, immobile as a whole, firm-rooted, nourished through long stems to the head The Arabs might be a vapour, blowing where they listed It seemed that a regular soldier might be helpless without a target He would own the ground he sat on, and what he could poke his rifle at The next step was to estimate how many posts they would need to contain this attack in depth, sedition putting up her head in every unoccupied one of these 100,000 square miles They would have need of a fortified post every four square miles, and a post could not be less than 20 men The Turks would need 600,000 men to meet the combined ill wills of all the local Arab people They had 100,000 men available It seemed that the assets in this sphere were with the Arabs, and climate, railways, deserts, technical weapons could also be attached to their interests The Turk was stupid and would believe that rebellion was absolute, like war, and deal with it on the analogy of absolute warfare

Humanity in Battle.—So much for the mathematical element, the second factor was biological, the breaking-point, life and death, or better, wear and tear Bionomics seemed a good name for it The war-philosophers had properly made it an art, and had elevated one item in it, "effusion of blood," to the height of a principle It became humanity in battle, an art touching every side of our corporal being There was a line of variability (man) running through all its estimates Its components were sensitive and illogical, and generals guarded themselves by the device of a reserve, the significant medium of their art Goltz had said that when you know the enemy's strength, and he is fully deployed, then you know enough to dispense with a reserve But this is never There is always the possibility of accident, of some flaw in materials, present in the general's mind and the reserve is unconsciously held to meet it There is a "felt" element in troops, not expressible in figures, and the greatest commander is he whose intuitions most nearly happen Nine-tenths of tactics are certain, and taught in books. but the irrational tenth is like the kingfisher flashing across the pool and that is the test of generals It can only be ensued by instinct, sharpened by thought practising the stroke so often that at the crisis it is as natural as a reflex

Yet to limit the art to humanity seemed an undue narrowing down It must apply to materials as much as to organisms In the Turkish Army materials were scarce and precious, men more plentiful than equipment Consequently the cue should be to destroy not the army but the materials The death of a Turkish bridge or rail, machine or gun, or high explosive was more profitable than the death of a Turk The Arab army just then was equally chary of men and materials. of men because they being irregulars were not units, but individuals, and an individual casualty is like a pebble dropped in water each may make only a brief hole, but rings of sorrow widen out from them The Arab army could not afford casualties Materials were easier to deal with Hence its obvious duty to make itself superior in some one branch, guncotton or machine guns, or whatever could be most decisive Foch had laid down the maxim, applying it to men, of being superior at the critical point and moment of attack The Arab army might apply it to materials, and be superior in equipment in one dominant moment or respect

For both men and things it might try to give Foch's doctrine a negative twisted side, for cheapness' sake, and be weaker than the enemy everywhere except in one point or matter Most wars are wars of contact, both forces striving to keep in touch to avoid tactical surprise The Arab war should be a war of detachment. to contain the enemy by the silent threat of a vast unknown desert, not disclosing themselves till the moment of attack This attack need be only nominal, directed not against his men, but against his materials so it should not seek for his main strength or his weaknesses, but for his most accessible material In railway cutting this would be usually an empty stretch of rail This was a tactical success From this theory came to be developed ultimately an unconscious habit of never engaging the enemy at all This chimed with the numerical plea of never giving the enemy's soldier a target Many Turks on the Arab front had no chance all the war to fire a shot, and correspondingly the Arabs were never on the defensive, except by rare accident The corollary of such a rule was perfect "intelligence," so that plans could be made in complete certainty The chief agent had to be the general's head (de Feuquière said this first), and his knowledge had to be faultless, leaving no room for chance The headquarters of the Arab army probably took more pains in this service than any other staff

The Crowd in Action.—The third factor in command seemed to be the psychological, that science (Xenophon called it diathetic) of which our propaganda is a stained and ignoble part It concerns the crowd, the adjustment of spirit to the point where it becomes fit to exploit in action It considers the capacity for mood of the men, their complexities and mutability, and the cultivation of what in them profits the intention The command of the Arab army had to arrange their men's minds in order of battle, just as carefully and as formally as other officers arranged their bodies and not only their own men's minds, though them first the minds of the enemy, so far as it could reach them and thirdly, the mind of the nation supporting it behind the firing-line, and the mind of the hostile nation waiting the verdict, and the neutrals looking on

It was the ethical in war, and the process on which the command mainly depended for victory on the Arab front The printing press is the greatest weapon in the armoury of the modern commander, and the commanders of the Arab army being amateurs in the art, began their war in the atmosphere of the 20th century, and thought of their weapons without prejudice, not distinguishing one from another socially The regular officer has the tradition of 40 generations of serving soldiers behind him, and to him the old weapons are the most honoured The Arab command had seldom to concern itself with what its men did, but much with what they thought, and to it the diathetic was more than half command In Europe it was set a little aside and entrusted to men outside the General Staff But the Arab army

was so weak physically that it could not let the metaphysical weapon rust unused. It had won a province when the civilians in it had been taught to die for the ideal of freedom: the presence or absence of the enemy was a secondary matter

These reasonings showed that the idea of assaulting Medina, or even of starving it quickly into surrender, was not in accord with the best strategy Rather, let the enemy stay in Medina, and in every other harmless place, in the largest numbers If he showed a disposition to evacuate too soon, as a step to concentrating in the small area which his numbers could dominate effectively, then the Arab army would have to try and restore his confidence, not harshly, but by reducing its enterprises against him The ideal was to keep his railway just working, but only just, with the maximum of loss and discomfort to him

The Turkish army was an accident, not a target Our true strategic aim was to seek its weakest link, and bear only on that till time made the mass of it fall The Arab army must impose the longest possible passive defence on the Turks (this being the most materially expensive form of war) by extending its own front to the maximum Tactically it must develop a highly mobile, highly equipped type of force, of the smallest size, and use it successively at distributed points of the Turkish line, to make the Turks reinforce their occupying posts beyond the economic minimum of 20 men The power of this striking force would not be reckoned merely by its strength The ratio between number and area determined the character of the war, and by having five times the mobility of the Turks the Arabs could be on terms with them with one-fifth their number

Range over Force.—Success was certain, to be proved by paper and pencil as soon as the proportion of space and number had been learned The contest was not physical, but moral, and so battles were a mistake All that could be won in a battle was the ammunition the enemy fired off Napoleon had said it was rare to find generals willing to fight battles The curse of this war was that so few could do anything else Napoleon had spoken in angry reaction against the excessive finesse of the 18th century, when men almost forgot that war gave licence to murder Military thought had been swinging out on his dictum for 100 years, and it was time to go back a bit again Battles are impositions on the side which believes itself weaker, made unavoidable either by lack of land-room, or by the need to defend a material property dearer than the lives of soldiers The Arabs had nothing material to lose, so they were to defend nothing and to shoot nothing Their cards were speed and time, not hitting power, and these gave them strategical rather than tactical strength Range is more to strategy than force The invention of bully-beef had modified land-war more profoundly than the invention of gunpowder

The British military authorities did not follow all these arguments, but gave leave for their practical application to be tried Accordingly the Arab forces went off first to Akaba and took it easily. Then they took Tafileh and the Dead Sea, then Azrak and Deraa, and finally Damascus, all in successive stages worked out consciously on these theories The process was to set up ladders of tribes, which should provide a safe and comfortable route from the sea-bases (Yenbo, Wejh or Akaba) to the advanced bases of operation These were sometimes 300 miles away, a long distance in lands without railways or roads, but made short for the Arab Army by an assiduous cultivation of desert-power, control by camel parties of the desolate and unmapped wilderness which fills up all the centre of Arabia, from Mecca to Aleppo and Baghdad

The Desert and the Sea.—In character these operations were like naval warfare, in their mobility, their ubiquity, their independence of bases and communications, in their ignoring of ground features, of strategic areas, of fixed directions, of fixed points "He who commands the sea is at great liberty, and may take as much or as little of the war as he will" he who commands the desert is equally fortunate Camel raiding-parties, self-contained like ships, could cruise securely along the enemy's land-frontier, just out of sight of his posts along the edge of cultivation, and tap or raid into his lines where it seemed fittest or easiest or most profitable, with a sure retreat always behind them into an element which the Turks could not enter.

Discrimination of what point of the enemy organism to disarrange came with practice. The tactics were always tip and run; not pushes, but strokes. The Arab army never tried to maintain or improve an advantage, but to move off and strike again somewhere else It used the smallest force in the quickest time at the farthest place To continue the action till the enemy had changed his dispositions to resist it would have been to break the spirit of the fundamental rule of denying him targets

The necessary speed and range were attained by the frugality of the desert men, and their efficiency on camels In the heat of summer Arabian camels will do about 250 miles comfortably between drinks. and this represented three days' vigorous marching This radius was always more than was needed, for wells are seldom more than 100 miles apart. The equipment of the raiding parties aimed at simplicity, with nevertheless a technical superiority over the Turks in the critical department Quantities of light machine guns were obtained from Egypt for use not as machine guns, but as automatic rifles, snipers' tools, by men kept deliberately in ignorance of their mechanism, so that the speed of action would not be hampered by attempts at repair Another special feature was high explosives, and nearly every one in the revolt was qualified by rule of thumb experience in demolition work

Armoured Cars.—On some occasions tribal raids were strengthened by armoured cars, manned by Englishmen Armoured cars, once they have found a possible track, can keep up with a camel party On the march to Damascus, when nearly 400 miles off their base, they were first maintained by a baggage train of petrol-laden camels, and afterwards from the air Cars are magnificent fighting machines, and decisive whenever they can come into action on their own conditions But though each has for main principle that of "fire in movement," yet the tactical employments of cars and camel-corps are so different that their use in joint operations is difficult It was found demoralizing to both to use armoured and unarmoured cavalry together

The distribution of the raiding parties was unorthodox It was impossible to mix or combine tribes, since they disliked or distrusted one another Likewise the men of one tribe could not be used in the territory of another In consequence, another canon of orthodox strategy was broken by following the principle of the widest distribution of force, in order to have the greatest number of raids on hand at once, and fluidity was added to speed by using one district on Monday, another on Tuesday, a third on Wednesday This much reinforced the natural mobility of the Arab army, giving it priceless advantages in pursuit, for the force renewed itself with fresh men in every new tribal area, and so maintained its pristine energy Maximum disorder was, in a real sense its equilibrium

An Undisciplined Army.—The internal economy of the raiding parties was equally curious Maximum irregularity and articulation were the aims Diversity threw the enemy intelligence off the track By the regular organization in identical battalions and divisions information builds itself up, until the presence of a corps can be inferred on corpses from three companies The Arabs, again, were serving a common ideal, without tribal emulation, and so could not hope for any *esprit de corps* Soldiers are made a caste either by being given great pay and rewards in money, uniform or political privileges, or, as in England, by being made outcasts, cut off from the mass of their fellow-citizens There have been many armies enlisted voluntarily there have been few armies serving voluntarily under such trying conditions, for so long a war as the Arab revolt Any of the Arabs could go home whenever the conviction failed him Their only contract was honour

Consequently the Arab army had no discipline, in the sense in which it is restrictive, submergent of individuality, the Lowest Common Denominator of men In regular armies in peace it means the limit of energy attainable by everybody present it is the hunt not of an average, but of an absolute, a 100-per-cent standard, in which the 99 stronger men are played down to the

level of the worst. The aim is to render the unit a unit, and the man a type, in order that their effort shall be calculable, their collective output even in grain and in bulk The deeper the discipline, the lower the individual efficiency, and the more sure the performance It is a deliberate sacrifice of capacity in order to reduce the uncertain element, the bionomic factor, in enlisted humanity, and its accompaniment is *compound* or social war, that form in which the fighting man has to be the product of the multiplied exertions of long hierarchy, from workshop to supply unit, which maintains him in the field

The Arab war, reacting against this, was *simple* and individual Every enrolled man served in the line of battle, and was self-contained. There were no lines of communication or labour troops It seemed that in this articulated warfare, the sum yielded by single men would be at least equal to the product of a compound system of the same strength, and it was certainly easier to adjust to tribal life and manners, given elasticity and understanding on the part of the commanding officers Fortunately for its chances nearly every young Englishman has the roots of eccentricity in him Only a sprinkling were employed, not more than one per 1,000 of the Arab troops A larger proportion would have created friction, just because they were foreign bodies (pearls if you please) in the oyster: and those who were present controlled by influence and advice, by their superior knowledge, not by an extraneous authority

The practice was, however, not to employ in the firing line the greater numbers which the adoption of a "simple" system made available theoretically Instead, they were used in relay: otherwise the attack would have become too extended Guerrillas must be allowed liberal work-room In irregular war if two men are together one is being wasted The moral strain of isolated action makes this simple form of war very hard on the individual soldier, and exacts from him special initiative, endurance and enthusiasm Here the ideal was to make action a series of single combats to make the ranks a happy alliance of commanders-in-chief The value of the Arab army depended entirely on quality, not on quantity The members had to keep always cool, for the excitement of a blood-lust would impair their science, and their victory depended on a just use of speed, concealment, accuracy of fire Guerrilla war is far more intellectual than a bayonet charge.

The Exact Science of Guerrilla Warfare.—By careful persistence, kept strictly within its strength and following the spirit of these theories, the Arab army was able eventually to reduce the Turks to helplessness, and complete victory seemed to be almost within sight when General Allenby by his immense stroke in Palestine threw the enemy's main forces into hopeless confusion and put an immediate end to the Turkish war His too-greatness deprived the Arab revolt of the opportunity of following to the end the dictum of Saxe that a war might be won without fighting battles But it can at least be said that its leaders worked by his light for two years, and the work stood This is a pragmatic argument that cannot be wholly derided The experiment, although not complete, strengthened the belief that irregular war or rebellion could be proved to be an exact science, and an inevitable success, granted certain factors and if pursued along certain lines

Here is the thesis. Rebellion must have an unassailable base, something guarded not merely from attack, but from the fear of it. such a base as the Arab revolt had in the Red Sea ports, the desert, or in the minds of men converted to its creed It must have a sophisticated alien enemy, in the form of a disciplined army of occupation too small to fulfil the doctrine of acreage. too few to adjust number to space, in order to dominate the whole area effectively from fortified posts It must have a friendly population, not actively friendly, but sympathetic to the point of not betraying rebel movements to the enemy Rebellions can be made by 2% active in a striking force, and 98% passively sympathetic The few active rebels must have the qualities of speed and endurance, ubiquity and independence of arteries of supply. They must have the technical equipment to destroy or paralyze the enemy's organized communications, for irregular war is fairly Willisen's definition of strategy, "the study of communication," in its extreme degree, of attack where the enemy is not In 50 words. Granted mobility, security (in the form of denying targets to the enemy), time, and doctrine (the idea to convert every subject to friendliness), victory will rest with the insurgents, for the algebraical factors are in the end decisive, and against them perfections of means and spirit struggle quite in vain

(T. E LA)

GUERRINI, OLINDO (1845–1916), Italian poet, who wrote under the name of Lorenzo Stechetti, was born at Sant' Alberto, Ravenna, and became university librarian at Bologna, where he died on Oct 21, 1916 His *Postuma* (1877), a volume of *canzoniere,* made him known as the leader of the "verist," as opposed to the idealistic, school of Italian lyrical poets. His poems were collected and published as *Rime di Lorenzo Stechetti* (1903)

GUESDE, JULES [Mathieu Basile] (1845–1922), French socialist, was born in Paris on Nov 11, 1845 He had begun his career as a clerk in the French home office, but at the outbreak of the Franco-German War he was editing *Les Droits de l'homme* at Montpellier, and had to take refuge at Geneva in 1871 from a prosecution instituted on account of articles which had appeared in his paper in defence of the Commune In 1876 he returned to France to become one of the chief French apostles of Marxian collectivism, and was imprisoned for six months in 1878 for taking part in the first Parisian International Congress After the amnesty of 1878 he edited at different times *Les Droits de l'homme, Le Cri du peuple, Le Socialiste,* but his best-known organ was the weekly *Égalité* He had been in close association with Paul Lafargue, and through him with Karl Marx, whose daughter he married With Marx and Lafargue he drew up the collectivist and revolutionary programme accepted by the national congress of the Labour party at Havre in 1880, which laid stress on the formation of an international labour party working by revolutionary methods Next year at the Reims congress the orthodox Marxian programme of Guesde was opposed by the "possibilists," who rejected the intransigeant attitude of Guesde for the "reformist" policy of Benoît Malon At the congress of St Étienne the difference developed into separation, those who refused all compromise with a capitalist government following Guesde, while the "reformists" formed several groups Guesde took his full share in the consequent discussion between the Guesdists, the Blanquists, the possibilists, etc In 1893 he was returned to the Chamber of Deputies for Lille (7th circonscription) with a large majority over the Christian Socialist and Radical candidates He brought forward various proposals in social legislation forming the programme of the Labour party, without reference to the divisions among the Socialists, and on Nov. 20, 1894 succeeded in raising a two-days' discussion on the collectivist principle in the Chamber of Deputies

In 1900 he fiercely opposed Jaurès, who advocated the participation of Socialists in the Government In 1902 he was not re-elected, but resumed his seat in 1906 In 1903 there was a formal reconciliation at the Reims congress of the sections of the party, which then took the name of the Socialist party of France Guesde, nevertheless, continued to oppose the opportunist policy of Jaurès, whom he denounced for supporting one bourgeois party against another But he gradually lost ground, and many of his adherents joined the "reformist" section under Jaurès His defence of the principle of freedom of association led him, incongruously enough, to support the religious Congregations against Émile Combes During the World War he was minister without portfolio from August 1914 to October 1915. Besides the numerous political and socialist pamphlets written by Guesde he also published during 1901 two volumes of his various speeches in the Chamber of Deputies entitled *Quatre ans de lutte de classes 1893–1898* He died on July 28, 1922, at Saint Naudí (Charente-Inférieure)

Guesde's works were *Essai de Catéchisme socialiste* (1878); *Collectivisme et Socialisme* (1879); *Services publics et Socialisme* (1884), *Le Socialisme au jour le jour* (1899), and, with Sangnier, *Christianisme et Socialisme* (1905)

See Zévaès, *Les Guesdistes* (1911), and references under SOCIALISM

GUEŠOV, IVAN EVSTRÁTIEV (1849–1924), Bulgarian politician, was born at Philippopolis on Feb. 1849 He was educated at Philippopolis, and at Owens college, Manchester. In 1872 he returned to Bulgaria. In 1877 he was arrested by the Turkish governor and condemned to death for political propaganda against Turkish rule, but was saved by the intervention of the British and American consuls He then began to send accounts of the Turkish atrocities to *The Times* and *The Daily News* (London). In 1878 Guešov became general manager of the Bulgarian National Bank at Sofia, and was minister of finance from 1894 to 1897. He was elected president of the Sobranie (National Assembly) in 1901 and became prime minister in March 1911 As such, he concluded the alliances which formed the basis of the Balkan Alliance of 1912 On May 30, 1913, owing to King Ferdinand's failure to support his moderate policy, which might have averted the second Balkan War, Guešov resigned During the World War he retired from politics and became president of the Bulgarian Red Cross He died at Sofia on March 11, 1924.

Guešov published well-documented accounts and defences of his policy, in two short but important works. *L'Alliance Balkanique* (1915; Eng trans, *The Balkan League*, 1915) and *La Genèse de la Guerre Mondiale* (Berne, 1919)

GUEST, one who receives hospitality in the house of another (Ger *Gast*, cognate with Lat *hostis*, originally a stranger, in Class Lat an enemy, *cf* host). "Guest" is also applied in biology to a parasite

GUEST, KEEN AND NETTLEFOLDS, LIMITED. This British joint stock company was registered in 1900 to acquire the businesses of Guest and Co, ironmasters, steel-makers and colliery proprietors, and that of The Patent Nut and Bolt company Ltd who, in addition to being ironmasters and colliery owners, manufacture iron and steel railway fastenings, etc In 1902 the screw manufacturing firm of Nettlefolds Ltd was acquired, and so the name of the company became Guest, Keen and Nettlefolds Ltd. In 1920 a controlling interest was acquired in John Lysaght Ltd, manufacturers of black and galvanised sheets, in Joseph Sankey and Sons Ltd, makers of panel sheets, steel furniture and parts for the motor trades, and in Bayliss, Jones and Bayliss, Ltd, makers of railway fastenings, fencing and telegraph iron work In 1921–24 control was taken of a number of important collieries In addition, the company has a considerable interest in Guest, Keen and Piggotts, Ltd, steel pipe makers, in the Crown Preserved Coal Co Ltd, makers of patent fuel, in Tarmac (South Wales) Ltd and in The Orconera Iron Ore Co Ltd, at Bilbao, Spain In these operations the company employs (1928) an issued and fully paid share capital of over £12,500,000, and there are debentures for £1,850,000

The chief businesses amalgamated in this great company have a long and romantic history The business of Guest and Co was established about 160 years ago, and was one of the pioneer firms in the manufacture of iron Developments made it the largest producer of coal, iron and steel in South Wales The Dowlais Iron Works, belonging to Guest and Co, was established as long ago as 1758 The first steel rails made by the Bessemer process were rolled at these works in 1865 The works at Smethwick were originally owned by Fox, Henderson and Co, the engineers who built the Crystal Palace, and the bolt and nut manufacture was begun there as long ago as 1853 The Heath-street works at Birmingham were established by the late John Sutton Nettlefold in 1826 Joseph Chamberlain, father of the late Rt Hon Joseph Chamberlain became a partner of his brother-in-law J S Nettlefold, in 1854 The late Rt Hon Joseph Chamberlain, M P, also became a partner in the business but retired in 1874 (L C M)

GUEUX, LES or "The Beggars," a name assumed by the confederacy of nobles and other malcontents, who in 1566 opposed Spanish tyranny in the Netherlands The leaders of the nobles, who signed a solemn league known as "the Compromise," by which they bound themselves to assist in defending the rights and liberties of the Netherlands against the civil and religious despotism of Philip II, were Louis, count of Nassau, and Henry, count of Brederode On April 5, 1566, permission was obtained for the confederates to present a petition of grievances, called "the request," to the regent, Margaret, duchess of Parma. About 250 nobles marched to the palace accompanied by Louis of Nassau and Brederode. The regent was at first alarmed at the appearance of so large a body, but one of her councillors, Berlaymont by name, was heard to exclaim, "What, madam, is your highness afraid of these beggars (*ces gueux*)?" The appellation was not forgotten At a great feast held by some 300 confederates at the Hôtel Culemburg three days later, Brederode in a speech declared that if need be they were all ready to become "beggars" in their country's cause The words caught on, and the hall resounded with loud cries of "*Vivent les gueux!*" ("Long live the beggars!") The name became henceforward a party appellation The patriot party adopted the emblems of beggarhood, the wallet and the bowl, as trinkets to be worn on their hats or their girdles The original league of "Beggars" was short-lived, crushed by the iron hand of Alva, but its principles survived and were to be ultimately triumphant

In the year 1569 the prince of Orange, who had now openly placed himself at the head of the party of revolt, granted letters of marque to a number of vessels manned by crews of desperadoes drawn from all nationalities These fierce corsairs under the command of a succession of daring and reckless leaders—the best known of whom is William de la Marck, lord of Lumey—were called "*Gueux de mer*," or "Sea Beggars" At first they were content with plundering both by sea and land and carrying their booty to the English ports where they were able to refit and replenish their stores This went on till 1572, when Queen Elizabeth suddenly refused to admit them to her harbours Having no longer any refuge, the Sea Beggars in desperation made an attack upon Brill, which they seized by surprise in the absence of the Spanish garrison on April 1, 1572 Encouraged by their unhoped-for success, they sailed to Flushing, which was also taken by a *coup de main* The capture of these two towns gave the signal for a general revolt of the northern Netherlands, and is regarded as the real beginning of the War of Dutch Independence

GUEVARA, ANTOÑIO DE (*c* 1480–1545), Spanish chronicler and moralist He held successively the offices of court preacher, court historiographer, bishop of Guadix and bishop of Mondedo His earliest work, entitled *Libro llamado Relox de Principes, en el qual va encorporado el muy famoso libro de Marco Aurelio* (1529) is a didactic novel, after the manner of Xenophon's *Cyropaedia* It was often reprinted in Spanish; and before the close of the century had also been translated into Latin, Italian, French and English, one English translation being by J Bourchier (1546) and another by T North It is difficult now to account for its extraordinary popularity, its thought being neither just nor profound, while its style is stiff and affected It gave rise to a literary controversy, however, of great bitterness and violence, the author having ventured without warrant to claim for it an historical character, appealing to an imaginary "manuscript" in Florence Other works of Guevara are the *Decada de Césares* (1539); the *Epistolas familiares* (1539–45), sometimes called "The Golden Letters," and the *Libro de los inventores del arte de marear* (1539)

GUEVARA, LUIS VÉLEZ DE: *see* Vélez de Guevara, Luis

GUHAYNA: *see* Arabs

GUIANA, in general, the region lying north of the Amazon river, south of the Orinoco river and the Atlantic ocean, and east of the southern arm of the upper Orinoco, and comprising an area of roughly 690,000 sq m at the north-eastern corner of the continent of South America Specifically, the term is now applied to the three small European colonies (combined area, about 175,000 sq m) on the northern coast of the continent, British, Dutch and French Guiana, which constitute the only European holdings on the continent of South America Venezuela, however, calls the easternmost portion of her territory "Guiana," and Brazil's territories along the northern bank of the Amazon and south of the colonies are properly Brazilian Guiana.

The origin of the name Guiana, Gayana or Guayana is the subject of doubt and conjecture Sir Robert Schomburg has suggested that the name was derived from a small river, a tribu-

tary of the Orinoco, called the Waini or Guainia It has also been suggested that the name Guayana was an Indian word signifying "wild coast," a theory supported by the old Dutch map of Hartsinck, where the region is called "Guiana Caribania of de Wilde Kust." The late Colonel G. E Church (*q v*) held, however, that the name is derived from that of the Indian tribes, found there when it was discovered, a group well known in Brazil, the Guayana tribes, called by earlier writers, Guianas, Goyana, Guayana, etc

The three Guiana colonies with which this article will alone treat, are British Guiana, extending from Venezuela, the boundary having been settled by award of the king of Italy in 1904 (*see* VENEZUELA) eastward to the left bank of the Corentyn river, Dutch Guiana or Surinam, from the right bank of the Corentyn to the left bank of the Maroni river, French Guiana or Cayenne from the right bank of the Maroni to the left bank of the Oyapock river which forms its boundary with Brazil

Physical Geography.—The combined area of the three colonies is approximately 175,000 sq m, and the physical characteristics are approximately the same in all There is an alluvial plain 18 to 50 m in width, much of it below the level of the sea at high tide, but protected, in nature, by mangrove bush and where there is cultivation, by dikes and canals This plain rises gradually to a height of 10 to 15 ft above mean sea level The second area in all the countries is a somewhat higher plateau marked by wide savannahs, traversed by sand dunes and rising to the hills of the third zone which reach a height of 2,000 ft or more, covered densely with tropical forests, almost impenetrable by land and lining the shores of the innumerable streams The second zone is cultivated in part, particularly in Dutch Guiana, where the choice of these inland plains for cultivation at first made the developed portion of the Dutch colony much less agreeable, climatically, than the low-land section developed in British Guiana, which is swept by the trade winds from the north-east ten months of the year The further interior, the third section, is broken by hills and heavily forested mountains and here chiefly are found the tropical woods and gums The highest point of the upland is on Mount Roraima (8,635 ft), on the western boundary of British Guiana, in the Roraima Range A sandstone formation, interbedded with volcanic rocks, extends from Mount Roraima to the Potaro and Essequibo rivers and thence eastward An immense number of rivers, with their tributaries, cut the land and make travel almost impossible excepting along these streams Moreover, the rivers rise and fall with the rains and are broken by rapids and waterfalls, making travel difficult, uncertain and always slow

Nearly all of Guiana is a worn-down plateau of ancient schist and gneiss overlain in places, especially in the southern part of British Guiana, by beds of Mesozoic sandstone, into which have been intruded dikes and sheets of diabase and other igneous rocks The mineral products are diamonds, gold and bauxite The gold is won from placers, which appear to have been formed from the schist and intrusive rocks

Climate.—The climate of the Guianas is tropical, but is saved from being oppressive by the trade winds from the north-east, which sweep the coastal regions between October and July, August and September usually being dull and oppressive The average temperature during the season of the trade winds is about 80°, while in the interior the dank forests shut off the breezes and make the heat oppressive and the nights, while cool, offer slight relief

As in all tropical countries, the variation of temperature between day and night is only a little less than throughout the year, records taken in Dutch Guiana showing the following ranges of the mean temperatures day and night, 77 54°–88 38° F, month, 76 1°–78·62°, year, 70 52°–90 14° Rainfall varies throughout the year, recorded averages showing 8 58 in in December, 9 57 in January, 11 26 in May, 10·31 in June, 7 2 in February, 6 8 in March, 2 to 2 5 in September The annual rainfall is from 100 to 130 in at different points The dry season is officially in August, September and October, but the dry spell in February and March (called the *veranillo* or "little summer," a season of planting, in Spanish speaking Caribbean regions) is fairly fixed and is an important annual stage in the agricultural economy of the colonies

Population.—While the inhabitants of the three colonies vary both as to total numbers and with regard to the proportion and nature of the European classes, the Guianas have a population which is extremely cosmopolitan yet at the same time characteristic The inhabitants of the three Guianas total about 500,000 The native Indians represent a small proportion of the total, about 6,000 in British, 2,000 in Dutch and 1,500 in French Guiana Both the British and Dutch colonies have a large population (relatively) of East Indians, imported beginning about 1850 in large numbers (now about 120,000 in British and 50,000 in Dutch Guiana) and Chinese and Japanese add to the mixture The underlying population, however, is the descendants of the negro slaves, those who escaped into the jungles prior to the abolition of slavery in the colonies forming a caste of their own, of which the "bush negroes" or Djukas are a part This hardy race, in common now with the negroes of the plantations and those of the Caribbean islands, have a religion, a pantheon of gods and a language of their own, recognized throughout the Guianas and the Dutch West Indies This language is based on a bastard English to which have been added Indian, African, Dutch and Portuguese words

Flora and Fauna.—The vegetation is most luxuriant and its growth perpetual Indigenous trees and plants abound in the utmost variety, while many exotics have readily adapted themselves to local conditions Along the coast is a belt of courida and mangrove—the bark of the latter being used for tanning—forming a natural barrier to the inroads of the sea, but one which—very unwisely—has been in parts almost ruined to allow of direct drainage The vast forests afford an almost inexhaustible supply of valuable timbers, greenheart and mora, largely used in shipbuilding and for wharves and dock and lock gates, silverbally, yielding magnificent planks for all kinds of boats, and cabinet woods, such as cedar and crabwood There may be seen great trees, struggling for life one with the other, covered with orchids —some of great beauty and value—and draped with falling *lianas* and vines Giant palms fringe the riverbanks and break the monotony of the mass of smaller foliage Many of the trees yield gums, oils and febrifuges, the bullet tree being bled extensively for *balata*, a gum used largely in the manufacture of belting Valuable varieties of rubber have also been found in several districts On the coast plantains, bananas and mangoes grow readily and are largely used for food, while several districts are admirably adapted to the growth of limes Oranges, pineapples, star-apples, granadillas, guavas are among the fruits, maize, cassava, yams, eddoes, tannias, sweet potatoes and ochroes are among the vegetables, while innumerable varieties of peppers are grown and used in large quantities by all classes The avocado grows readily In the lagoons and trenches many varieties of water-lilies grow wild, the largest being the famous *Victoria regia*

Guiana is full of wild animals, birds, insects and reptiles Among the wild animals are the tapir, manatee, sloth, ant-eater, armadillo, several kinds of deer, monkeys and the puma and jaguar The last is seen frequently down on the coast, attracted from the forest by the cattle grazing on the front and back pasture lands of the estates Among the birds may be mentioned the carrion crow (an invaluable scavenger), vicissi and muscovy ducks, snipe, teal, plover, pigeon and the ubiquitous kiskadee or *qu'est que dit*, a species of shrike—his name derived from his shrill call These are all found on the coast In the forest are maam (anamon), maroudi (wild turkey), the beautiful bell-bird with note like a silver gong, great flocks of macaws and parrots, and other birds of plumage of almost indescribable richness and variety On the coast the trenches and canals are full of alligators, but the great cayman is found only in the rivers of the interior Among the many varieties of snakes are huge constricting anacondas, deadly bushmasters, labarrias and rattlesnakes Among other reptiles are the two large lizards, the salumpenta (an active enemy of the barn-door fowl) and the iguana, whose flesh when cooked resembles chicken The rivers, streams and trenches abound with fishes, crabs and shrimps, the amount of the latter consumed being enormous, running into tons weekly as the coolies use them in their curries and the blacks in their foo-foo

Economics and Trade.—The three Guianas, although together the smallest administrative units in South America, with the exception of Uruguay and Paraguay, and with an aggregate population less than half that of Paraguay, have a production and commerce that are far from negligible The total foreign trade of the three is two and a half times that of Paraguay and half as much again as Ecuador's. The *per capita* trade (about £17) is three times that of Brazil or Colombia, four times that of Venezuela and six times that of Ecuador British Guiana is the second in the world, or a close third to Brazil's second place, in the productions of diamonds and the world's balata and bauxite are supplied in large measure by these three generally believed secondary colonies

The interest of the world in the Guianas has from the first been in trade The traders of the early period exchanged their cargoes for good values in cotton, tobacco and forest gums The Dutch sought tobacco in their early voyages, but sugar early became the most promising of the products and slaves were brought from Africa to cultivate the cane in the uplands away from the buccaneers of the coasts In later years, and particularly in British Guiana after the British first took possession in 1796, cotton became an important crop, but the abolition of the slave traffic in 1807 struck a hard blow to both sugar and cotton Coffee has been and still is a most important crop in all the Guianas and cacao has had its turn, although recently it has suffered from blight much as has the cacao of Ecuador. All of the colonies produce balata from wild jungle trees, and this, too, is a product of interest and importance to the highly industrialized countries.

Only a small proportion of the soil of the Guianas is cultivated, 136,000 ac. or 0·3 of 1%, in British Guiana, being the largest area and the largest proportional cultivation of the three colonies The plantations have shrunk in number since the end of the slave traffic, and the labour problem is an almost insurmountable barrier to great progress The territory under cultivation, to a large extent lying along the coast, is subject to overflow at high tide, and the Zeelanders who came to British and Dutch Guiana in early days introduced there a system of dikes, against the sea on the one side, with trenches behind them, and often, too, against inundation from the rivers The complicated system of canals and drains which are necessary often occupy as much as 10% of the area of the plantations or estates, and in addition apparently preclude the use of machinery in the sugar fields, which if it were available, would go far to neutralize the lack of labour in these rich but none too healthy colonies

History.—The Guiana coast was sighted and noted by Christopher Columbus (*q.v.*) in 1498, but he made no landing, although his one landing upon the continent of South America was on the peninsula of Paria, the north-eastern extremity of what is now Venezuela, just north of Venezuelan Guiana It was also noted by Amerigo Vespucci (*q.v.*) and Alonzo de Ojeda, in 1499 and in 1500 Vicente Yañez de Pinzon, who discovered the Amazon river, skirted these shores closely and probably explored some of the rivers, the River Oyapock, the eastern boundary of French Guiana, was called, before the Dutch, by his name, Rio Pinzon

The legend of El Dorado, the Gilded King, who was reputed to cover himself with pure gold and to wash it from him in the waters of a sacred lake at "Manoa," was early localized in Guiana, although some of the Spanish adventurers sought his kingdom in the highlands of Colombia It was this legend, of which he read in the papers of captured ships, that led Sir Walter Raleigh (*q.v.*) to ascend the Orinoco in 1595 in search of El Dorado, to send Lawrence Keymis again on the same search in 1596, and to go again himself, for the last time, in 1617 on that expedition which ended in tragic disaster This strange legend was apparently invented by the coastal Indians to account for the quills of gold which to this day come down the Orinoco in the course of many exchanges from far interior sources which no white prospector has even yet uncovered

The Dutch apparently made their first trade contacts with Guiana in 1598, although they had been skirting the coast of the Caribbean (the Spanish "main" or mainland) since 1580 By 1613 these hardy explorers and traders had three or four settlements on the coast of Demerara and Essequibo (which with Berbice now form British Guiana), eastward of the mouth of the Orinoco, and by 1616 they had penetrated inland. During the same period the French and also the English were establishing their trading posts in Cayenne (now French Guiana) and in Surinam (Dutch Guiana). The French early took predominance in the more eastern region, along the Rio Oyapock at the beginning, and there they still remain. By 1652 the English had substantial interests in Surinam, and in 1663 Charles II. issued letters patent to Lord Willoughby of Parham and Lawrence Hyde, second son of the earl of Clarendon, granting them the region between the Copenam and Maroni rivers, comprising 120 m. of the coastland from east to west, of what is now Dutch Guiana.

It was this stretch of territory regarded as excellent (as it is) for the growing of sugar cane, that Holland willingly accepted in exchange with England for Nieu Amsterdam, the Dutch colony which lay between the English colonies of New England and Pennsylvania, and which now comprises the city and most of the state of New York. The transfer was made as the result of the treaty of Breda, in 1667. The English were then without possessions or claims in Guiana. The Dutch West India company, which had been formed in 1621, had taken over Essequibo, over whose destinies it exercised sovereign rights for 170 years. The Dutch made their first settlement in the Berbice river in 1624, thus founding the third of the three colonies which were later to form present British Guiana. Berbice was independent of the other Dutch colonies, but Dutch settlement continued to strengthen itself throughout all of what is now British and Dutch Guiana In 1657 colonies of Zeelanders had settled on the Pomeroon, Moruca and Demerra rivers, and in 1674 the New Dutch West India company, succeeding the old which had failed, was formed; in 1682 this new company received Guiana by charter from the States-General.

This was in the heydey of the slave traffic, the plantations were in full swing, worked by blacks from Africa, and the colonies were very prosperous In 1683, the company sold one-third of its Guiana holdings to the city of Amsterdam, and another third to Cornelis van Aessens, lord of Sommelsdijk The Chartered society of Surinam was formed by the three owners of Guiana, the New Dutch East India company holding in addition the trade in slaves, the most lucrative of all the commerce, but allowing the Chartered society to import slaves on their own account, however, on payment of a fine to the company

Sommelsdijk had agreed to take the post of governor of the colony at his own expense He travelled thither and lived and died there He brought the Indians under control, disciplined the ruffian soldiery, and built the important canal which bears his name He set up a substantial provincial government, including a high court of justice, and contributed much to agriculture, amongst other things introducing the cultivation of the cocoanut palm His notable five-year reign was ended in June 17, 1688, when he was murdered in a mutiny of his soldiers Sommelsdijk's widow offered his third portion of the Guianas for sale to William II of England, but it was finally purchased for 700,000 florins, by the city of Amsterdam In 1732, Berbice was given a constitution and status as an independent colony, and in 1773 Demerara, which had been administered as a part of Essequibo, was also constituted as an independent colony In 1781, British privateers took possession of the three colonies which constitute present-day British Guiana, and Lord Rodney placed them under the rule of the Governor of Barbados In 1782 they were recaptured, this time by the French, who were then the allies of the Dutch, and in 1783 they passed again to the possession of Holland, by the terms of the peace settlement In 1784 Essequibo and Demerara were again united under one governor and the town of Stabroek (now Georgetown) was fixed as the capital

In 1796 the British again captured Essequibo, Demerara and Berbice and held them until the peace of Amiens in 1802, when they were returned to Holland only to be taken again by the British in 1803, to be held until formally ceded in 1814–15, in the settlement following the close of the Napoleonic Wars

(W THO.)

BRITISH GUIANA

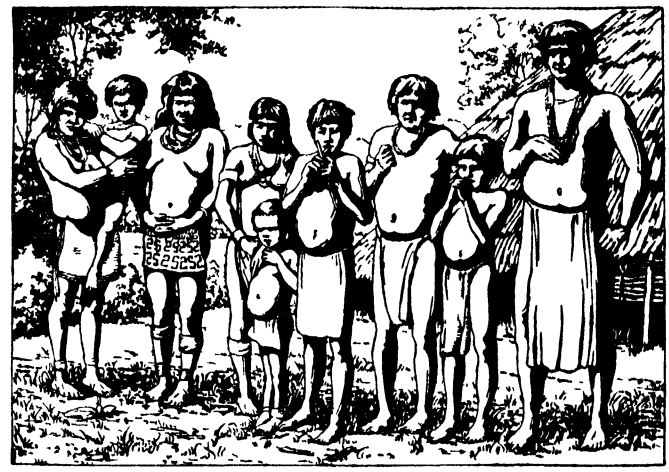
The only British possession in South America was formally ceded in 1814–1815. Three colonies were in 1831 consolidated into one, divided into three counties, Berbice from Corentyn river to Abary creek, Demerara from Abary to Boerasirie creek, Essequibo from the Boerasirie to the Venezuelan frontier This boundary-line with Venezuela long remained in dispute. The Dutch, while British Guiana was theirs, claimed the whole watershed of the Essequibo river, while the Venezuelans said the Spanish province of Guayana had extended to the Essequibo In 1840 Sir Robert Schomburgk suggested the "Schomburgk line", and later, though no agreement was arrived at, modifications were made. In 1886 Great Britain located outposts at points along "the modified Schomburgk line" and for some years Guiana police and Venezuelan soldiers faced one another across Amacura creek in the Orinoco mouth and at Yuruan up the Cuyuni river. After a presidential message to the Congress of the U S A. (1897) an international commission made its award at Paris in 1899 (*see* VENEZUELA) Neither party gained its extreme claim, the line laid down differing but little from the original Schomburgk line Demarcation by a joint commission (Venezuela and British Guiana) was completed in 1904 Owing to the impassability of the country, the commissioners suggested a deviation to follow the watersheds of the Caroni, Cuyuni and Mazaruni rivers and the two governments agreed In 1902 the delimitation of the boundary between British Guiana and Brazil was referred to the arbitration of the king of Italy, who in June 1904, awarded most of the area in dispute to British Guiana The demarcation has since been carried out. The present area is 89,480 sq miles

Inhabitants and Towns.—Population (1925) 297,691, including 120,000 negroes, 124,000 East Indians, 4,300 Europeans, other than Portuguese, estimated at about 11,600, and some 30,000 of mixed race The aborigines—Arawaks, Caribs, Wapisianas, Warraws, etc—are estimated at about 6,500 In 1904 the birth-rate for the whole colony was 30 3 per 1,000 and the death-rate 28 8. The capital is Georgetown, at the mouth of the Demerara river, on its right bank Pop 55,638 New Amsterdam is on the right bank of the Berbice river Pop about 8,000 Each possesses a mayor and town council, with statutory powers to impose rates There are nineteen incorporated villages, and ten other locally governed areas known as country districts, controlled by village councils and country authorities respectively

Physical Geography.—The seaboard is flat and below the level of high-water, the forest belt is swampy along the rivers but rising between them, the savannahs lie inland of the forest belt, the high table-lands are grass-covered and practically treeless, and rise to mountain ranges A rough inclined plain, starting at some 900ft above sea-level at the source of the Takutu in the south-west, but only some 400ft at that of the Corentyn in the south-east, slopes down gradually to the alluvial flats The eastern part is forested, the western is level savannah, with woodlands along the rivers The coastal fluviomarine deposits extend inland 25m to 30m, ending against beds of sandy clay which form an extensive undulating region stretching back to the forest-covered hills Roughly parallel to the coast-line are the dunes, indicating the lines of a former coast, and still farther back are the higher "sand hills" of granite or diabase with thick coarse white sand

West to east are the Pacaraima and Merumé Mts, and the lesser Kanuku Mts (2,000ft.), while the Acarai Mts, densely-wooded (2,500ft.), form the southern boundary and the watershed between the Essequibo and Amazon The mountains rise in terraces and broad plateaus, with steep sandstone scarps They are mostly flat-topped, and their average height is about 3,500ft. The Pacaraima Mts reach 8,635ft. at Roraima, which springs as a wall of red rock 1,500ft high out of forest-clad slopes; in December 1884 Messrs im Thurn and Perkins found a ledge by which to reach the summit, a table-land some 12sq m Mt Kukenaam, of similar structure rises above 8,500ft Other conspicuous summits (about 7,000ft) are Iwalkarima, Eluwarima, Ilutipu and Waiakapiapu. The southern part of the Pacaraima range comprises rugged hills and rock-strewn valleys, but to the north where the sandstone assumes the table-shaped form there are dense forests, and waterfalls may descend nearly 2,000ft sheer, as at Roraima and Kukenaam Long ranges of hills 2,000 up to 3,000ft, traversing the gneissose plains are either old intrusions of diabase and gabbro or later ones of dolerite The rocks of these ranges are the main source of gold in British Guiana

Rivers.—The rivers are practically the only highways inland from the coast The Essequibo rises in the Acarai Mts, and



BY COURTESY OF THE MUSEUM OF THE UNIVERSITY OF PENNSYLVANIA

SOME MEMBERS OF A TARUMA VILLAGE, IN SOUTHERN BRITISH GUIANA
The Taruma, a division of the Arawak tribe, is the most highly civilized Indian group of British Guiana. Although clever in handicraft work and devoted to agriculture, they are a weakly people and their numbers are steadily decreasing

flows north for about 600m to an estuary nearly 15m wide. Craft drawing 20ft. may go up 50 miles; beyond this point are cataracts Some 7m below the first series of rapids it is joined by the Mazaruni, itself joined by the Cuyuni some 4m farther up By the Awaricura, which joins the Rupununi tributary of the Essequibo, the Pirara, a tributary of the Amazon, may be reached, —an example of the interesting series of *itabos* connecting nearly all South American rivers with one another On the Potaro branch is the famed Kaieteur fall, which drops from a tableland of sandstone and conglomerate into a deep valley 822ft below For the first 741ft the water falls as a perpendicular column, thence as a sloping cataract The river above the fall is about 400 ft wide, while the actual waterway of the fall itself varies from 120ft in dry weather to nearly 400ft in rainy seasons The Kaieteur can now be reached on the fifth day from Georgetown The Demerara's source is known only to Indians, but is near 5° N The last 70 of the river's 200m are navigable to vessels which can get over the bar (19ft draught) The Berbice river rises in about 3° 40′ N, and in 3° 53′ N is within 9m of the Essequibo Its mouth is 2½m wide; vessels of 12ft draught can go up 105, those of 7ft draught, 175 miles, above which are cataracts The Corentyn which rises in a divide 400ft high in parts has cataracts in upper reaches only less fine than Kaieteur, its lower 150m are navigable and beautiful and its estuary is 14m wide The Abary, Mahaicony and Mahaica, between Berbice and Demerara, and the Boerasirie between Demerara and Essequibo are large streams or creeks which fall into the Atlantic direct Forest rivers are dark brown from humus, savannah streams milky white

Climate.—Malaria is common but preventible, and phthisis is prevalent, not because of climate but through ignorance of rules of health Strong gales are unknown, a tidal wave is an impossibility, and the soil of the coast renders earthquakes practically harmless The North-east trades bring rains mid-April to mid-August and temperature averages about 80° F The trades die away in August and dry heat ensues They begin again in October and temperature falls to 80° F average Rain follows in December and January and dry weather in February and March Rainfall (80in on the coast) varies much from place to place and very wet or dry abnormal seasons may occur

Government and Administration.—Executive power is

vested in a governor advised by an executive council Legislative authority was until July 18, 1928 vested in the Court of Policy consisting of the governor who presided and without whose permission no legislation could be initiated, seven other official members and eight elected members This body had, however, no financial authority, all taxation and expenditure being dealt with by the Combined Court, consisting of the Court of Policy with six financial representatives In 1927 a Parliamentary commission was appointed to report on the economic condition of the colony and recommended certain constitutional changes These recommendations were subsequently adopted by the Home Government and promulgated by an order in council which superseded the old Court of Policy and the Combined Court by a Legislative Council consisting of the governor as president, ten official members and 19 unofficial members The (male) franchise is based upon certain small property qualifications. The Roman-Dutch law, modified by orders-in-council and local statutes, governs actions in the civil courts, but the criminal law is founded on that of England The Church of England and the Church of Scotland are both established, and grants-in-aid are also given to the Roman Catholic and Wesleyan Churches and to several other denominations The revenue and expenditure now each amount annually to an average of a little over £1,000,000 About one-half of the revenue is produced by import duties, and about one-fifth by excise The public debt on December 31, 1926, stood at £2,701,126

Education.—The system of primary education is denominational and is mainly supported from the general revenue Secondary education is privately provided in Georgetown and Berbice, aided by government grants, and given for boys at Queen's college, an undenominational government institution where the course of instruction is the same as at a public school in England The Guiana scholarship, open to boys and girls, carries a university or professional training in England

Industries and Trade.—The principal exports are sugar, rum, molasses, molascuit—a cattle food made from molasses—rice, timber, coconuts, balata, bannik, diamonds and gold The value of the total exports was £3,130,706 in 1925 of which three-fourths went to Great Britain and British possessions The cultivation of rice has made great strides in recent years In 1873, 32,000,000 lb of rice were imported, whereas in 1925, 15,496,205 lb were exported, principally to the British West Indies The cultivation of the sugar-cane and its manufacture into sugar and its by-products still remains, in spite of numerous fluctuations the principal industry Production has been greatly economized by the grouping of exports about central factories Most of the sugar exported now goes to Canada, most of the rum to England and most of the molasses to Holland and Portuguese possessions The lands on the coast and on the river banks up to the sand hills are of great fertility The problem of agricultural development, however, is one of great difficulty Much of the privately owned land is not beneficially occupied, and though there are vast tracts of uncultivated Crown land where a farm can be easily and cheaply acquired, the difficulties involved in clearing, draining and in some cases protecting it by dams are almost prohibitive

Prospecting for gold began in 1880, and from 1884 to 1893–1894 the output, chiefly from alluvial workings, increased from 250 oz. to nearly 140,000 oz annually. It has now fallen to about 6,000 oz Diamonds to the value of £686,900 were exported in 1926 Bauxite (aluminium ore) £170,850

Timber (export value 1925, £31,608) is cut, and balata (£113,-112) and rubber collected from Crown lands by licences issued from the department of lands and mines An efficient forest department newly created is making a survey of the forest resources The value of imports was £2,908,434 in 1925, of which nearly three-fourths were from Great Britain and British possessions Of the vessels trading with the colony, most are under the British flag, the remainder being principally American and Norwegian.

The money of account is dollars and cents, but, with the exception of the notes of the two local banks, the currency is British sterling. The unit of land measure is the Rhynland rood, roughly equal to 12 feet 4 inches. A Rhynland acre contains 300 square roods.

Inland Communication.—The public roads extend along the coast from the Corentyn river to some 20m N of the Essequibo mouth on the Aroabisci coast, and for a short distance up each of the principal rivers and creeks entering the sea between these points A line of railway 60½m in length runs from Georgetown to Rosignol on the left bank of the Berbice river opposite New Amsterdam; and another line 15m long starts from Vreed-en-hoop, on the left bank of the Demerara river opposite Georgetown, and runs to Greenwich Park on the right bank of the Essequibo river some 3m. from its mouth A light railway, metre gauge, 18½m in length, connects Wismar (on the left bank of the Demerara river some 70m from its mouth) with Rockstone (on the right bank of the Essequibo, and above the first series of cataracts in that river) Steamers run daily to and from Georgetown and Wismar, and launches to and from Rockstone and Tumatumari Fall on the Potaro, and all expeditions for the gold-fields of the Essequibo and its tributaries above Rockstone travel by this route Another steamer goes twice a week to Bartica at the confluence of the Essequibo and Mazaruni, and another weekly to Mt Everard on the Barima, from which termini expeditions start to the other gold and diamond fields Steamers also run from Georgetown to New Amsterdam and up the Berbice river for about 100m Above the termini of these steamer routes all travelling is done in keelless *bateaux*, propelled by paddlers and steered when coming through the rapids at both bow and stern by certificated bowmen and steersmen Owing to the extreme dangers of this inland travelling, stringent regulations have been framed as to the loading of boats, supply of ropes and qualifications of men in charge, and the shooting of certain falls is prohibited Ocean communications are maintained with Britain, Canada, the United States, France and Holland (X ; O)

BIBLIOGRAPHY—J B Harrison and F A Stockdale, *Rubber and Balata in British Guiana* (1911), W Beebe, G I Hartley and P G Howes, *Tropical Life in British Guiana* (1917), *Blue Book of the Colony, and Colonial Report* (Annual), A Aspinall, *Handbook of the British West Indies, British Guiana,* and *British Honduras* (1926)

DUTCH GUIANA

Dutch Guiana or *Surinam* is a colony of Holland, on the north coast of South America between 2° and 6° N latitude and 53° 50′ and 58° 20′ E longitude It is bounded on the east by French Guiana, on the south by Brazil, on the west by British Guiana, and on the north by the Atlantic Ocean Area, 54,291 sq miles The Atlantic coast line is about 240m, the port of the colony being Paramaribo, the capital

The five main rivers are the Corentyn or Corentyne (Dutch, *Corantijn*), the Maroni (Dutch, *Marowijne*), on the border with French Guiana, and the Coppename, Saramacca and Surinam All flow northward The Corentyne is navigable for about 70m and vessels of six-foot draft can ascend it for 150 miles The Surinam and Maroni are also navigable, the former for 100m to 10 foot draft, and the latter for 40 miles The interior is cut with hills, rising to 3,800 feet in the mountain known as Wilhelmina Kette, in the west The mountainous, forested region to the south, and along the border with Brazil, is virtually unexplored Geology and climate, flora and fauna, are described under the general heading of the Guianas

Population—The population of Dutch Guiana (Dec 1926) was 142,896, although 120,000 is a usual estimate Taking the smaller figure, the approximate division is: negroes, 56,500; British East Indians, 32,000; Dutch East Indians (Javanese), 20,000, native Indians, 9,000, Chinese, 1,500; Europeans, 1,000 Of the negroes, about 10,000 are estimated to be "bush Negroes," "Djurkas" or "Marrons," the picturesque race descended from slaves who escaped into the forests The only town and port of importance is Paramaribo, pop (1926) 45,703

Since 1870, when a convention was signed between Holland and Great Britain for the regulation of the traffic, the serious labour problem existent since slavery was abolished in 1863, has been met in part by the importation of coolies from India and the Dutch East Indian colony of Java Health conditions are not

particularly satisfactory. There are the usual tropical diseases, and malaria is but little controlled. Drinking water is usually obtained from the drainage of the roofs Paramaribo has a few wells, but the water is poor and is used only during drought No town in Dutch Guiana had a sewerage system up to 1928

Education and Charities—There is a government normal school with 97 pupils (1926), 35 public schools with 5,268 pupils and 58 private schools with 10,108 pupils The government supports in whole or in part various orphan asylums and religious and other philanthropical institutions

Religious Denominations—The following were the different religious bodies (1926). Reformed and Lutheran, 11,556, Moravian, 29,170; Roman Catholic, 24,062, Jews, 750, Mohammedans, 34,536, Hindus, 20,719

Government—Dutch Guiana is the only Dutch possession on the continent of South America It is a colony administered by an appointed governor, who is president of an executive council nominated by the crown The legislative body is the Colonial States, the 13 members of which are chosen for six years by local electors The colony is divided into 16 districts, for administrative and fiscal purposes For the administration of justice there are three cantonal courts, two district courts and a supreme court at Paramaribo, the members of this court are nominated by the crown There is a civic guard of about 1,800 and a militia of 500, with a small garrison

Finance—The expenses of government are derived from import, export and excise duties, taxes on property and incomes and by a subvention from the Dutch Government, which varies to make up the deficit between expenditures and income The budget of four years in Dutch florins, the currency of the colony, is as follows

	1925	1926	1927	1928
	Fl	Fl	Fl	Fl
Expenditures	8,078,000	8,051,000	7,104,000	7,742,000
Local revenue	4,7[illegible]1,000	5,5[illegible]4,000	4,564,000	4,821,000
Subvention	2,528,000	2,527,000	2,540,000	2,533,000

Economics and Trade—The chief products are agricultural, including sugar (with rum and molasses), coffee, cacao, rice and maize The mineral products are gold and bauxite Balata is the only important forest product, in spite of the number and quantity of precious woods and gums contained in the virtually unexplored timbered regions Sugar has always been the principal item of export, and so continues The 1925 sugar exports reached a total of 13,973,740 kg, as compared with exports of 7,658,701 kg in 1924 In 1926 the exports fell again, owing in part at least to the general downward tendency of the world sugar market, the total exports for that year being 10,236,620 kilograms Coffee is now the second export crop of Surinam In 1925 the exports were 1,893,072 kilograms Cacao, once a major export item of Dutch Guiana, has been seriously affected by the witches' broom disease In 1926, the total exports were 470,092 kilograms Maize and rice are raised chiefly for local use

Balata is the chief forest product In 1926 exports were 470,092 kilograms Some 2,500 natives are engaged in its extraction, which is pursued without much respect to the conservation of the supply, a practice that may account in part for the falling exports, for the world demand continues and increases The gold workings of Dutch Guiana date only from 1876, and are still almost entirely placer, although there are one or two dredges in operation The peak of production was in 1912, when some 38,000 oz were shipped This has progressively declined, only 250,656 g being exported in 1926 The exploitation of the mineral bauxite began on a commercial scale in 1923 The mines are located 100 m south-east of Paramaribo, and the ore is loaded direct on the ocean steamers, and is shipped almost entirely to the United States The production fell from 86,826 tons in 1925 to 46,454 tons in 1926

Imports include foodstuffs and textiles, cotton goods constituting the largest single item The colony is virtually without produce for manufacture, and the imports rise close to the exports in all years The trade figures follow

	Imports	Exports
	Florins	Florins
1921	13,150,025	6,562,014
1922	10,563,579	5,688,370
1923	7,855,161	8,388,338
1924	7,496,453	7,409,441
1925	9,474,101	9,932,306
1926	9,995,444	7,670,508

Holland is chief customer, taking some 67% of its products British imports, like its exports, are confused by the transhipment trade between British Guiana and the Dutch colony It is noted that British Guiana, for instance, shows a larger total of exports of textiles to Dutch Guiana than does Great Britain Holland also leads as the country of origin of imports into Dutch Guiana, with the United States second

Communications—Paramaribo the only seaport is served by various steamship lines from Europe and the United States There is local steamship service from Paramaribo to the small ports of Nickerie, Gattice, Albina, etc, and government steamers also go each week to Georgetown, British Guiana The rivers furnish the chief means of interior communication They are joined by cross channels and canals River transportation is not satisfactory as droughts make it uncertain and the rainy season causes floods There is one railway, the Lawa, 107 m long, from Paramaribo to Dam One train a week is operated, and most of the freight and traffic comes from the gold fields Highways are in a primitive stage of development, the only important road, some 35 km, having been built by private capital for the service of the gold mines The plantations and the towns are all located on the rivers

History—The political history is uneventful, after the periods described in the general history of Guiana In 1828, Surinam and the islands of the Dutch West Indies were administrated by a single governor, residing at Paramaribo. This arrangement lasted until 1848, when the administration was separated Slavery was abolished in 1863 and the arrangement with the British for the control of the coolie traffic was drawn up in 1870 The interest of the Dutch government in this colony, which had waned with its dropping production of sugar through most of the 19th century has been renewed Expeditions for scientific study, laboratories and establishments for agricultural research, expositions of products from Surinam in Holland, have been evidence of this interest

BIBLIOGRAPHY—The literature in English is scarce and much of it inaccurate The most recent book is James Rodway's, *Guiana, British, Dutch and French* (1924) The United States Department of Commerce issued, in 1927, a booklet *The Guianas, Commercial and Economic Survey* The commercial side is also treated in various books on commerce and trade in the Caribbean countries and South America The following authorities on historical and other phases are to be cited of the older works on Surinam the first rank is held by Jan Jacob Hartsinck's *Beschryving van Guiana, of de Wilde Kust, in Zuid Amerika* Extracts from this work, selected for their bearing upon British boundary questions, were translated and annotated by J A J de Villiers (London, 1897) L Thompson, *Overzicht der Geschiedenis van Suriname* (The Hague, 1901), *Surinaamsche Almanak* (Paramaribo, annually)

FRENCH GUIANA

FRENCH GUIANA, or Cayenne, lies at the north-eastern extremity of the continent, between 2° and 3° N and 51° and 53° W It is bounded on the west by Dutch Guiana, the river Maroni marking the boundary, on the north by the Atlantic ocean, east and south by Brazil, the east and south-east boundary is along the Oyapock river, and the south along the crest of the Tumucumaque mountains The area is 34,740 sq m, about one-third the size of France

Both boundaries of French Guiana were long in dispute and have been settled only recently The Brazilian boundary was determined by the Swiss Government in 1900, setting the boundary at the Oyapock river and the Tumucumaque mountains The dispute with Dutch Guiana was settled by the emperor of Russia in 1891

The physical geography of French Guiana is in general like that of British and Dutch Guiana, but a large proportion of the low-

land coast is covered with dense jungle and mangrove swamps. Fifteen rivers, rising in the mountains, flow through the colony to the sea Practically all the inhabited portion of the colony is in the lowland section, where the heat is less oppressive The climate is not healthy and in the earlier years of the colony's history the French convicts and exiles in the penal settlements fell easy victims to tropical diseases and Cayenne was known as a pest-hole from which few returned

The population of French Guiana was placed in 1927 at 47,340, 13,936 of whom live in Cayenne and 6,200 making up the penal population This estimate does not include the army, the native tribes or the miners and others without fixed abode The largest proportion of French Guiana is an untracked wilderness, and the residents outside the towns, plantations and the penal settlement are very small Indians are estimated roughly at 1,500

Political Organization.—The colony is administered by a governor, assisted by a privy council of five members, including the secretary general and chiefs of the judicial service, the military, penitentiary and administrative departments The Council General, established in 1879, consists of 16 members, elected by the French citizens of the colony, and in its turn represented by a deputy in the French parliament There are a tribunal of the first instance and a higher tribunal at Cayenne, and four justices of the peace

The budget for 1926 provided for expenditures of 10,500,000 francs, the French franc, at its current exchange, being the unit of currency The expenses are chiefly for the penal settlement, French Guiana itself being close to self-supporting In the administration and budget of French Guiana and the penal settlement are included the three Safety islands, Royale, Joseph and Du Diable (the last notable as the island where Captain Dreyfus [*q v*] was imprisoned), the Enfant Perdu island and the five Remire islands

The penal settlement was established by decree in 1852, and from that date until 1867, some 18,000 exiles were sent to Guiana; then for about twenty years, the bulk of these unfortunates were sent to New Caledonia (*q v*) In 1885–87 Cayenne was designated specifically as the place of banishment for confirmed criminals and convicts sentenced for more than 8 years of hard labour The penal settlement is entirely separate from the life of the colony, the mainland settlement containing the majority of the criminals and the islands being used for the more desperate

Primary education has been free and non-religious since 1889, there being schools in various communes and villages There is secondary and higher education in Cayenne, and a normal school for teachers The school population in 1927 was 3,600. The penal settlement has three schools with 215 pupils There are several parochial schools The religious community is chiefly Roman Catholic, and at the head of the clergy is an apostolic prefect

Economics and Trade.—The agricultural development of French Guiana lags far behind that of either of the other two Guianas, the abolition of slavery in 1849 having struck a blow to the development of the plantations from which they have never recovered Only about 9,000 acres are under cultivation in the whole colony, and very little of the produce is exported Plantations were early set out to cultivate spices including cloves, cinnamon, pepper and nutmeg, all of which were successfully acclimated late in the 18th century Vanilla, which is native, was also cultivated, as are coffee, cacao and sugar cane still

The forests cover immense areas of the colony and are rich in commercial gums and all the tropical hardwoods of commerce Balata is extracted as in the other Guianas, 1924 exports being 468,190 kilos, worth 11,236,560 francs Rosewood essence is extracted, an industry which began in 1900 and has expanded until in 1924 the exports were 86,425 kilos valued at 12,963,750 francs.

Gold mining furnishes 90% of the exports and while found in various sections of the country, its recovery has been profitable in only a few sections Exports of gold in 1924 totalled 1,201,664 grs, valued at 12,016,640 francs

The trade of French Guiana in 1926 was 6,973,000 francs of imports and 46,105,881 francs of exports France has 71% of the trade, 62 3% of the imports and 81·5% of the exports; the United States has 17% of the imports and takes 4 7% of the exports. Great Britain furnishes 1·3% of the imports and takes 7·3% of the exports.

Communications.—There is but one railway, 12 kilometres long, from St Laurent to St. Jean, in the penal settlement There are three short highways, built by the convicts, but no system of highways linking the country in any sense The rivers furnish the only means of penetrating the interior, the maximum distance to which they are navigable by steamer being 50 miles, although the Maroni can be covered in canoes in the hands of the bush negroes for 300 miles, and the other streams for varying distances Cayenne is in touch with the other smaller ports by coasting steamers and launches, and aeroplanes (seaplanes) have been introduced for similar service Cayenne is also in touch by regular packet with the Safety islands, 35 miles distant, with Dutch and British Guiana, with Martinique and with New York. There is a French cable, from Brest, landing at Cayenne

History.—Henri IV's death prevented the colonization of French Guiana following a reconnoitering expedition sent out in 1604, and it was not until 1626 that the first settlement was made on the Sinnamary by traders from Rouen Cayenne was founded similarly in 1835, but later organizations, most of them starting in Rouen, failed in 1643, 1645 and 1652 The Dutch held possession for a few years after 1654, another ambitious organization in France failed in 1664, and in 1674 the colony passed to the control of the Crown Colbert, then finance minister, turned his genius to its reorganization, and success seemed promising, until a disastrous military expedition against Dutch Guiana in 1686 again set the colony back

Few efforts were made in the succeeding years, but despite the unpleasant experiences of the past, in 1763 another major tragedy took place Choiseul, the prime minister, and his cousin Praslin obtained a concession for the territory between the Kourou and Maroni rivers, and sent out an immense number, said to be 12,000, of volunteer colonists, chiefly from Alsace and Lorraine They went without adequate preparation, found neither food nor water for their sustenance, and died miserably; only 918 remained alive in 1765.

During the French Revolution, Cayenne was used as a place of exile of royalists, and suffering and tragedy followed all of these unfortunate bands One group of 600 exiled in 1797 were landed on the Sinnamary without shelter or food, and two-thirds perished In 1809 the colony was taken by the English and Portuguese

French Guiana was awarded to the French in 1814, and turned over by the Portuguese in 1817. Efforts were made again to induce the French to colonize it, a steam sugar mill was set up in 1822, and a fairly successful colony was established at Nouvelle Angoulême in 1824. The emancipation of the slaves in 1849 caused a severe setback, which was followed by attempts to colonize free blacks from Africa, one such colony being brought over in 1853 In 1852 French Guiana was made the site of the penal settlement, which has had a deterrent effect on voluntary development from France.

BIBLIOGRAPHY —A recent English book of description as well as biography, is Mrs. Blair Niles, *Condemned to Devil's Island* (1927) The French penal settlements have a large bibliography of their own A detailed bibliography of French Guiana will be found in Ternaux-Compans, *Notice historique de la Guyane française* (Paris, 1843) Among more recent works, *see* H A Coudreau, *La France équinoxiale* (1887), *Dialectes indiens de Guyane* (1891), *Dix ans de Guyane* (1892) and *Chez nos Indiens* (1893), G Brousseau, *Les Richesses de la Guyane française* (1901); L F Viala, *Les Trois Guyanes* (1893), Clement Duval, *Memorie autobiografiche* (1919); Gilles Normand, *Au Pays d l'or* (1923) and current and older issues of the reports of the French Colonial Ministry. (W THO.)

GUIART or **GUIARD, GUILLAUME** (d *c* 1316), French chronicler and poet, was probably born at Orleans, and served in the French army in Flanders in 1304 He lived at Arras and then in Paris, thus being able to consult the large store of manuscripts in the abbey of St Denis, including the *Grandes chroniques de France* Afterwards he appears as a *ménestrel de bouche* Guiart's poem *Branche des royaulx lignages,* was written

and then rewritten between 1304 and 1307, in honour of the French king Philip IV, and in answer to the aspersions of a Flemish poet. Its 21,000 verses deal with the history of the French kings from the time of Louis VIII.; but it is only really important for the period after 1296 and for the war in Flanders from 1301 to 1304, for which it is a high authority It was first published by J A Buchon (Paris, 1828), and again in tome xxii of the *Recueil des historiens des Gaules et de la France* (1865)

See A. Molinier, *Les Sources de l'histoire de France,* tome iii. (1903).

GUIBERT or **WIBERT** (*c.* 1030–1100), of Ravenna, antipope under the title of Clement III from June 25, 1080 until September 1100, was born at Parma between 1020 and 1030 of the noble imperialist family, Corregio He was appointed by the empress Agnes, chancellor and, after the death of Pope Victor II (1057), imperial vicar of Italy. He strove to uphold the imperial authority during Henry IV's minority, and presided over the synod at Basel (1061) Guibert lost the chancellorship in 1062 In 1073, through the influence of Empress Agnes and the support of Cardinal Hildebrand, he obtained the archbishopric of Ravenna and swore fealty to Alexander II. and his successors He seems to have been at first on friendly terms with Gregory VII, but soon quarrelled with him over the possession of the city of Imola, and henceforth was recognized as the soul of the imperial faction in the investiture contest He allied himself with Cencius, Cardinal Candidus and other opponents of Gregory at Rome, and, on his refusal to furnish troops or to attend the Lenten synod of 1075, he was ecclesiastically suspended by the pope He was probably excommunicated at the synod of Worms (1076) with other Lombard bishops who sided with Henry IV, and at the Lenten synod of 1078 he was banned by name The emperor, having been excommunicated for the second time in March 1080, convened 19 bishops of his party at Mainz on May 31, who pronounced the deposition of Gregory; and on June 25 he caused Guibert to be elected pope by 30 bishops assembled at Brixen Guibert was installed in the Lateran and consecrated as Clement III on March 24, 1084 One week later, on Easter Sunday, he crowned Henry IV and Bertha in St Peter's Clement survived not only Gregory VII but also Victor III and Urban II, maintaining his title to the end and in great measure his power over Rome and the adjoining regions Excommunication was pronounced against him by all his rivals He was driven out of Rome finally by crusaders in 1097, and sought refuge in various fortresses on his own estates St Angelo, the last Guibertist stronghold in Rome, fell to Urban II on Aug 24, 1098 Clement, on the accession of Paschal II in 1099, prepared to renew his struggle but was driven from Albano by Norman troops and died at Civita Castellana in September 1100

See J Langen, *Geschichte der romischen Kirche von Gregor VII bis Innocenz III* (Bonn, 1893), Jaffé-Wattenbach, *Regesta pontif Roman* (2nd ed, 1885–88), K. J von Hefele, *Conciliengeschichte,* vol v (2nd ed), F Gregorovius, *Rome in the Middle Ages,* vol iv, trans by Mrs G W Hamilton (London, 1900–02), and O Kohncke, *Wibert von Ravenna* (Leipzig, 1888) (C H H)

GUIBERT, JACQUES ANTOINE HIPPOLYTE, Comte de (1743–1790), French general and military writer, was born at Montauban, and at the age of 13 accompanied his father, Charles Bénoit, comte de Guibert (1715–1786), chief of staff to Marshal de Broglie, throughout the war in Germany, and won the cross of St Louis and the rank of colonel in the expedition to Corsica (1767) His *Essai général de tactique* (1770) appeared in numerous subsequent editions and in English, German and even Persian translations (extracts also in Liskenne and Sauvan, *Bibl. historique et militaire,* 1845) His *Défense du système de guerre moderne,* a reply to his many critics (Neuchâtel, 1779) is a reasoned and scientific defence of the Prussian method of tactics, which formed the basis of his work when in 1775 he began to co-operate with the count de St Germain in a series of much-needed and successful reforms in the French army In 1777, however, St. Germain fell into disgrace, and his fall involved that of Guibert, who was promoted to the rank of *maréchal de camp* and relegated to a provincial staff appointment In his semi-retirement he vigorously defended his old chief St Germain against his detractors. On the eve of the Revolution he was recalled to the War Office, but in his turn he became the object of attack and he died, practically of disappointment, on May 6, 1790.

See Toulongeon, *Eloge véridique de Guibert* (1790), Madame de Stael, *Eloge de Guibert;* Bardin, *Notice historique du général Guibert* (1836), Flavian d'Aldeguier, *Discours sur la vie et les écrits du comte de Guibert* (Toulouse, 1855), Count Forestie, *Biographie du comte de Guibert* (Montauban, 1855), Count zur Lippe, "Friedr der Grosse und Oberst Guibert" (*Militar-Wochenblatt,* 1873, 9 and 10)

GUIBERT OF NOGENT (1053–1124), historian and theologian, was born of noble parents at Clermont-en-Beauvoisis, and studied at the Benedictine abbey of Flavigny (Flaviacum) or St Germer, where he devoted himself at first to the secular poets, and later changed to theology, through the influence of Anselm of Bec, afterwards of Canterbury In 1104, he became head of the abbey of Notre Dame de Nogent Of his works which appeared at Paris in 1651 and in Migne's *Patrol Lat*, vols 156 and 184, the chief are his interesting autobiography, *De vita sua, sive monodiarum,* and his history of the first crusade, *Gesta Dei per Francos* The former was translated into English by C C Swinton Bland (1926)

See H von Sybel, *Geschichte des ersten Kreuzzuges* (Leipzig, 1881); B Monod, *Le Moine Guibert et son temps* (1905), and *Guibert de Nogent; histoire de sa vie* (ed G Bourgin, 1907)

GUICCIARDINI, FRANCESCO (1483–1540), Italian historian and statesman, was born at Florence on Mar 6, 1483 He studied at the universities of Ferrara and Padua, and at that time contemplated a career in the church Owing, however, to the opposition of his father, he turned his attention to law, and at the age of 23 was appointed by the Signoria of Florence to read the *Institutes* in public He advanced his political prospects by his marriage with Maria Salviati In 1512 the Signoria sent him on a mission to the court of Ferdinand of Spain, and Guicciardini issued from this first trial of his skill with an assured reputation for diplomacy, which in the Italy of that time implied an ability to meet plot with counterplot, and parry force with sleight of hand

In 1515 Leo X took him into service, and made him governor of Reggio and Modena In 1521 Parma was added to his rule, and in 1523 he was appointed viceregent of Romagna by Clement VII Guicciardini was thus virtual master of the papal States beyond the Apennines, during a period of great difficulty In 1526 Clement made him lieutenant-general of the papal army In this capacity he witnessed from a distance the sack of Rome and the imprisonment of Clement, without being able to rouse the duke of Urbino into activity Clement did not withdraw his confidence, and in 1531 Guicciardini was advanced to the governorship of Bologna, the most important of all the papal lord-lieutenancies This post he resigned in 1534 on the election of Paul III, preferring to follow the fortunes of the Medicean princes

It may here be noticed that though Guicciardini served three popes through a period of 20 years, he hated the papacy with a deep bitterness, attributing the woes of Italy to the ambition of the church The same discord between his private opinions and his public actions may be traced in his later conduct Guicciardini believed that the best form of government was a commonwealth administered upon the type of the Venetian constitution, and we have ample evidence to prove that he had judged the tyranny of the Medici at its true worth Yet he did not hesitate to place his powers at the disposal of the most vicious members of that house for the enslavement of Florence In 1527 he had been declared a rebel by the Signoria on account of his well-known Medicean prejudices, and in 1530, deputed by Clement to punish the citizens after their revolt, he revenged himself with a cruelty and an avarice that were long and bitterly remembered When he returned to Florence in 1534, he did so as the creature of the dissolute Alessandro de' Medici, and he pushed his servility so far as to defend this infamous despot at Naples in 1535, before the bar of Charles V, from the accusations brought against him by the Florentine exiles (*Op med* vol ix) He won his cause, but he justified the reproaches of his contemporaries, who describe him as a cruel, venal, grasping seeker after power, eager to support a despotism for the sake of honours, offices and emoluments

secured for himself by a bargain with the oppressors of his country Varchi, Nardi, Jacopo Pitti and Bernardo Segni are unanimous upon this point; but it is only the publication of Guicciardini's private mss that has made us understand the force of their invectives After the murder of Duke Alessandro in 1537, Guicciardini espoused the cause of Cosimo de' Medici, a boy unused to the game of statecraft, hoping to rule Florence as grand vizier under this inexperienced princeling But Cosimo displayed the genius of his family for politics, and dismissed him Guicciardini spent his last years in the composition of the *Storia d'Italia* He died at Florence on May 23, 1540.

The Storia d'Italia (1561–64) dealt with the period 1494–1532, it was translated into most European languages It is a masterpiece of scientific history, and is remarkable for treating the history of Italy for the first time as a national whole, and not as the accumulation of separate principalities and republics The whole tangled skein of Italian politics, in that involved and stormy period, is unravelled with a patience and insight that are above praise The *Storia d'Italia* was undoubtedly the greatest historical work that had appeared since the beginning of the modern era, though it owes its greatness in part to the importance of the period with which it deals It remains the most solid monument of Italian reason in the 16th century, the final triumph of that Florentine school of philosophical historians which included Machiavelli, Segni, Pitti, Nardi, Varchi, Francesco Vettori and Donato Giannotti

Though Guicciardini lived through that agony of the Italian people, he does not seem to be aware that he is writing a great historical tragedy, and never ceases to be an impartial spectator—a cold and curious critic He maintained that the explanation of historical events could only be traced in the detailed study of human character and motive His writing is therefore overburdened with detail which, although it tends to destroy the proper perspective of his work, very accurately portrays the principles underlying his method

Up to the year 1857 the fame of Guicciardini as a writer, and the estimation of him as a man, depended almost entirely upon the *Storia d'Italia,* and on a few ill-edited extracts from his aphorisms At that date the Guicciardini family entrusted to Giuseppe Canestrini the publication of his hitherto inedited mss The works thus brought to light include (1) the *Ricordi politici,* consisting of about 400 aphorisms on political and social topics, which illustrate Guicciardini's conviction that man is naturally actuated by the basest motives, (2) the observations on Machiavelli's *Discorsi,* which very clearly show his lack of political idealism; (3) the *Storia Fiorentina,* an early work, (4) the *Dialogo del reggimento di Firenze,* also probably an early work, in which the forms of government suited to an Italian commonwealth are discussed, and illustrated by the vicissitudes of Florence up to the year 1494, and (5) *Discorsi politici,* composed during his Spanish legation Taken in combination with Machiavelli's treatises, the *Opere inedite* furnish a comprehensive body of Italian political philosophy anterior to the date of Fra Paolo Sarpi

See Rosini's edition of the *Storia d' Italia* (10 vols, Pisa, 1819) and the *Opere inedite* (ed Canestrini, 10 vols, 1857) *See* also Agostino Rossi, *Francesco Guicciardini e il governo Fiorentino* (2 vols, Bologna, 1896)

GUICHARD, KARL GOTTLIEB (1724–1775), soldier and military writer, known as QUINTUS ICILIUS, was born at Magdeburg in 1724, of a family of French refugees He was educated for the Church, but sought and obtained a commission in the Dutch army, making the campaigns of 1747–48 in the Low Countries In 1757 his *Mémoires militaires sur les Grecs et les Romains* appeared at the Hague, and in Jan 1758 he entered the service of Frederick the Great, remaining for nearly 18 months in the royal suite Guichard's Prussian official name of Quintus Icilius was the outcome of a friendly dispute with the king (*see* Nikolai, *Anekdoten,* vi 129–145, Carlyle, *Frederick the Great,* viii 113–114) He was appointed to the command of a free battalion This corps he commanded throughout the later stages of the Seven Years' War, his battalion, as time went on, becoming a regiment of three battalions, and Quintus himself recruited seven more battalions of the same kind of troops His command was almost always with the king's own army in these campaigns, but for a short time it fought in the western theatre under Prince Henry. When not on the march he was always at the royal headquarters, and it was he who brought about the famous interview between the king and Gellert (*see* Carlyle, *Frederick the Great,* ix 109, Gellert, *Briefwechsel mit Demoiselle Lucius,* ed Ebert, Leipzig, 1823, pp 629–631) on the subject of national German literature. He was made lieutenant-colonel in 1765, and in 1773, in recognition of his work *Mémoires critiques et historiques sur plusieurs points d'antiquités militaires,* dealing mainly with Caesar's campaigns in Spain (Berlin, 1773), was promoted colonel He died at Berlin on May 13, 1775

GUICHEN, LUC URBAIN DE BOUEXIC, COMTE DE (1712–1790), French admiral, was born at Fougères on June 21, 1712, and entered the navy in 1730 When France had become the ally of the Americans in the War of Independence, he hoisted his flag as rear-admiral in the Channel fleet, and was present at the battle of Ushant (July 27, 1779) In March of the following year he was sent to the West Indies to fight Rodney In the action to leeward of Martinique (April 17), Guichen narrowly escaped disaster He gave no further opportunity of bringing him to close action, and brought his fleet back to Brest for repairs In December 1781 Guichen was sent to the West Indies with stores and reinforcements On the 12th Admiral Kempenfelt, who had been sent out by the British Government to intercept him, sighted the French admiral in the Bay of Biscay through a temporary clearance in a fog, and attacked the transports, twenty of which were captured and the rest put to flight Guichen died on Jan 13, 1790

See vicomte de Noailles, *Marins et soldats français en Amérique* (1903), and E Chevalier, *Histoire de la marine française pendant la guerre de l'indépendence américaine* (1877)

GUIDE, an agency for directing or showing the way, specifically a person who leads or directs a stranger over unknown or unmapped country, or conducts travellers and tourists through a town, or over buildings of interest

A particular class of guides is employed in mountaineering, these are not merely to show the way, but stand in the position of professional climbers with an expert knowledge of rock and snowcraft, who are in dangerous expeditions an element of safety for the whole party

This professional class of guides arose in the middle of the 19th century when Alpine climbing became recognized as a sport (*see* MOUNTAINEERING), though long before that the guiding of travellers on their way to or from Italy had been a well organized occupation in mediaeval Switzerland, and many little touches in the *Divina Commedia* show that Dante was writing from actual experience of real, if minor, mountains under a real guide.

GUIDI, CARLO ALESSANDRO (1650–1712), Italian lyric poet, was born at Pavia on June 14, 1650 As chief founder of the well-known Roman academy called "L'Arcadia," he had a share in the reform of Italian poetry, corrupted by the extravagances of the poets Marini and Achillini and their school Guidi's most celebrated song is that entitled *Alla Fortuna* (To Fortune) In 1681 he published at Parma his poems, his lyric tragedy *Amalasunta in Italy,* and two pastoral dramas *Daphne* and *Endymion* His poetical version of the six homilies of Pope Clement XI proved to be the indirect cause of the author's death Guidi was on his way to present a copy to the pope, when he found a serious typographical error, he took it so much to heart that he was seized with an apoplectic fit at Frascati and died (June 12, 1712)

See G Capsoni, *Alessandro Guidi* (1896).

GUIDICCIONI, GIOVANNI (1480–1541), Italian poet, was born at Lucca on Feb 25, 1480, and died at Macerata He was bishop of Fossombrone and president of Romagna The *Rime* (mod ed, 2 vols, 1912) and *Letters* of Guidiccioni are models of elegant and natural Italian style

GUIDO OF AREZZO (*c* 990), a musician who lived in the 11th century, is also known as Guido Aretinus, Fra Guittone, and Guy of Arezzo He has been called the father of modern music, and a portrait of him in the refectory of the monastery of Avellana bears the inscription *Beatus Guido, inventor musicae* Of his life little is known, and that little is chiefly

derived from the dedicatory letters prefixed to two of his treatises and addressed respectively to Bishop Theodald of Arezzo, and Michael, a monk of Pomposa and Guido's pupil and friend At his first appearance in history Guido was a monk in the Benedictine monastery of Pomposa, where he taught singing and invented his educational method, by means of which, according to his own statement, a pupil might learn in five months what formerly it would have taken him ten years to acquire Envy and jealousy, however, drove him from the monastery and he went to live at Arezzo, where, about 1030, he received an invitation to Rome from Pope John XIV He obeyed the summons, and the pope himself became his first and apparently one of his most proficient pupils. In Rome he met again his former superior, the abbot of Pomposa, who seems to have induced him to return to Pomposa Thenceforward the particulars of his life are scanty but it is known that at one period he worked in the Benedictine monastery of St Maur des Fosses where he invented his novel system of notation and taught the brothers to sing by it In codex 763 of the British Museum the composer of the "Micrologus," which gives an account of his method and other works by him is always described as Guido de Sancto Mauro

But whatever the details of his life there is no room for question as to the importance of his musical reforms and innovations He it was who for the first time systematically used the lines of the staff, and the intervals or *spatia* between them There is also little doubt that the names of the first six notes of the scale, *ut, re, mi, fa, sol, la,* still in use in France and Italy, were introduced by him They were derived from the first syllables of six lines of a hymn addressed to St John the Baptist, the initial notes of each line of which happened to form the scale, C, D, E, F, G, A, the lines in question being as follows —

Ut queant laxis *re*sonare fibris
*Mi*ra gestorum *fa*muli tuorum,
*Sol*ve polluti *la*bii reatum,
Sancte Joannes.

Further Guido is generally credited with the introduction of the F clef and with writings on music which are amply sufficient to account for the high esteem in which he was ultimately held by his contemporaries The precise year of his death is unknown

The most important of Guido's treatises, and those which are generally acknowledged to be authentic, are *Micrologus Guidonis de disciplina artis musicae,* dedicated to Bishop Theodald of Arezzo, and comprising a complete theory of music, in 20 chapters; *Musicae Guidonis regulae rhythmicae in antiphonarii sui prologum prolatae,* written in trochaic decasyllabics of anything but classical structure, *Aliae Guidonis regulae de ignoto cantu, identidem in antiphonarii sui prologum prolatae;* and the *Epistola Guidonis Michaeli monacho de ignoto cantu,* already referred to These are published in the second volume of Gerbert's *Scriptores ecclesiastici de musica sacra* A very important manuscript unknown to Gerbert (the *Codex bibliothecae Utricensis,* in the Paris library) contains, besides minor treatises, an antiphonarium and gradual undoubtedly belonging to Guido

See L Angeloni, *G d'Arezzo* (1811), Kiesewetter, *Guido von Arezzo* (1840), Kornmuller, "Leben und Werken Guidos von Arezzo," in Habert's *Jahrb* (1876), Antonio Brandi, *G Aretino* (1882), G B Ristori, *Biografia di Guido monaco d'Arezzo* (1868), and a life by Gastoué in the *Dict d'archéologie* (Paris, 1924). (*See* also HEXACHORD, MUSIC and MUSICAL NOTATION)

GUIDO OF SIENA. The name of this Italian painter is of interest in the history of art, on the ground that, if certain assumptions regarding him could be accepted as true, he would be the earliest representative of a new school of neo-Byzantine art which flourished in Siena in the 13th century The case stands thus A large painting of the "Virgin and Child Enthroned," which was once in the church of San Domenico at Siena and is now in the Palazzo Pubblico bears a rhymed Latin inscription, giving the painter's name as Gu o de Senis, with the date 1221· Milanesi alleged that the inscription had been tampered with and should read 1281, while Prof Wickhoff maintained that the date 1221 was genuine Recent art criticism has inclined towards the latter view Milanesi thinks that the work in S Domenico is due to Guido Graziani, of whom no other record remains earlier than 1278, when he is mentioned as the painter of a banner

See Milanesi, *Della vera eta di Guido, in Giorn stor dyli Arch Toscani* III. (1859), Wickhoff, *Arch Stor dell' arte* III (1890), Langton Douglas, *History of Siena* (1902), Weigelt, *Duccio di Buoninsegna* (1911), Sirén, *Tosk Maler im 13 Jahr.* (1922).

GUIDO RENI (1575–1642), Italian painter of the Bolognese school, and one of the most admired artists of the period of incipient decadence in Italy, was born at Calvenzano near Bologna on Nov. 4, 1575 He studied under Denys Calvaert, a Flemish painter, who was at the head of an academy of design at Bologna He then worked under the Caracci for a short time Guido was faithful to the eclectic principle of the Bolognese school of painting On one occasion Annibale Caracci made the remark that a style might be formed reversing that of Caravaggio in such matters as the ponderous shadows and the gross common forms; this observation germinated in Guido's mind, and he endeavoured after some such style, aiming constantly at suavity Towards 1602 he went to Rome which remained his headquarters for 20 years Here, in the pontificate of Paul V (Borghese), he was greatly noted and distinguished In the garden-house of the Rospighosi Palace he painted the vast fresco which is justly regarded as his masterpiece—"Phoebus and the Hours preceded by Aurora" It is beyond doubt a work of pre-eminent beauty and attainment, it is stamped with pleasurable dignity, without being effeminate The pontifical chapel of Montecavallo was assigned to Reni to paint, but, being straitened in payments by the ministers, the artist made off to Bologna He was fetched back by Paul V with ceremonious éclat, and lodging, living and equipage were supplied to him In 1622 he was called to Naples to paint the chapel of S Gennaro, but he had to abandon this work in order to escape from the persecution of Ribera and other artists He returned to Rome, and then resettled in Bologna He had taught as well as painted in Rome, and he left pupils behind him, but on the whole he did not stamp any great mark upon the Roman school of painting, apart from his own numerous works in the papal city.

In Bologna Guido lived in great splendour, and established a celebrated school, numbering more than two hundred scholars He himself drew in it, even down to his latest years He now left Bologna hardly at all, in one instance, however, he went off to Ravenna, and, along with three pupils, he painted the chapel in the cathedral with his admired picture of the "Israelites gathering Manna" His prosperity was not to last till the end, for he was dissipated, and an inveterate gambler In his decline he sold his time at so much per hour to a number of picture dealers Half-heartedness, half-performance, blighted his product, self-repetition and mere mannerism, with affectation for sentiment and vapidity for beauty, became the art of Guido He died in Bologna on Aug 18, 1642, and was buried with great pomp in the church of S Domenico.

Of his numerous scholars, Simone Cantarini, named Il Pesarese, Giacomo Semenza and Francesco Gessi were among the more distinguished Guido's most characteristic style exhibits a prepense ideal, of form rather than character, and silvery, somewhat cold, colour His best works have beauty, great amenity, artistic feeling and high accomplishments of manner with a certain element of generalization Both in Rome and wherever else he worked he introduced increased softness of style, which was then designated as the modern method His pictures are mostly Scriptural or mythologic in subject, and between two and three hundred of them are to be found in various European collections He painted very few portraits The so-called Beatrice Cenci in the Barberini Palace was wrongly attributed to him Many etchings are attributed to him—some from his own works, and some after other masters

Of other works not already noticed, the following should be named —in Bologna, the "Massacre of the Innocents," and the "Pietà"; in the Dresden Gallery, an "Ecce Homo", in Milan (Brera Gallery), "Saints Peter and Paul", in Genoa (church of S Ambrogio), the "Assumption of the Virgin"; in Berlin, "St Paul the Hermit and St Anthony in the Wilderness", in Munich, "Apollo and Marsyas", in Rome (Capitol) "Mary Magdalene", (Vatican) "The Crucifixion of St Peter," an early work under the

influence of Caravaggio The Louvre contains eight of his pictures, the National Gallery of London seven

For the life and works of Guido Reni, *see* Bolognini, *Vita di Guido Reni* (1839); Passeri, *Vite de' pittori;* and Malvasia, *Felsina Pittrice;* also Lanzi, *Storia pittorica*

GUIENNE, an old French province which corresponded roughly to the *Aquitania Secunda* of the Romans and the archbishopric of Bordeaux In the 12th century it formed with Gascony the duchy of Aquitaine, which passed under the dominion of the kings of England by the marriage of Eleanor of Aquitaine to Henry II; but in the 13th, through the conquests of Philip Augustus, Louis VIII and Louis IX, it was confined within the narrower limits fixed by the treaty of Paris (1259) It is at this point that Guienne becomes distinct from Aquitaine It then comprised the Bordelais (the old countship of Bordeaux), the Bazadais, part of Périgord, Limousin, Quercy and Rouergue, the Agenais ceded by Philip III (the Bold) to Edward I (1279), and (still united with Gascony) formed a duchy extending from the Charente to the Pyrenees This duchy was held on the terms of homage to the French kings, an onerous obligation, and both in 1296 and 1324 it was confiscated by the kings of France on the ground that there had been a failure in the feudal duties At the treaty of Brétigny (1360) Edward III acquired the full sovereignty of the duchy of Guienne, together with Aunis, Saintonge, Angoumois and Poitou The victories of du Guesclin and Gaston Phoebus, count of Foix, restored the duchy soon after to its 13th-century limits In 1451 it was conquered and finally united to the French crown by Charles VII In 1469 Louis XI gave it in exchange for Champagne and Brie to his brother Charles, duke of Berry, after whose death in 1472 it was again united to the royal dominion Guienne then formed a government which from the 17th century onwards was united with Gascony The government of Guienne and Gascony, with its capital at Bordeaux, lasted till the end of the *ancien régime* Under the Revolution the departments formed from Guienne proper were those of Gironde, Lot-et-Garonne, Dordogne, Lot, Aveyron and the chief part of Tarn-et-Garonne

GUILBERT, YVETTE (1869–), French *diseuse,* was born in Paris She soon won an immense vogue by her rendering of songs drawn from Parisian lower-class life, or from the humours of the Latin Quarter, *les Quatre-z-Etudiants* and the *Hôtel du numéro trois* being among her early triumphs Her adoption of an habitual yellow dress and long black gloves, her studied simplicity of diction, and her ingenuous delivery of songs charged with *risqué* meaning, made her famous She owed something to M. Xanrof, who for a long time composed songs especially for her, and perhaps still more to Aristide Bruant, who wrote many of her *argot* songs She made successful tours in England, Germany and America In 1895 she married Dr M Schiller In later years she discarded something of her earlier manner, and sang songs of the "pompadour" and the "crinoline" period in costume.

She published the novels *La Vedette* and *Les Demi-vieilles,* both in 1902, and *La Chanson de ma vie* (*mes mémoires*) in 1927

GUILDFORD, municipal borough and county town of Surrey, England Pop (1921) 24,926, 29 m S.W. of London by the Southern railway Guildford (Gyldeford, Geldeford), a possession of King Alfred, was a royal borough throughout the middle ages It owed its rise to its command of trade routes It is first mentioned as a borough in 1131. Henry III. granted its inhabitants in 1256, freedom from all toll throughout the kingdom and a county court Elizabeth in 1580 confirmed earlier privileges, and other charters were granted in 1603, 1626 and 1686 The borough was incorporated in 1486 During the middle ages the government of the town rested with a powerful merchant gild. Two members for Guildford sat in the parliament of 1295, and the borough continued to return two representatives until 1867. Edward II granted two fairs, at the feast of St Matthew (Sept 21) and at Trinity respectively Henry VII. granted fairs on the feast of St Martin (Nov. 11) and St. George (April 23) Fairs in May for the sale of sheep and in November for the sale of cattle are still held The market rights date at least from 1276, and three weekly markets are still held The cloth trade which formed the staple industry at Guildford in the middle ages is now extinct.

Some old streets contain gabled houses, with quaint lattices and curious doorways Well preserved ruins of a Norman castle stand above the town. The church of St. Mary is Norman and Early English, with later additions; its aisles retain their eastward apses The churches of St. Nicholas and Holy Trinity are modern ones on ancient sites The town hall dates from 1683 Abbot's hospital, founded by Archbishop Abbot in 1619, is a Tudor brick building The Royal Free grammar school was founded in 1509, and incorporated by Edward VI The town has flour mills and iron foundries, and a large trade in grain, and live stock fairs are held Guildford is a suffragan bishopric in the diocese of Winchester

GUILDS. (The spelling *guild* is now the common English spelling, but there are many reasons for preferring the older spelling *gild.*) Mediaeval gilds were voluntary associations formed for the mutual aid and protection of their members Among the gildsmen there was a strong spirit of fraternal co-operation or Christian brotherhood, with a mixture of worldly and religious ideals—the support of the body and the salvation of the soul Early meanings of the root *gild* or *geld* were expiation, penalty, sacrifice or worship, feast or banquet, and contribution or payment; it is difficult to determine which is the earliest meaning, and we are not certain whether the gildsmen were originally those who contributed to a common fund or those who worshipped or feasted together Their fraternities or societies may be divided into three classes. religious or benevolent, merchant and craft gilds The last two categories, which do not become prominent anywhere in Europe until the 12th century, had, like all gilds, a religious tinge, but their aims were primarily worldly, and their functions were mainly of an economic character

Origin.—Various theories have been advanced concerning the origin of gilds Some writers regard them as a continuation of the Roman *collegia* and *sodalitates,* but there is little evidence to prove the unbroken continuity of existence of the Roman and Germanic fraternities. A more widely accepted theory derives gilds wholly or in part from the early Germanic or Scandinavian sacrificial banquets This view does not seem to be tenable, for the old sacrificial carousals lack two of the essential elements of the gilds, namely, corporative solidarity or permanent association and the spirit of Christian brotherhood Dr Max Pappenheim has ascribed the origin of Germanic gilds to the northern "foster-brotherhood" or "sworn-brotherhood," which was an artificial bond of union between two or more persons After intermingling their blood in the earth and performing other peculiar ceremonies, the two contracting parties with grasped hands swore to avenge any injury done to either of them The foster-brotherhood seems to have been unknown to the Franks and the Anglo-Saxons, the nations in which mediaeval gilds first appear; and hence Dr Pappenheim's conclusions, if tenable at all, apply only to Denmark or Scandinavia.

No theory on this subject can be satisfactory which wholly ignores the influence of the Christian Church Imbued with the idea of the brotherhood of man, the Church naturally fostered the early growth of gilds and tried to make them displace the old heathen banquets The work of the Church was, however, directive rather than creative Gilds were a natural manifestation of the associative spirit which is inherent in mankind The same needs produce in different ages associations which have striking resemblances, but those of each age have peculiarities which indicate a spontaneous growth It is not necessary to seek the germ of gilds in any antecedent age or institution. When the old kin-bond or *maegth* was beginning to weaken or dissolve, and the State did not yet afford adequate protection to its citizens, individuals naturally united for mutual help

Gilds are first mentioned in the Carolingian capitularies of 779 and 789, and in the enactments made by the Synod of Nantes early in the 9th century, the text of which has been preserved in the ecclesiastical ordinances of Hincmar of Reims (A.D. 852) The capitularies of 805 and 821 also contain vague references to sworn unions of some sort, and a capitulary of 884 prohibits

villeins from forming associations "vulgarly called gilds" against those who have despoiled them. The Carolingians evidently regarded such "conjurations" as "conspirations" dangerous to the State. The gilds of Norway, Denmark and Sweden are first mentioned in the 11th, 12th and 14th centuries respectively; those of France and the Netherlands in the 11th.

Many writers believe that the earliest references to gilds come from England The laws of Ine speak of *gegildan* who helped one another pay the *wergeld,* but it is not quite certain that they were members of gild fraternities in the later sense. These are more clearly referred to in England in the second half of the 9th century, though we have little information concerning them before the 11th century. To the first half of that century belong the statutes of the fraternities of Cambridge, Abbotsbury and Exeter They are important because they form the oldest body of gild ordinances extant in Europe. The thanes' gild at Cambridge afforded help in blood-feuds, and provided for the payment of the *wergeld* in case a member killed anyone The religious element was more prominent in Orcy's gild at Abbotsbury and in the fraternity at Exeter; their ordinances exhibit much solicitude for the salvation of the brethren's souls. The Exeter gild also gave assistance when property was destroyed by fire Prayers for the dead, attendance at funerals of gildsmen, periodical banquets, the solemn entrance oath, fines for neglect of duty and for improper conduct, contributions to a common purse, mutual assistance in distress, periodical meetings in the gildhall—in short, all the characteristic features of the later gilds already appear in the statutes of these Anglo-Saxon fraternities Some Continental writers, in dealing with the origin of municipal government throughout western Europe, have, however, ascribed too much importance to the Anglo-Saxon gilds, exaggerating their prevalence and contending that they form the germ of mediaeval municipal government. This view rests almost entirely on conjecture, there is no good evidence to show that there was any organic connection between gilds and municipal government in England before the coming of the Normans It should also be noted that there is no trace of the existence of either craft or merchant gilds in England before the Norman Conquest Commerce and industry were not yet sufficiently developed to call for the creation of such associations

Religious Gilds after the Norman Conquest.—Though we have not much information concerning the religious gilds in the 12th century, they doubtless flourished under the Anglo-Norman kings, and we know that they were numerous, especially in the boroughs, from the 13th century onward In 1388 parliament ordered that every sheriff in England should call upon the masters and wardens of all gilds and brotherhoods to send to the king's council in Chancery, before Feb 2, 1389, full returns regarding their foundation, ordinances and property. They throw much light on the functions of the gilds Their ordinances are similar to those of the above-mentioned Anglo-Saxon fraternities Each member took an oath of admission, paid an entrance fee, and made a small annual contribution to the common fund The brethren were aided in old age, sickness and poverty, often also in cases of loss by robbery, shipwreck and conflagration, for example, any member of the gild of St Catherine, Aldersgate, was to be assisted if he "fall into poverty or be injured through age, or through fire or water, thieves or sickness" Alms were often given even to non-gildsmen, lights were supported at certain altars, feasts and processions were held periodically; the funerals of brethren were attended, and masses for the dead were provided from the common purse or from special contributions made by the gildsmen. Some of the religious gilds supported schools, or helped to maintain roads, bridges and town-walls, or even came, in course of time, to be closely connected with the government of the borough; but, as a rule, they were simply private societies with a limited sphere of activity They are important because they played a prominent rôle in the social life of England, especially as eleemosynary institutions, down to the time of their suppression in 1547 Religious gilds, closely resembling those of England, also flourished on the Continent during the middle ages

The Gild Merchant.—The merchant and craft fraternities are particularly interesting to students of economic and municipal history. The gild merchant came into existence in England soon after the Norman Conquest, as a result of the increasing importance of trade, and it may have been transplanted from Normandy. Until clearer evidence of foreign influence is found, it may, however, be safer to regard it simply as a new application of the old gild principle, though this new application may have been stimulated by Continental example The evidence seems to indicate the pre-existence of the gild merchant in Normandy, but it is not mentioned anywhere on the Continent before the 11th century It spread rapidly in England, and from the reign of John onward we have evidence of its existence in many English boroughs But in some prominent towns, notably London, Colchester, Norwich and the Cinque Ports, it seems never to have been adopted In fact it played a more conspicuous rôle in the small boroughs than in the large ones It was regarded by the townsmen as one of their most important privileges Its chief function was to regulate the trade monopoly conveyed to the borough by the royal grant of *gilda mercatoria* A grant of this sort implied that the gildsmen had the right to trade freely in the town, and to impose payments and restrictions upon others who desired to exercise that privilege The ordinances of a gild merchant thus aim to protect the brethren from the commercial competition of strangers or non-gildsmen More freedom of trade was allowed at all times in the selling of wares by wholesale, and also in retail dealings during the time of markets and fairs The ordinances were enforced by an alderman with the assistance of two or more deputies, or by one or two masters, wardens or keepers The *Morwenspeches* were periodical meetings at which the brethren feasted, revised their ordinances, admitted new members, elected officers and transacted other business

Historians have expressed divergent views regarding the early relations of the craftsmen and their fraternities to the gild merchant. One of the main questions in dispute is whether artisans were excluded from the gild merchant Many of them seem to have been admitted to membership They were regarded as merchants, for they bought raw material and sold the manufactured commodity, no sharp line of demarcation was drawn between the two classes in the 12th and 13th centuries. Separate societies of craftsmen were formed in England soon after the gild merchant came into existence; but at first they were few in number The gild merchant did not give birth to craft fraternities or have anything to do with their origin, nor did it delegate its authority to them In fact, there seems to have been little or no organic connection between the two classes of gilds As has already been intimated, however, many artisans probably belonged both to their own craft fraternity and to the gild merchant, and the latter, owing to its great power in the town, may have exercised some sort of supervision over the craftsmen and their societies When the king bestowed upon the tanners or weavers or any other body of artisans the right to have a gild, they secured the monopoly of working and trading in their branch of industry Thus with every creation of a craft fraternity the gild merchant was weakened and its sphere of activity was diminished, though the new bodies were subsidiary to the older and larger fraternity The greater the commercial and industrial prosperity of a town, the more rapid was the multiplication of craft gilds, which was a natural result of the ever-increasing division of labour The old gild merchant remained longest intact and powerful in the smaller boroughs, in which, owing to the predominance of agriculture, few or no craft gilds were formed In some of the larger towns the crafts were prominent already in the 13th century, but they became much more prominent in the first half of the 14th century Their increase in number and power was particularly rapid in the time of Edward III, whose reign marks an era of industrial progress Many master craftsmen now became wealthy employers of labour, dealing extensively in the wares which they produced The class of dealers or merchants, as distinguished from trading artisans, also greatly increased and established separate fraternities When these various unions of dealers and of craftsmen embraced all the trades and branches of production in

the town, little or no vitality remained in the old gild merchant; it ceased to have an independent sphere of activity. The tendency was for the single organization, with a general monopoly of trade, to be replaced by a number of separate organizations representing the various trades and handicrafts In short, the function of guarding and supervising the trade monopoly split up into various fragments, the aggregate of the crafts superseding the old general gild merchant This transference of the authority of the latter to a number of distinct bodies and the consequent disintegration of the old organization was a gradual spontaneous movement—a process of slow displacement, or natural growth and decay, due to the play of economic forces—which, generally speaking, may be assigned to the 14th and 15th centuries, the very period in which the craft gilds attained the zenith of their power While in most towns the name and the old organization of the gild merchant thus disappeared and the institution was displaced by the aggregate of the crafts towards the close of the middle ages, in some places it survived long after the 15th century either as a religious fraternity, shorn of its old functions, or as a periodical feast, or as a vague term applied to the whole municipal corporation

On the Continent of Europe the mediaeval gild merchant played a less important rôle than in England In Germany, France and the Netherlands it occupies a less prominent place in the town charters and in the municipal polity, and often corresponds to the later fraternities of English dealers established either to carry on foreign commerce or to regulate a particular part of the local trade monopoly

Craft Gilds.—A craft gild usually comprised all the artisans in a single branch of industry in a particular town Such a fraternity was commonly called a "mistery" or "company" in the 15th and 16th centuries, though the old term "gild" was not yet obsolete "Gild" was also a common designation in north Germany, while the corresponding term in south Germany was *Zunft,* and in France *métier* These societies are not clearly visible in England or on the Continent before the early part of the 12th century. With the expansion of trade and industry the number of artisans increased, and they banded together for mutual protection Some German writers have maintained that these craft organizations emanated from manorial groups of workmen, but strong arguments have been advanced against the validity of this theory (notably by F Keutgen) It is unnecessary to elaborate any profound theory regarding the origin of the craft gilds The union of men of the same occupation was a natural tendency of the age In the 13th century the trade of England continued to expand and the number of craft gilds increased In the 14th century they were fully developed and in a flourishing condition; by that time each branch of industry in every large town had its gild The development of these societies was even more rapid on the Continent than in England

Their organization and aims were in general the same throughout western Europe Officers, commonly called wardens in England, were elected by the members, and their chief function was to supervise the quality of the wares produced so as to secure good and honest workmanship Therefore, ordinances were made regulating the hours of labour and the terms of admission to the gild, including apprenticeship Other ordinances required members to make periodical payments to a common fund, and to participate in certain common religious observances, festivities and pageants. But the regulation of industry was always paramount to social and religious aims; the chief object of the craft gild was to supervise the processes of manufacture and to control the monopoly of working and dealing in a particular branch of industry.

We have already called attention to the gradual displacement of the gild merchant by the craft organizations The relations of the former to the latter must now be considered more in detail There was at no time a general struggle in England between the gild merchant and the craft gilds, though in a few towns there seems to have been some friction between merchants and artisans There is no exact parallel in England to the conflict between these two classes in Scotland in the 16th century, or to the great Continental revolution of the 13th and 14th centuries, by which the crafts threw off the yoke of patrician government and secured more independence in the management of their own affairs and more participation in the civic administration. The main causes of these conflicts on the Continent were the monopoly of power by the patricians, acts of violence committed by them, their bad management of the finances and their partisan administration of justice. In some towns the victory of the artisans in the 14th century was so complete that the whole civic constitution was remodelled with the craft fraternities as a basis. A widespread movement of this sort would scarcely be found in England, where trade and industry were less developed than on the Continent, and where the motives of a class conflict between merchants and craftsmen were less potent. Moreover, borough government in England seems to have been mainly democratic until the 14th or 15th century; there was no oligarchy to be depressed or suppressed Even if there had been motives for uprisings of artisans such as took place in Germany and the Netherlands, the English kings would probably have intervened True, there were popular uprisings in England, but they were usually conflicts between the poor and the rich; the crafts as such seldom took part in these tumults While many Continental municipalities were becoming more democratic in the 14th century, those of England were drifting towards oligarchy, towards government by a close "select body" As a rule the craft gilds secured no dominant influence in the boroughs of England, but remained subordinate to the town government Whatever power they did secure, whether as potent subsidiary organs of the municipal polity for the regulation of trade, or as the chief or sole medium for the acquisition of citizenship, or as integral parts of the common council, was, generally speaking, the logical sequence of a gradual economic development, and not the outgrowth of a revolutionary movement by which oppressed craftsmen endeavoured to throw off the yoke of an arrogant patrician gild merchant

Two new kinds of craft fraternities appear in the 14th century and become more prominent in the 15th, namely, the merchants' and the journeymen's companies The misteries or companies of merchants traded in one or more kinds of wares They were preeminently dealers, who sold what others produced Hence they should not be confused with the old gild merchant, which originally comprised both merchants and artisans, and had the whole monopoly of the trade of the town In most cases, the company of merchants was merely one of the craft organizations which superseded the gild merchant

In the 14th century the journeymen or yeomen began to set up fraternities in defence of their rights The formation of these societies marks a cleft within the ranks of some particular class of artisans—a conflict between employers, or master artisans, and workmen The journeymen combined to protect their special interests, notably as regards hours of work and rates of wages, and they fought with the masters over the labour question in all its aspects The resulting struggle of organized bodies of masters and journeymen was widespread throughout western Europe, but it was more prominent in Germany than in France or England This conflict was indeed one of the main features of German industrial life in the 15th century In England the fraternities of journeymen, after struggling a while for complete independence, seem to have fallen under the supervision and control of the masters' gilds; in other words, they became subsidiary or affiliated organs of the older craft fraternities.

An interesting phenomenon in connection with the organization of crafts is their tendency to amalgamate, which is occasionally visible in England in the 15th century, and more frequently in the 16th and 17th. A similar tendency is visible in the Netherlands and in some other parts of the Continent already in the 14th century Several fraternities—old gilds or new companies, with their respective cognate or heterogeneous branches of industry and trade—were fused into one body In some towns all the crafts were thus consolidated into a single fraternity, in this case a body was reproduced which regulated the whole trade monopoly of the borough, and hence bore some resemblance to the old gild merchant

In dealing briefly with the modern history of craft gilds we may confine our attention to England In the Tudor period the policy of the Crown was to bring them under public or national control Laws were passed, for example in 1503, requiring that new ordinances of "fellowships of crafts or misteries" should be approved by the royal justices or by other Crown officers, and the authority of the companies to fix the price of wares was thus restricted The statute of 5 Elizabeth c 4 also curtailed their jurisdiction over journeymen and apprentices (*see* APPRENTICESHIP).

The craft fraternities were not suppressed by the statute of 1547 (1 Edward VI) They were indeed expressly exempted from its general operation Such portions of their revenues as were devoted to definite religious observances were, however, appropriated by the Crown The revenues confiscated were those used for "the finding, maintaining or sustentation of any priest or of any anniversary, or obit, lamp, light or other such things " This has been aptly called "the disendowment of the religion of the misteries " Edward VI 's statute marks no break of continuity in the life of the craft organizations Even before the Reformation, however, signs of decay had already begun to appear, and these multiplied in the 16th and 17th centuries The old gild system was breaking down under the action of new economic forces Its dissolution was due especially to the introduction of new industries, organized on a more modern basis, and to the extension of the domestic system of manufacture Thus the companies gradually lost control over the regulation of industry, though they still retained their old monopoly in the 17th century, and in many cases even in the 18th In fact, many craft fraternities still survived in the second half of the 18th century, but their usefulness had disappeared The mediaeval form of association was incompatible with the new ideas of individual liberty and free competition, with the greater separation of capital and industry, employers and workmen, and with the introduction of the factory system Intent only on promoting their own interests and disregarding the welfare of the community, the old companies had become an unmitigated evil Attempts have been made to find in them the progenitors of the trade unions, but there seems to be no immediate connection between the latter and the craft gilds The privileges of the old fraternities were not formally abolished until 1835, and the substantial remains or spectral forms of some are still visible in other towns besides London

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GUILD SOCIALISM, the name of a school of Socialist thought which became prominent in Great Britain in the second decade of the 20th century, and spread thence to other parts of the world, especially the English-speaking countries Its governing idea is that of self-government in industry—the application of democratic principles to industrial as well as to political affairs —and the organization of the economic life of the community on a "functional" basis As the name implies, Guild Socialism has, in the minds of its founders, a relation to the forms of industrial organization which existed throughout the mediaeval world, and is based on an attempt, in some measure, to apply mediaeval ideas to the solution of modern problems This does not mean that Guild Socialists wish to restore the mediaeval guild system, or that Guild Socialism has any necessary connection with the attempt to revive handicraft in place of machine production This element was indeed present in the early stages, but had dropped away before it acquired any wide influence

The origin of the movement is to be found in the work of an architect, Arthur J Penty, who published *The Restoration of the Guild System* in 1906, and of A R Orage, for many years editor of the *New Age,* in which journal the new doctrine gradually developed in the next few years The fruit of this development was the book, *National Guilds,* written by S G Hobson and edited by A R Orage, first published in the *New Age* in 1912 In this work, Guild Socialism first assumed its distinctive form as an attempt to convert the trade unions to the idea of "workers' control" in industry, and to create with their aid self-governing functional organizations for the government of industry in conjunction with the State

So far the guild movement had not spread beyond a small circle of theoretical adherents But in the years before 1914 a great wave of Labour unrest spread over Great Britain There were many strikes, and a new spirit of economic revolt entered into the trade union movement At the same time the doctrines of Industrial Unionism were imported from America, and those of Syndicalism from France, and both these doctrines found numerous adherents among the younger trade unionists, and excited vigorous controversy Guild Socialism was influenced by these movements, and was more and more presented as a reconciliation of Syndicalist and Socialist doctrines Like the Syndicalists, it denounced bureaucracy and State control Unlike them, it repudiated Anarchism, and recognized the necessity of the State as an instrument of political organization and control It was not, however, until a group of the younger men began, in 1913, regularly to advocate Guild Socialism in the newly founded *Daily Herald* that the movement attained to any widespread influence And it was not until 1915 that it assumed, with the foundation of the National Guilds League by G D H Cole, W Mellor, M B Reckitt and others, an organized form

The industrial situation during the World War undoubtedly helped the growth of the new movement For the War, by making necessary large and frequent changes in industrial organization, profoundly stirred the trade unions, and created in the minds of trade unionists a keen desire for control and self-government in industry During the War the influence of Guild Socialism was widely felt in the shop stewards' movement (*q v*), and in the redrafting of many trade union programmes, so as to include the demand for "workers' control " Thus, the Miners' Federation, which before the War had demanded nationalisation and State administration of the mines, changed its programme in 1918 to a demand for national ownership and democratic control by the workers, and put forward its new Guild Socialist claim before the famous Sankey Commission of 1919 The Socialist bodies, such as the Independent Labour Party and the Labour Party itself, also altered their programmes so as to include the demand for some measure of workers' control in industry

Immediately after the War Guild Socialism spread still more rapidly, and entered on a new phase with the formation of actual working guilds, under trade union auspices, in the building and other industries The National Building guild and its local centres executed, between 1920 and 1922, a number of important housing contracts, and was generally agreed to have done excellent work But it had no capital, and the abandonment of the Addison housing scheme in 1921 was fatal to it Driven to depend on bank and commercial credits, it overtraded and got into financial difficulties, which in 1922 led to its collapse Certain of its local centres, however, survived, and were still active in 1928, as were the successful tailoring guilds in Glasgow and Leeds, the piano workers' guild in London, and certain others

Guild Socialism and Collectivism.—These practical ventures, however, were, from the standpoint of the main body of

Guild Socialists, only of minor importance. For the guild was for them essentially a part of the mechanism of a Socialist community, and "guilds" formed in a capitalist society could be guilds only in a quite incomplete sense. Guild Socialism involves the ownership of industries by the whole community, as well as their administration by the "workers by hand and brain" (a phrase originally coined by the Guild Socialists) engaged in them. It is essentially a Socialist doctrine, accepting the Socialist idea of public ownership, and differing from the Collectivist, or State Socialist, school of thought only in its insistence on the idea of industrial self-government and its hostility to bureaucracy and political control of industrial affairs. Guild Socialists differ, indeed, in their views about the form and structure of the State in a guild society. Some believe in the continued supremacy of the State as the political organ of government, while others hold that the State in its present form is destined to disappear, and to be replaced by a sort of federal authority representing the community in its various functional aspects. This latter view, which has usually carried the day, is closely associated with the philosophical ideas of political Pluralism as advocated by G. D. H. Cole and other writers

Industrial self-government is, for the Guild Socialists, the application to economics of a general principle that is of far wider significance They believe that democracy can be real only if it is "functional"—that is, if it is specifically related to each of the main activities of society It is absurd, they hold, to speak of political democracy when industry is organised on autocratic lines, for the conditions of a man's daily work will inevitably affect his attitude and status as a citizen Moreover, the existing economic system fails because it does not call out what is best in men Instead of a co-operative fellowship of service we have contending groups of masters and men, alike wasted by "the sickness of an acquisitive society" (Tawney) It is necessary so to organise the economic and social system as to make each service a responsible fellowship, whose members are "on their honour" to do their best in the interest of all

As a distinct body of doctrine, Guild Socialism reached its highest point in the years immediately after the war Thereafter, it gradually dissolved The National Guilds League has been wound up and with its disappearance the formal existence of the movement has come to an end. But its influence survives, and many of its once hotly-contested doctrines are now generally accepted among Socialists in Great Britain It has left an abiding mark on both trade union and Socialist policy, and is likely to contribute an important element to future Socialist schemes for the reorganization of industry Its thesis that "economic power precedes political power" is, indeed, still rejected by Socialist politicians, but the guild Socialists' insistence that the power which goes with responsibility must be diffused to the widest possible extent among the whole mass of the people, and that this diffusion, on functional lines, is the necessary condition of democratic health in the body politic is now part of the common stock of Socialist doctrine

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(G D H. C)

GUILFORD, BARONS AND EARLS OF. FRANCIS NORTH, 1st Baron Guilford (1637–85), was the third son of the 4th Baron North (*see* NORTH, BARONS), and was created Baron Guilford in 1683, after becoming lord keeper in succession to Lord Nottingham. He had been an eminent lawyer, solicitor-general (1671), attorney-general (1673), and chief-justice of the common pleas (1675), and in 1679 was made a member of the council of thirty and, on its dissolution, of the cabinet He was a man of wide culture and a staunch royalist In 1672 he married Lady Frances Pope, daughter and co-heiress of the earl of Downe, who inherited the Wroxton estate, and he was succeeded as 2nd baron by his son Francis (1673–1729), whose eldest son Francis (1704–90), after inheriting first his father's title as 3rd baron, and then (in 1734) the barony of North from his kinsman the 6th Baron North, was in 1752 created 1st earl of Guilford. His first wife was a daughter of the earl of Halifax, and his son and successor Frederick was the English prime minister, commonly known as Lord North, his courtesy title while the 1st earl was alive

FREDERICK NORTH, 2nd earl of Guilford, but better known by his courtesy title of Lord North (1732–92), prime minister of England during the important years of the American War, was born on April 13, 1732, and was educated at Eton and Christ Church, Oxford At 22 years of age, he was elected M P for Banbury, of which town his father was high steward; and he sat for the same town in parliament for nearly 40 years. In 1759 the duke of Newcastle made him a lord of the treasury, and he held this office under Lord Bute and George Grenville till 1765 On the fall of the first Rockingham ministry in 1766 he was sworn of the privy council, and made paymaster-general by the duke of Grafton. In December 1767, on the death of the brilliant Charles Townshend, he was made chancellor of the exchequer North succeeded Grafton as premier in March 1770, and continued in office for 12 of the most eventful years in English history George III had at last overthrown the ascendancy of the great Whig families, and found in North a pliant instrument The path of the minister in parliament was a hard one, he had to defend measures which he had not designed, and of which he had not approved, and this too in a House of Commons in which all the oratorical ability of Burke and Fox was against him, and when he had only the purchased help of Thurlow and Wedderburne to aid him. The most important events of his ministry were those of the American War of Independence He cannot be accused of causing it, but one of his first acts was the retention of the tea-duty, and he introduced the Boston Port bill in 1774. When war had broken out he earnestly counselled peace, and it was only the earnest solicitations of the king not to leave his sovereign again at the mercy of the Whigs that induced him to defend a war which from 1779 he knew to be both hopeless and impolitic. In March 1782, he insisted on resigning after the news of Cornwallis's surrender at Yorktown He had been rewarded for his assistance to the king by honours for himself and sinecures for his relatives, but in April 1783 North formed a famous coalition with C J Fox (*q v*), and became secretary of state with him under the nominal premiership of the duke of Portland The coalition ministry went out of office on Fox's India bill in December 1783, and North, who was losing his sight, gave up politics He succeeded to his father's earldom in 1790, and died on Aug 5, 1792

For the Lord Keeper Guilford *see* the *Lives* by the Hon R North, edited by A Jessopp (1890), and E Foss, *The Judges of England*, vol vii. (1848–64) For the prime minister, Lord North, see *Correspondence of George III. with Lord North*, edited by W B. Donne (1867), Horace Walpole, *Journal of the Reign of George III* (1859), and *Memoirs of the Reign of George III*, edited by G F R Barker (1894), Lord Brougham, *Historical Sketches of Statesmen*, vol 1 (1839), Earl Stanhope, *History of England* (1858), Sir T E May, *Constitutional History of England* (1863–65), and W E H Lecky, *History of England in the 18th century* (1878–90)

GUILFORD, a town, including a borough of the same name, in New Haven county, Conn., U.S A., on Long Island sound, 16 m E by S of New Haven It is served by the New York, New Haven and Hartford railroad. The population of the town was 2,803 in 1920, of the borough, 1,612 The 12 acre green is shaded by fine old trees, and on an eminence commanding a view of the sound is a stone house, built in 1639 for a meeting-house, parsonage and fortification, which was restored in 1898 and made a state museum Guilford was founded in 1639 as an independent colony by some 25 families from Kent, Surrey and Sussex, under the leadership of the Rev Henry Whitfield, on land they bought from the Indians The colony was at first known by the Indian name Menuncatunk In 1643, for considerations of safety, it became a member of the New Haven jurisdiction, but with the understanding that Guilford planters who were not church mem-

bers should have certain rights in town meeting; and from 1661 until 1664 it was active in urging submission to Connecticut, which did away with the church-state and the restriction of the suffrage to freemen Guilford was the birthplace of Fitz-Greene Halleck, the poet; and of Samuel Johnson, the first president of King's college (now Columbia university) The borough was incorporated in 1815

GUILLAUMAT, MARIE LOUIS ADOLPHE (1863–), French soldier, was born at Bourgneuf, Charente Inférieure, Jan 4, 1863 He left the military school of St Cyr in 1884, and became a captain in 1893. He served for three years in Tongking with the Foreign Legion, and during the Boxer rising in 1900 was in Tientsin where he received his first wound In 1903 he was appointed professor of military history at St Cyr and in 1908 lecturer on infantry tactics After being director of infantry at the ministry of war from 1911, he became *chef de cabinet* to the minister of war, M Messimy, in 1914 At the outset of the World War, Guillaumat, who had already taken part in 12 campaigns, commanded a division at the battle of the Marne and later in the Argonne Subsequently, in command of the I Army Corps, he took a notable part in the battles of Verdun and the Somme In Dec 1916 he was given the command of the II Army in front of Verdun and directed the attack of Aug 20, 1917, which succeeded in freeing the position

In Dec 1917 he was sent to Salonika as commander-in-chief of the armies in the East (*see* SALONIKA CAMPAIGNS) but was recalled in July 1918 to take command of the entrenched camp at Paris in face of the enemy advance. He urged the launching of an offensive in Macedonia both at the Inter-Allied War Council at Versailles and before the British War Cabinet, and on Sept 4, 1918, at the London conference, his advice was adopted. In Oct. 1918 Gen Guillaumat was given the command of the V Army on the Aisne for the final advance After the war he was president of the commission of inquiry into the surrender of the frontier fortresses and later was elected a member of the Conseil Supérieur de la Guerre After being entrusted with a mission to Athens, where he drew up a plan for the reorganisation of the Greek army, he took command of the army of occupation in the Rhineland at the end of 1924 He was minister of war in June but in July 1926 returned to his command in the Rhineland

GUILLAUME, CHARLES EDOUARD (1861–), French physicist, was born at Fleurier, Switzerland, Feb 15, 1861 Educated at Neuchâtel, he became a *docteur-ès-sciences,* and devoted himself to the study of practical physics He is principally known for his invention of the metal invar, an alloy of nickel and steel which, having a coefficient of linear expansion of only ·0000008 for one degree Centigrade, is in general use as a material for standard measures and instruments of precision In 1920 he was awarded the Nobel Prize for physics and he became director of the international bureau of weights and measures

Guillaume's works include *Traité pratique de la thermométrie de précision* (1889), *Les radiations nouvelles, Les rayons X, etc.* (1896), *Les applications des aciers au nickel* (1904), *Détermination du volume du kilogramme d'eau* (1910), *Compensation des horloges et des montres* (1921), *Les récents progrès du système métrique* (1907–21)

GUILLAUME, JEAN BAPTISTE CLAUDE EUGÈNE (1822–1905), French sculptor, was born at Montbard on July 4, 1822, and studied under Cavelier, Millet and Barrias, at the École des Beaux-Arts, Paris, which he entered in 1841, and where he gained the *prix de Rome* in 1845 with "Theseus finding on a rock his Father's Sword" He became director of the École des Beaux-Arts in 1864, and director-general of fine arts from 1878 to 1879, when the office was suppressed His monuments are to be found in the public squares of the chief cities of France

GUILLAUME DE LORRIS (*fl* 1230), author of the earlier section of the *Roman de la Rose,* derives his name from a township in the department of Loiret Nothing else is positively known of him A rubric in the poem puts Jean de Meun's continuation 40 years after Guillaume's death, which therefore used to be dated about 1260; but since Jean de Meun's own work has recently been thrown back, Guillaume's has been fixed before 1240 He tells us he dreamt the dream which forms the substance of the poem in his 20th year, and began to "rhyme it" five years later. The continuation shows more intellectual vigour than Guillaume's portion, but the earlier part is perhaps the more original The great features of his work are the almost unsurpassed beauty of his word-pictures, and the allegorical setting, which, though now wearisome, was in his time effective He had, of course, predecessors (Raoul de Houdenc, the troubadours, and others); but it was Guillaume who fixed the style

For an attempt to identify de Lorris *see* L Jarry, *Guillaume de L. et le testament d'Alphonse de Poitiers* (1881), P Paris, in *Hist litt de la France,* vol xxiii For Chaucer's translation, see *Skeat,* vol 1

GUILLAUME DE PALERNE (WILLIAM OF PALERNE), hero of romance The French verse romance was written at the desire of a Countess Yolande, probably daughter of Baldwin IV, count of Flanders The English poem in alliterative verse was written about 1350 by a poet called William Guillaume, a foundling, is brought up at the court of the emperor of Rome, and loves his daughter Melior. The lovers flee into the woods disguised in bear-skins Alfonso, who is Guillaume's cousin and a Spanish prince, has been changed into a wolf by his step-mother's enchantments. He provides food and protection for the fugitives, and Guillaume eventually triumphs over Alfonso's father, and wins back from him his kingdom The benevolent wer-wolf is disenchanted, and marries Guillaume's sister.

See *Guillaume de Palerne,* ed H Michelant (Soc d anc textes fr, 1876), and W. W Skeat (E E Text Soc, extra series No 1, 1867)

GUILLAUME D'ORANGE, also known as Fierabrace, St Guillaume de Gellone, and the Marquis au court nez, was the central figure of the southern cycle of French romance, called by the *trouvères* the *geste* of Garin de Monglane This cycle has a measure of unity, the poems being episodic rather than independent Ms Royal 20 D xi (British Museum) contains 18 *chansons* of the cycle Guillaume, son of Thierry and Alde, daughter of Charles Martel, was born in the north of France about the middle of the 8th century He became one of the best soldiers of Charlemagne, and in 790 Charles's son Louis the Pious was put under his charge He subdued the Gascons, and defended Narbonne against the infidels In 793 Hescham, the successor of Abd-al-Rahman II, proclaimed a holy war against the Christians, and collected an army of 100,000 men, half of it against the Asturias, half against France Guillaume met him at Villedaigne, and was defeated, but only after a resistance which so far exhausted the Saracens that they were compelled to retreat to Spain He took Barcelona from the Saracens in 803, and in the next year founded the monastery of Gellone (now Saint Guilhem-le-Désert), of which he became a member in 806 He died there in the odour of sanctity in 812

No less than 13 historical personages bearing the name of William have been thought to have their share in the formation of the legend William, count of Provence, son of Boso II, delivered southern France from a Saracen invasion by his victory at Fraxinet in 973, and ended his life in a cloister William Towhead (*Tête d'étoupe*), duke of Aquitaine (d 983), showed a fidelity to Louis IV paralleled by Guillaume d'Orange's service to Louis the Pious The cycle of *chansons* which form the *geste* of Guillaume reposes on the traditions of the Arab invasions, from the battle of Poitiers (732) onwards, and on the French conquest of Catalonia from the Saracens In the Norse version Guillaume appears in his historical environment, as a chief under Charlemagne, but plays a leading part in the *Couronnement Looys,* describing the formal association of Louis in the empire at Aix (813, the year after Guillaume's death), and after the battle of Aliscans it is from the emperor Louis that he seeks reinforcements This anachronism arises from the fusion of the epic Guillaume with the champion of Louis IV, and from the fact that he was a general of Louis the Pious, who was titular king of Aquitaine under his father. The inconsistencies between the real and the epic Guillaume are often left standing in the poems The personages associated with Guillaume in his Spanish wars belong to Provence, and have names common in the south The most famous are Beuves de Comarchis, Ernaud de Girone, Aimer le chétif, so called from his long captivity with the Saracens The separate

existence of Aimer, who refused to sleep under a roof, and spent his life in warring against the infidel, is proved. He was Hadhemar, count of Narbonne, who in 809 was one of the leaders sent by Louis against Tortosa. No doubt the others had historical prototypes In the hands of the *trouvères* they became all brothers of Guillaume, and sons of Aymeri de Narbonne, grandson of Garin de Monglane Nevertheless when Guillaume seeks help from Louis he finds all his relations in Laon, in accordance with his historic Frankish origin

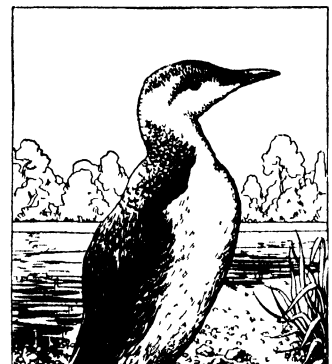
The central fact of the *geste* is the battle of the Archant or Aliscans, in which perished Guillaume's heroic nephew, Vezian or Vivien At the eleventh hour he summoned Guillaume to his help against the Saracens Guillaume arrived too late, was himself defeated, and returned alone to his wife Guibourc This event is related in a Norman-French transcript of an old French *chanson de geste,* the *Chançun de Willame*—brought to light in 1901 at the sale of the books of Sir Henry Hope Edwardes—and in the *Covenant Vivien,* a recension of an older French chanson *Aliscans* continues the story, telling how Guillaume obtained reinforcements from Laon, and how, with the help of the comic hero, the scullion Rainouart, he avenged his nephew's death Rainouart turns out to be the brother of Guillaume's wife Guibourc, who was before her marriage the Saracen princess and enchantress Orable Two other poems are consecrated to his later exploits, *La Bataille Loquifer,* the work of a French Sicilian poet, Jendeu de Brie (*fl* 1170), and *Le Moniage Rainouart* The starting-point of Herbert of Dammartin (*fl* 1170) in *Foucon de Candie* (Candie = Gandia in Spain?) is the return of Guillaume from the battle, and the Italian compilation *I Nerbonesi* seems in some cases to represent an earlier tradition than the later of the French *chansons,* although its author Andrea di Barberino wrote towards the end of the 14th century The minnesinger Wolfram von Eschenbach based his *Willehalm* on a French original which must have differed from our versions The variations in the story of the defeat of Aliscans, and the numerous inconsistencies of the narratives have occupied many critics Aliscans (Aleschans, Elysii Campi) was, however, generally taken to represent the battle of Villedaigne, and to take its name from the cemetery outside Arles Wolfram von Eschenbach even mentions the tombs which studded the field of battle Indications that this tradition was not unassailable were not lacking before the discovery of the *Chançun de Willame,* which, although preserved in a very corrupt form, represents the earliest recension of the story, dating at least from the beginning of the 12th century It seems probable that the Archant was situated in Spain near Tortosa, and that Guillaume started from Barcelona, not from Orange, to his nephew's help The account was modified by successive *trouvères,* and the uncertainty of their methods may be judged by the fact that in the *Chançun de Willame* two accounts (11 450–1326 and 11 1326–2420) of the fight appear to be set side by side *Le Couronnement Looys, Le Charroi de Nîmes* (12th century) in which Guillaume enumerates his services to the terrified Louis, and *Aliscans* (12th century), with the earlier *Chançun,* are among the finest of the French epic poems The figure of Vivien is among the most heroic elaborated by the *trouvères,* and the giant Rainouart has a touch of Rabelaisian humour

The *chansons de geste* of the cycle are *Enfances Garin de Monglane* (15th century) and *Garin de Monglane* (13th century), on which is founded the prose romance of *Guérin de Monglane,* printed in the 15th century by Jehan Trepperel and often later, *Girars de Viane* (13th century, by Bertrand de Bar-sur-Aube), ed P. Tarbé (Reims, 1850), *Hernaut de Beaulande* (fragment 14th century), *Renier de Gennes,* which only survives in its prose form, *Aymeri de Narbonne* (*c* 1210) by Bertrand de Bar-sur-Aube, ed L Demaison (Soc des anc textes fr, 2 vols, 1887); *Les Enfances Guillaume* (13th century), *Les Narbonnais,* ed H Suchier (Soc des anc textes fr, 2 vols, 1898), with a Latin fragment dating from the 11th century, preserved at The Hague, *Le Couronnement Looys* (ed E Langlois, 1888), *Le Charroi de Nimes, La Prise d'Orange, Le Covenant Vivien, Aliscans,* which were edited by W J A Jonckbloet in vol 1 of his *Guillaume d'Orange* (The Hague, 1854), a critical text of *Aliscans* (Halle, 1903, vol i) is edited by E Wienbeck, W. Hartnacke and P Rasch, *Loquifer* and *Le Moniage Rainouart* (12th century), *Bovon de Commarchis* (13th century), recension of the earlier *Siège de Barbastre,* by Adenès li Rois, ed A. Scheler (Brussels, 1874); *Guibert d'Andrenas* (13th century), *La Prise de Cordres* (13th century), *La Mort Aimeri de Narbonne,* ed. J. Couraye de Parc (Soc des Anciens Textes fr 1884), *Foulque de Candie* (ed. P. Tarbé, Reims, 1860), *Le Moniage Guillaume* (12th century); *Les Enfances Vivien* (ed C Wahlund and H v. Feilitzen, Uppsala and Paris, 1895); *Chançun de Willame* (Chiswick Press, 1903), described by P Meyer in *Romania* (xxxiii 597–618). The ninth branch of the *Karlamagnus Saga* (ed C R Unger, 1860) deals with the *geste* of Guillaume *I Nerbonesi* is edited by J G Isola (Bologna, 1877, etc)

See C Révillout, *Etude hist et litt sur la vita sancti Willelmi* (Montpellier, 1876); W J. A Jonckbloet, *Guillaume d'Orange* (2 vols, 1854, The Hague), L Clarus (ps for W Volk), *Herzog Wilhelm von Aquitanien* (Munster, 1865), P Paris, in *Hist litt de la France* (vol xxii, 1852); L Gautier, *Epopées françaises* (vol iv, 2nd ed, 1882), R Weeks, *The Newly discovered Chançun de Willame* (Chicago, 1904), A Thomas, *Etudes romanes* (1891), on Vivien, L Saltet, "S. Vidian de Martres-Tolosanes" in *Bull de litt ecclés* (Toulouse, 1902), P Becker, *Die altfrz Wilhelmsage u ihre Beziehung zu Wilhelm dem Heiligen* (Halle, 1896), and *Der südfranzosische Sagenkreis und seine Probleme* (Halle, 1898), A Jeanroy, "Etudes sur le cycle de Guillaume au court nez" (in *Romania,* vols 25 and 26, 1896–97), H. Suchier, "Recherches sur . Guillaume d'Orange" (in *Romania,* vol 32, 1903); *La légende de Guillaume d'Orange* (1920).

GUILLAUMIN, ARMAND (1841–), French landscape painter and engraver, an important member of the Impressionist movement He was born in Paris on Feb 16, 1841, and he spent his boyhood at Moulins-sur-Allier At the age of 17 he went to Paris and earned his living as an employee in the administration of the city In his spare time he studied drawing under the sculptor, Caillouette, and he painted views in the neighbourhood of Montmartre and Meudon, and on the banks of the Seine He also worked on portraiture and still-life In 1874 he took part in an exhibition of Impressionist paintings with C Pissaro, C Monet and Sisley In 1892 he was in a position to give up his post and to concentrate entirely on his art After that date, he painted many seascapes both on the Atlantic and Mediterranean coasts His execution is direct, bold and sometimes vehement, his colour harmonious He is represented in the following public collections —Paris (Luxembourg and Petit Palais), Rouen, Limoges, Brussels, Munich, Moscow and in the Art Institute at Chicago

GUILLEMOT, or, as it is usually called in U S A, MURRE, a sea-bird breeding on the rocky coasts of the North Atlantic in vast numbers This bird, *Uria aalge,* is a member of the auk family and, like the rest of the *Alcidae,* it winters in the open sea A second species, Brunnich's Guillemot (*U lomvia*), inhabits the Atlantic coasts of North America with *U aalge* Other species occur farther northward, on the west coast of North America and elsewhere The black guillemot *U grylla,* known to sailors as the doveky, is almost entirely black in summer plumage Unlike the common form, which lays a single egg, the black guillemot produces two or three in a clutch The so-called bridled or ringed guillemot is a variety of *U aalge* with a white mark resembling a bridle round its eye It is worth mention as a good example of a quite distinct variation found in considerable numbers in nature, but not intergrading with the normal It is probably due to a Mendelian mutation.



GUILLEMOT, A SEA-BIRD THAT BREEDS ON THE BRITISH COAST AND FLIES SEAWARD FOR THE WINTER MONTHS.

GUILLOCHE, in architecture, an ornament consisting of a band which is represented as curled round a series of circles placed in a row The pattern may have its origin in basketry as it has a form similar to that made by the withes that are wound round and between the vertical reeds Like the fret (*q v*) the guilloche is found in many parts of the world and in many periods

GUILLON, MARIE NICOLAS SYLVESTRE (1760–1847), French ecclesiastic, was born in Paris on Jan 1, 1760 He was librarian and almoner in the household of the princess de

Lamballe, and when in 1792 she was executed, he fled to the provinces, where under the name of Pastel he practised medicine He afterwards served in turn under Napoleon, the Bourbons and the Orleanists, and became canon of St. Denis, bishop of Morocco and dean of the Sorbonne Among his many works are a *Collection des brefs du pape Pie VI* (1798), *Bibliothèque choisie des pères grecs et latins* (1822, 26 vols) and a French translation of Cyprian with notes (1837, 2 vols)

GUILLOTINE, the instrument for inflicting capital punishment by decapitation, introduced into France at the period of the



THE DEATH OF ST MATTHEW AFTER A GERMAN WOODCUT OF 1539
The martyrdom of St Matthew, one of the twelve Apostles, is disputed, it being stated by some authorities that he died a natural death But the woodcut is interesting as showing that execution by the guillotine or diele was practiced in Germany during the middle ages

Revolution It consists of two upright posts surmounted by a cross beam, and grooved so as to guide an oblique-edged knife, the back of which is heavily weighted to make it fall swiftly and with force when the cord by which it is held aloft is let go Previous to the period when it obtained notoriety under its present name it had been in use in Scotland, England and various parts of the Continent There is still preserved in the antiquarian museum of Edinburgh the rude guillotine called the "maiden" by which the regent Morton was decapitated in 1581 The last persons decapitated by the Scottish "maiden" were the marquis of Argyll in 1661 and his son the earl of Argyll in 1685 It would appear that no similar machine was ever in general use in England, but until 1650 there existed in the forest of Hardwick, which was coextensive with the parish of Halifax, West Riding, Yorkshire, a mode of trial and execution called the gibbet law, by which a felon convicted of theft within the liberty was sentenced to be decapitated by a machine called the Halifax gibbet A print of it is contained in a small book called *Halifax and its Gibbet Law* (1708), and in Gibson's edition of Camden's *Britannia* (1722) In Germany the machine was in general use during the middle ages, under the name of the *Diele*, the *Hobel* or the *Dolabra* Two old German engravings, the one by George Penez, who died in 1550, and the other by Heinrich Aldegrever, with the date 1553, represent the death of a son of Titus Manlius by a similar instrument, and its employment for the execution of a Spartan is the subject of the engraving of the 18th symbol in the volume entitled *Symbolicae quaestiones de universo genere*, by Achilles Bocchi (1555) From the 13th century it was used in Italy under the name of *Mannaia* for the execution of criminals of noble birth The *Chronique de Jean d'Anton*, first published in 1835, gives minute details of an execution in which it was employed at Genoa in 1507, and it is elaborately described by Père Jean Baptiste Labat in his *Voyage en Espagne et en Italie en 1730* It is mentioned by Jacques, viscomte de Puységur, in his *Mémoires* as in use in the south of France, and he describes the execution by it of Marshal Montmorency at Toulouse in 1632 For about a century it had, however, fallen into general disuse on the continent, and Dr Guillotin, who first suggested its use in modern times, is said to have obtained his information regarding it from the description of an execution that took place at Milan in 1702, contained in an anonymous work entitled *Voyage historique et politique de Suisse, d'Italie, et d'Allemagne*

Guillotin, who was born at Saintes, May 28, 1738, and elected to the Constituent Assembly in 1789, brought forward on Dec. 1 of that year two propositions regarding capital punishment, the second of which was that "in all cases of capital punishment it shall be of the same kind—that is, decapitation—and it shall be executed by means of a machine " The reasons urged in support of this proposition were that in cases of capital punishment the privilege of execution by decapitation should no longer be confined to the nobles, and that it was desirable to render the process of execution as swift and painless as possible After satisfactory experiments had been made with the machine on several dead bodies in the hospital of Bicêtre, it was erected on the Place de Grève for the execution of the highwayman Pelletier on April 25, 1792 While the experiments regarding the machine were being carried on, it received the name *Louisette* or *La Petite Louison*, but the mind of the nation seems soon to have reverted to Guillotin, who first suggested its use, and in the *Journal des révolutions de Paris* for April 28, 1792, it is mentioned as *la guillotine*, a name which it thenceforth bore both popularly and officially

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GUIMARÃES, a town of northern Portugal, 36 m N E of Oporto by the Trofa-Guimarães branch of the Oporto-Corunna railway Pop (1920) 8,995 Guimarães is a very ancient town with Moorish fortifications It occupies a low hill, skirted on the north-west by a small tributary of the river Ave The citadel founded in the 11th century by Count Henry of Burgundy, was in 1094 the birthplace of his son Alphonso, the first king of Portugal The font in which Alphonso was baptized is preserved, among other interesting relics, in the collegiate church of Santa Maria da Oliveira, "St Mary of the Olive," a Romanesque building of the 14th century, which occupies the site of an older foundation The convent of São Domingos, now a museum of antiquities, has a fine 12th–13th century cloister, the town hall is built in the blend of Moorish and Gothic architecture known as Manueline Guimarães has a flourishing trade in wine and farm produce, it also is engaged in the manufacture of cutlery, linen, leather and preserved fruits Near the town are Citania, the ruins of a prehistoric Iberian city, and the hot sulphurous springs of Taipas

GUIMARD, MARIE MADELEINE (1743–1816), French dancer, was born in Paris on Oct 10, 1743 For 25 years she was the star of the Paris Opéra, and became even more famous by her love affairs, especially by her long liaison with the prince de Soubise Her magnificent house at Pantin had a private theatre, where Collé's *Partie de chasse de Henri IV* which was prohibited in public, and most of the *Proverbes* of Carmontelle (Louis Carrogis, 1717–1806), and similar licentious performances were given to the delight of high society In 1772, in defiance of the archbishop of Paris, she opened a gorgeous house with a theatre seating 500 spectators in the Chaussée d'Antin In this Temple of Terpsichore, as she named it, the wildest orgies took place In 1786 her property was sold by lottery for her benefit for 300,000 francs After her retirement in 1789 she married Jean Etienne Despréaux (1748–1820), dancer, song-writer and playwright

GUINEA, the general name applied to part of the western coast region of equatorial Africa, and also to the gulf formed by the great bend of the coast line eastward and then southward In the widest acceptation of the term, the Guinea coast may be said to extend from 13° N to 16° S , from the neighbourhood of the Gambia to Cape Negro Southern or Lower Guinea comprises the coasts of Gabun and Loango, the Congo and Angola, and Northern or Upper Guinea stretches from the river Casamance to and inclusive of the Niger delta, the Cameroons occupying a middle position In a narrower use, Guinea is the coast only from Cape Palmas to the Gabun estuary Originally,

however, Guinea was supposed to begin as far north as Cape Nun, opposite the Canary Islands, and Gomes Azurara, a Portuguese historian of the 15th century, is said to be the first authority who brings Guinea south to the Senegal

The derivation of the name is uncertain, but is probably taken from Ghinea, Ginnie, Genni or Jenné, a town and kingdom in the basin of the Niger, famed for the enterprise of its merchants and dating from the 8th century A.D. The name Guinea is found on maps of the middle of the 14th century, but it did not come into general use in Europe till towards the close of the 15th century Guinea may, however, be derived from Ghana (or Ghanata) the name of the oldest known state in the western Sudan. Its capital, also called Ghana, was west of the Niger, and is generally placed some 200 m. west of Jenné. (*See* L Desplagnes in *La Géographie*, xvi 329.)

By the early traders the coast of Upper Guinea was given names founded on the productions characteristic of the different parts The Grain coast, that part of the Guinea coast extending for 500 m. from Sierra Leone eastward to Cape Palmas received its name from the export of the seeds of several plants of a peppery character, called variously grains of paradise, Guinea pepper and melegueta The name Grain coast was first applied to this region in 1455

Towards the end of the 18th century Guinea pepper was supplanted in Europe by peppers from the East Indies The name is seldom used, the Grain coast being divided between the British colony of Sierra Leone and the republic of Liberia The Ivory coast extends from Cape Palmas to 3° W. and obtained its name from the ivory it exported. Eastwards of the Ivory coast are the Gold and Slave coasts The Niger delta was for long known as the Oil rivers

Few questions in historical geography have been more keenly discussed than that of the first discovery of Guinea by the navigators of modern Europe Lancelot Malocello, a Genoese, in 1270 reached at least as far as the Canaries The first direct attempt to find a sea route to India was, it is said, also made by Genoese, Ugolino and Guido de Vivaldo, Tedisio Doria and others who equipped two galleys and sailed south along the African coast in 1291 Beyond the fact that they passed Cape Nun there is no trustworthy record of their voyage

In 1346 a Catalan expedition started for "the river of gold" on the Guinea coast, its fate is unknown The French claim that between 1364 and 1410 the people of Dieppe sent out several expeditions to Guinea, and Jean de Béthencourt, who settled in the Canaries about 1402, made explorations towards the south At length the consecutive efforts of the navigators employed by Prince Henry of Portugal—Gil Eannes, Diniz Diaz, Nuno Tristam, Alvaro Fernandez, Cadamosto, Usodimare and Diego Gomez—made known the coast as far as the Gambia, and by the end of the 15th century the whole coast was familiar to Europeans.

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GUINEA, a gold coin at one time current in the United Kingdom It was first coined in 1663, in the reign of Charles II, from gold imported from the Guinea coast of West Africa by a company of merchants trading under charter from the British crown—hence the name. Many of the first guineas bore an elephant on one side, this being the stamp of the company, in 1675 a castle was added. Issued at the same time as the guinea were five-guinea, two-guinea and half-guinea pieces The current value of the guinea on its first issue was twenty shillings. It was subsidiary to the silver coinage, but this latter was in such an unsatisfactory state that the guinea in course of time became over-valued in relation to silver, so much so that in 1694 it had risen in value to thirty shillings. The rehabilitation of the silver coinage in William III.'s reign brought down the value of the guinea to 21s 6d in 1698, at which it stood until 1717, when its value was fixed at twenty-one shillings. This value the guinea retained until its disappearance from the coinage It was last coined in 1813, and was superseded in 1817 by the sovereign. In 1718 the quarter-guinea was first coined The third-guinea was first struck in George III's reign (1787) To George III's reign also belongs the "spade-guinea," a guinea having the shield on the reverse pointed at the base or spade-shaped.

GUINEA-FOWL, a well-known gallinaceous bird, so called from the country whence it was brought to Europe. It was known to the Romans but was probably reintroduced by the Portuguese in the 16th century.

The ordinary guinea-fowl of the poultry-yard (*see* also POULTRY AND POULTRY-FARMING) is *Numida meleagris* Under domestication few varieties have arisen. We may mention total and partial albinism and forms with legs bright orange instead of greyish brown The sexes are alike The home of this species is West Africa from the Gambia to the Gaboon. It has been imported into the Cape Verde islands, where, as in some of the Greater Antilles and in Ascension, it has run wild. Representing the species in South Africa we have *N. coronata* which is numerous from the Cape Colony to Ovampoland, and *N. papillosa* which replaces it in the west as far as the Zambesi Madagascar has *N mitrata*, distinguishable by its red crown and extending to East Africa This bird has been introduced to Rodriguez Abyssinia is inhabited by *N ptilorhyncha*, which differs from the foregoing by the absence of red about the head Darwin (*Anim and Pl under Domestication*, i 294), gives this as the original stock of the modern domestic birds, but obviously by an accidental error The finest species known is *Acryllium vulturinum* of Somaliland, conspicuous by the bright blue in its plumage, the hackles in the lower part of its neck, and its long tail All these guinea fowls except the last are characterized by having the crown bare of feathers and elevated into a bony "helmet," but there is another group in which a thick tuft of feathers ornaments the top of the head This contains four or five species inhabiting Africa, the best known being *Guttera cristata* from Sierra Leone This bird is remarkable for the structure of its *furcula*, or merry thought, where the head is a hollow cup opening upwards, into which the trachea dips, and then emerges on its way to the lungs Allied to the genus *Numida*, but distinguished therefrom by the possession of spurs and the absence of a helmet are *Agelastes* and *Phasidus*, from western Africa.

Polygamous and gregarious, guinea-fowls lay many eggs on the ground The flocks are noisy The birds feed on the ground but normally roost in the trees

See Elliot, *Monograph of the Phasianidae*

GUINEA-PIG, the domesticated form of the cavy (q.v.)

GUINEA-WORM (*Dracontiasis*), a disease due to the *Filaria medinensis*, or *Dracunculus*, a filarious nematode like a horse-hair, whose most frequent habitat is the subcutaneous and intramuscular tissues of the legs and feet It is common on the Guinea coast, and in many other tropical and subtropical regions, and sometimes amounts to an epidemic The black races are most liable, but Europeans are not exempt The worm lives in water, and appears to have an intermediate host for its larval stage It is doubtful whether the worm penetrates the skin of the legs directly or enters the body by the mouth as a larva

GÜINES, a town in the interior of Havana province, Cuba, about 30 m S E of Havana. Pop (1919) 13,679 It is situated on a plain, in the midst of a rich plantation district, chiefly devoted to the cultivation of tobacco The first railway in Cuba was built from Havana to Güines between 1835 and 1838. A good highway connects Güines with the capital The pueblo of Güines, which was built on a great private estate of the same name, dates back to about 1735

GUINGAMP, a town of north-western France, capital of an arrondissement in the department of Côtes-du-Nord, on the right bank of the Trieux, 20 m. W.N.W of St. Brieuc on the railway to Brest Pop (1926) 6,317. Guingamp was the chief town of the countship (subsequently the duchy) of Penthièvre. The Gothic chapel of Grâces is near Guingamp Its chief church, Notre-Dame de Bon-Secours, dates from the 14th to the 16th centuries; two towers rise on each side of the richly sculptured western portal and a third surmounts the crossing. A famous statue of the Virgin, the object of one of the most important "pardons" or religious pilgrimages in Brittany, stands in one of the two northern porches The central square is decorated by a graceful fountain in the Renaissance style, restored in 1743. Remains of the ramparts and of the Château of the dukes of Penthièvre, which belong to the 15th century, still survive Guingamp is the seat of a sub-prefect and of a tribunal of first importance It is an important market for dairy-cattle, and its industries include flour-milling, tanning, leather-dressing, furniture making and the manufacture of wool, wax, hosiery, wooden-shoes and sheet iron Guingamp is a tourist centre

GUINNESS, the name of a family of Irish brewers The firm was founded by ARTHUR GUINNESS, who about the middle of the 18th century owned a modest brewing-plant at Leixlip, a village on the river Liffey In or about 1759 Arthur Guinness (d 1855), purchased a small porter brewery at St James's Gate, Dublin By careful attention to the purity of his product, coupled with a shrewd perception of the public taste, he built up a considerable business But his third son, BENJAMIN LEE GUINNESS (1798–1868), may be regarded as the real maker of the firm, of which about 1825 he was given sole control. The trade in Guinness's porter and stout had been confined hitherto to Ireland, but Guinness established agencies in the United Kingdom, on the continent, in the British colonies and in America The export trade soon assumed huge proportions, the brewery was continually enlarged, and Guinness, who in 1851 was elected first lord mayor of Dublin, became the richest man in Ireland He spent some of his wealth on the restoration of St Patrick's cathedral, Dublin He represented Dublin city in parliament as a Conservative from 1865 till his death, and in 1867 was created a baronet He was succeeded in the control of the business by Sir Arthur Edward Guinness (b 1840), his eldest, and Edward Cecil Guinness (b 1847), his third, son Sir ARTHUR EDWARD GUINNESS was in 1880 raised to the peerage as Baron Ardilaun, and disposed of his share in the brewery to his brother Edward Cecil Guinness In 1886 EDWARD CECIL GUINNESS disposed of the brewery, the products of which were then being sent all over the world, to a limited company, in which he remained the largest shareholder Edward Cecil Guinness was raised to the peerage in 1891 as Baron Iveagh, created Earl of Iveagh (*q.v.*) in 1919 and died in 1927, was succeeded by Lesson, Rupert Viscount Elreden The ordinary capital of the company has been increased to £7,500,000, and in one year the total taxation has exceeded £16,000,000 Three thousand men are employed in the Guinness breweries

GUINOBATAN, a municipality (with administration centre and 14 *barrios* or districts) of the province of Albay, Luzon, Philippine Islands, on the Inaya river, 9 m W by N of Albay Pop (1918) 25,113 Abacá is grown in large quantities in the surrounding regions In 1918, it had 5 manufacturing establishments and 4 rice mills with outputs valued at 30,200 and 117,800 pesos respectively It has good deposits of lime Of the 21 schools, 11 were public The language spoken is Bikol

GUIPUZCOA, a maritime Basque province of northern Spain bounded north by the bay of Biscay, west by the province of Vizcaya (Biscay), south and south-east by Alava and Navarre and north-east by the river Bidassoa, here the frontier of France The area is 728 sq m, estimated population (Dec 31, 1925) 278,166 or 382 per sq m Situated on the northern side of the Cantabrian mountains at their junction with the Pyrenees the province has a deeply dissected and highly picturesque surface with a much indented coastline and numerous harbours none of which are of the first importance, the chief are San Sebastian, Pasajes, Guetaria, Deva and Fuenterrabia. The rivers, Deva, Urola, Oria, Urumea, Bidassoa are all short, rapid and unnavigable. The climate is mild and moist and the soil is mostly rather infertile clay in the valleys, in spite of this cultivation is careful, but the province has to import grain Gorse and heath occur on the windswept areas and there are forests of oak, chestnut, pine, with a good deal of holly and arbutus Apple orchards are numerous and much cider is made The province is rich in minerals such as iron, lignite, lead, copper, zinc and cement, zinc being important. Fisheries are important, cod, tunny, sardines and oysters being procured There are ferruginous and sulphurous springs in many places, and these and the mild climate attract summer visitors. The province is concerned with international trade *via* the French frontier and its custom house on the Bidassoa is the most important in Spain, but it is chiefly remarkable for its development of local industries. Cotton and linen stuffs are made at Irun, Renteria, Villabona, Vergara and Azpéitia, baskets at Zumarraga, arms and gold work at Eibar, Plasencia and Elgoibar, chemicals at San Sebastian, Onati and Irun Paper and timber-work are developed at San Sebastian, Irun, Onati and Tolosa The Pasajes district is famed for its wines and liqueurs and large numbers are employed in this industry The main railway line from Madrid northward to the French frontier runs through the province and it has loops to most of the important industrial centres In consonance with the development of industries, roads are numerous and on the whole good in this province which, after Madrid, Barcelona and Vizcaya, is the most densely peopled in Spain. On the steep Cantabrian slopes roads are difficult and in rural areas there the ox cart is still widely used The capital is San Sebastian, a port with a population of 70,327 The other towns named are mostly comparatively small A good deal of emigration takes place from the province but, as in other industrialized areas the birth rate keeps high, and there is also considerable immigration from other parts of Spain, but the general Basque character of the population maintains itself fairly well and the province is relatively prosperous industrially and related in many ways to its western neighbour Vizcaya

GUISBOROUGH or **GUISBROUGH,** an urban district and market town, Cleveland parliamentary division, North Riding of Yorkshire, England, 10 m E.S.E of Middlesbrough by a branch of the L.N.E railway Pop (1921) 7,104 It lies in a narrow, fertile valley at the north foot of the Cleveland hills Ruins of an Augustinian priory, founded in 1129, are situated near the eastern extremity of the town The church contains some fine decorated work, and the chapter house and parts of the conventual buildings may be traced Considerable fragments of Norman and transitional work remain Among the historic personages buried within its walls was Robert Bruce, Lord of Annandale, the competitor for the throne of Scotland, and the grandfather of King Robert the Bruce The church of St Nicholas is Perpendicular, greatly restored The grammar school was founded in 1561. About 1 m. S.E of the town is a sulphurous spring discovered in 1822 The neighbouring district is rich in iron-stone and its working forms the chief industry of the town There are also tanneries and breweries

GUISE, a town of northern France, in the department of Aisne, on the Oise, 31 m N of Laon by rail Pop (1926) 6,977 The scene of the German stand of Oct 1918 is near Guise, which suffered much damage during the World War, 1914–18 The town was formerly the capital of the district of Thiérache and afterwards of a countship There is a château dating in part from the middle of the 16th century, which was converted into barracks during the World War Camille Desmoulins was in 1762 born in the town The chief industry is the manufacture of iron stoves and heating apparatus, carried on on the co-operative system advocated by Fourier, in works founded by J B A Godin (*q.v.*). (For an account of the battle of Guise *see* FRONTIERS, BATTLES OF THE.)

GUISE, HOUSE OF, a cadet branch of the house of Lorraine (*q.v.*) René II, duke of Lorraine (d 1508), united the two branches of the house of Lorraine From his paternal grandmother, Marie d'Harcourt, René inherited the countships of

Aumale, Mayenne, Elbeuf, Lillebonne, Brionne and other French fiefs, in addition to the honours of the elder branch, which included the countship of Guise, the dowry of Marie of Blois on her marriage in 1333 with Rudolph or Raoul of Lorraine. René's eldest surviving son by his marriage with Philippa, daughter of Adolphus of Egmont, duke of Gelderland, was Anthony, who succeeded his father as duke of Lorraine (d 1544), while the second, Claude, count and afterwards duke of Guise, received the French fiefs The Guises, though naturalized in France, continued to interest themselves in the fortunes of Lorraine, and their enemies were always ready to designate them as foreigners The partition between the brothers Anthony and Claude was ratified by a further agreement in 1530, reserving the lapsed honours of the kingdoms of Jerusalem, Sicily, Aragon, the duchy of Anjou and the countships of Provence and Maine to the duke of Lorraine Of the other sons of René II, John (1498–1550) became the first cardinal of Lorraine, while Ferri, Louis and Francis fell fighting in the French armies at Marignano (1515), Naples (1528) and Pavia (1525), respectively.

CLAUDE OF LORRAINE, count and afterwards 1st duke of Guise (1496–1550), was born on Oct 20, 1496 He was educated at the French court, and at 17 allied himself to the royal house of France by a marriage with Antoinette de Bourbon (1493–1583) daughter of François, count of Vendôme Guise distinguished himself at Marignano (1515), and was long in recovering from the 22 wounds he received in the battle, in 1521 he fought at Fuenterrabia, when Louise of Savoy ascribed the capture of the place to his efforts, in 1522 he defended northern France, and forced the English to raise the siege of Hesdin, and in 1523 he obtained the government of Champagne and Burgundy, defeating at Neufchâteau the imperial troops who had invaded his province In 1525 he destroyed the Anabaptist peasant army, which was overrunning Lorraine, at Lupstein, near Saverne (Zabern) On the return of Francis I from captivity, Guise was erected into a duchy in the peerage of France, though up to this time only princes of the royal house had held the title of duke and peer of France. The Guises, as cadets of the sovereign house of Lorraine and descendants of the house of Anjou, claimed precedence of the Bourbon princes Their pretensions and ambitions inspired distrust in Francis I, although he rewarded Guise's services by substantial gifts in land and money The duke distinguished himself in the Luxemburg campaign in 1542, but for some years before his death he effaced himself before the growing fortunes of his sons He died on April 12, 1550

He had been supported in all his undertakings and intrigues by his brother JOHN, cardinal of Lorraine (1498–1550), who had been made coadjutor of Metz at the age of three The cardinal was archbishop of Reims, Lyons and Narbonne, bishop of Metz, Toul, Verdun, Thérouanne, Luçon, Albi, Valence, Nantes and Agen, and before he died had squandered most of the wealth which he had derived from these and other benefices Part of his ecclesiastical preferments he gave up in favour of his nephews He became a member of the royal council in 1530, and in 1536 was entrusted with an embassy to Charles V Although a complaisant helper in Francis I's pleasures, he was disgraced in 1542, and retired to Rome He died at Nogent-sur-Yonne on May 18, 1550 He was extremely dissolute, but as an open-handed patron of art and learning, as the protector and friend of Erasmus, Marot and Rabelais he did something to counter-balance the general unpopularity of his calculating and avaricious brother

Claude of Guise had 12 children, among them Francis, 2nd duke of Guise, Charles, 2nd cardinal of Lorraine (1524–74), who became archbishop of Reims in 1538 and cardinal in 1547, Claude, marquis of Mayenne, duke of Aumale (1526–73), governor of Burgundy, who married Louise de Brézé, daughter of Diane de Poitiers, thus securing a powerful ally for the family, Louis (1527–78), bishop of Troyes, archbishop of Sens and cardinal of Guise, René, marquis of Elbeuf (1536–66), from whom descended the families of Harcourt, Armagnac, Marsan and Lillebonne, Mary of Lorraine (*q v*), generally known as Mary of Guise, who after the death of her second husband, James V of Scotland, acted as regent of Scotland for her daughter Mary, queen of Scots; and Francis (1534–63), grand prior of the order of the Knights of Malta The solidarity of this family, all the members of which through three generations cheerfully submitted to the authority of the head of the house, made it a formidable factor in French politics.

FRANCIS OF LORRAINE, 2nd duke of Guise (1519–1563), "le grand Guise," was born at Bar on Feb 17, 1519 As count of Aumale he served in the French army, and was nearly killed at the siege of Boulogne in 1545 by a wound which brought him the name of "Balafré" Aumale was made (1547) a peerage-duchy in his favour, and on the accession of Henry II the young duke, who had paid assiduous court to Diane de Poitiers, shared the chief honours of the kingdom with the constable Anne de Montmorency Both cherished ambitions for their families, but the Guises were more unscrupulous in subordinating the interests of France to their own Montmorency's brutal manners, however, made enemies where Guise's grace and courtesy won him friends Guise was a suitor for the hand of Jeanne d'Albret, princess of Navarre, who refused, however, to become a sister-in-law of a daughter of Diane de Poitiers and remained one of the most dangerous and persistent enemies of the Guises He married in Dec 1548 Anne of Este, daughter of Ercole II, duke of Ferrara, and through her mother Renée, a granddaughter of Louis XII, of France In the same year he had put down a peasant rising in Saintonge with a humanity that compared very favourably with the cruelty shown by Montmorency to the town of Bordeaux He made preparations in Lorraine for the king's German campaign of 1551–52 He was already governor of Dauphiné, and now became grand chamberlain, prince of Joinville, and hereditary seneschal of Champagne, with large additions to his already considerable revenues He was charged with the defence of Metz, which Henry II had entered in 1551 He reached the city in Aug 1552, and rapidly gave proof of his great powers as a soldier and organizer by the skill with which the place, badly fortified and unprovided with artillery, was put in a state of defence Metz was invested by the duke of Alva in October with an army of 60,000 men, and the emperor joined his forces in November An army of brigands commanded by Albert of Brandenburg had also to be reckoned with Charles was obliged to raise the siege on Jan 2, 1553, having lost, it is said, 30,000 men before the walls Guise used his victory with rare moderation and humanity, providing medical care for the sick and wounded left behind in the besiegers' camp The subsequent operations were paralysed by the king's suspicion and carelessness, and the constable's inactivity, and a year later Guise was removed from the command He followed the constable's army as a volunteer, and routed the army of Charles V at the siege of Renty on Aug 12, 1554 Montmorency's inaction rendered the victory fruitless, and a bitter controversy followed between Guise and the constable's nephew Coligny, admiral of France, which widened a breach already existing

The conclusion of a six years' truce at Vaucelles (1556) disappointed Guise's ambitions, and he was the main mover in the breach of the treaty in 1558, when he was sent at the head of a French army to Italy to the assistance of Pope Paul IV against Spain Guise, who perhaps had in view the restoration to his family of the Angevin dominion of Naples and Sicily, crossed the Alps early in 1557, and after a month's delay in Rome, where he failed to receive the promised support, marched on the kingdom of Naples, then occupied by the Spanish troops under Alva He seized and sacked Campli (April 17), but was compelled to raise the siege of Civitella Meanwhile the pope had veered round to a Spanish alliance, and Guise, seeing that no honour was to be gained in the campaign, wisely spared his troops, so that his army was almost intact when, in August, he was hastily summoned home to repel the Spanish army which had invaded France from the north, and had taken St Quentin On reaching Paris in October Guise was made lieutenant-general of the kingdom, and proceeded to prepare for the siege of Calais The town was taken, after six days' fighting, on Jan 6, 1558, and this success was followed up by the capture of Guînes, Thionville and Arlon, when the war was ended by the treaty of Câteau Cambrésis (1559).

Although his brother, the cardinal of Lorraine, was one of the negotiators, this peace was concluded against the wishes of Guise, and was regarded as a triumph of the constable's party The Guises were provided with a weapon against Montmorency by the bishop of Arras (afterwards Cardinal Granvella), who gave to the cardinal of Lorraine at an interview at Péronne in 1558 an intercepted letter proving the Huguenot leanings of the constable's nephews

On the accession in 1559 of Francis II , their nephew by marriage with Mary Stuart, the royal authority was practically delegated to Guise and the cardinal, who found themselves beyond rivalry for the time being They had, however, to cope with a new and dangerous force in Catherine de' Medici, who was now for the first time free to use her political ability The incapacity, suspicion and cruelty of the cardinal, who controlled the internal administration, roused the smaller nobility against the Lorraine princes A conspiracy to overturn their government was formed at Nantes, with a needy Périgord nobleman named La Renaudie as its nominal head, though the agitation had in the first instance been fostered by the agents of Louis I , prince of Condé The Guises were warned of the conspiracy while the court was at Blois, and for greater security removed the king to Amboise La Renaudie, nothing daunted, merely postponed his plans, and the conspirators assembled in small parties in the woods round Amboise They had, however, been again betrayed and many of them were surrounded and taken before the *coup* could be delivered, one party, which had seized the château of Noizay, surrendered on a promise of amnesty given "on his faith as a prince" by James of Savoy, duke of Nemours, a promise which, in spite of the duke's protest, was disregarded On March 19, 1560, La Renaudie and the rest of the conspirators openly attacked the château of Amboise They were repelled, their leader was killed, and a large number were taken prisoners The merciless vengeance of the Guises was the measure of their previous fears For a whole week the torturings, quarterings and hangings went on, the bodies being cast into the Loire, the young king and queen witnessing the bloody spectacle day by day from a balcony of the château

The cruel repression of this "conspiracy of Amboise" inspired bitter hatred of the Guises, since they were avenging a rising rather against their own than the royal authority They now entrenched themselves with the king at Orleans, and the Bourbon princes, Anthony, king of Navarre, and his brother Condé, were summoned to court The Guises convened a special commission to try Condé, who was condemned to death, but the affair was postponed by the chancellor, and the death of Francis II in December saved Condé Guise then made common cause with his old rival Montmorency and with the Marshal de Saint André against Catherine, the Bourbons and Coligny This alliance, constituted on April 6, 1561, and known as the triumvirate, aimed at the annulment of the concessions made by Catherine to the Huguenots The cardinal of Lorraine fomented the discord which appeared between the clergy of the two religions when they met at the colloquy of Poissy in 1561, but in spite of the extreme Catholic views he there professed, he was at the time in communication with the Lutheran princes of Germany, and in Feb 1562 met the duke of Wurttemberg at Zabern to discuss the possibility of a religious compromise

The signal for civil war was given by an attack of Guise's escort on a Huguenot congregation at Vassy (March 1, 1562) Although Guise did not initiate the massacre, and although, when he learned what was going on, he even tried to restrain his soldiers, he did not disavow their action When Catherine de' Medici forbade his entry into Paris, he accepted the challenge, and on March 16, he entered the city, where he was a popular hero, at the head of 2,000 armed nobles The provost of the merchants offered to put 20,000 men and two million livres at his disposal In September he joined Montmorency in besieging Rouen, which was sacked as if it had been a foreign city, in spite Guise's efforts to save it from the worst horrors At the battle of Dreux (Dec 19, 1562) he commanded a reserve army, with which he saved Montmorency's forces from destruction and inflicted a crushing defeat on the Huguenots The prince of Condé was his prisoner, while the capture of Montmorency by the Huguenots and the assassination of the Marshal de Saint-André after the battle left Guise the undisputed head of the Catholic party He was appointed lieutenant-general of the kingdom, and on Feb 5, 1563, he appeared with his army before Orleans On the 19th, however, he was shot by the Huguenot Jean Poltrot de Méré as he was returning to his quarters, and died on the 24th of the effects of the wound Guise's splendid presence, his generosity and humanity and his almost unvarying success on the battlefield made him the idol of his soldiers He attended personally to the minutest details, and Monluc complains that he even wrote out his own orders The mistakes and cruelties associated with his name were partly due to the evil counsels of his brother Charles, the cardinal, whose cowardice and insincerity were the scorn of his contemporaries The negotiations of the Guises with Spain dated from the interview with Granvella at Péronne, in 1558, and after the death of his brother the cardinal of Lorraine was constantly in communication with the Spanish court, offering, in the event of the failure of direct heirs to the Valois kings, to deliver up the frontier fortresses and to acknowledge Philip II as king of France His death in 1574 temporarily weakened the extreme Catholic party

Of the children of Francis "le Balafré" five survived him Henry, 3rd duke of Guise, Charles, duke of Mayenne (1554–1611) (*q v*), who consolidated the League, Catherine (1552–96), who married Louis of Bourbon, duke of Montpensier, and encouraged the fanaticism of the Parisian leaguers, Louis, second cardinal of Guise, afterwards of Lorraine (1555–88), who was assassinated with his brother Henry, and Francis (1558–73)

Henry of Lorraine, 3rd duke of Guise (1550–1588), born on Dec 31, 1550, was 13 years old at the time of his father's death, and grew up under the domination of a passionate desire for revenge Catherine de' Medici refused to take steps against Coligny, who was formally accused by the duchess of Guise and her brothers-in-law of having incited the murder In 1566 she insisted on a formal reconciliation at Moulins between the Guises and Coligny, at which, however, none of the sons of the murdered man was present Henry and his brothers were, however, compelled in 1572 to sign an ambiguous assent to this agreement Guise's widow married James of Savoy, duke of Nemours, and the young duke at 16 went to fight against the Turks in Hungary On the fresh outbreak of civil war in 1567 he returned to France and served under his uncle Aumale In the autumn of 1568 he received a considerable command and speedily came into rivalry with Henry of Valois, duke of Anjou He had not inherited his father's generalship, and his rashness and headstrong valour more than once brought disaster on his troops, but the showy quality of his fighting brought him great popularity in the army In the defence of Poitiers in 1569 with his brother the duke of Mayenne, he showed more solid abilities as a soldier On the conclusion of peace in 1570 he returned to court, where he made no secret of his attachment to Margaret of Valois His pretensions were violently resented by her brothers who threatened his life, and he saved himself by a precipitate marriage with Catherine of Cleves (daughter of Francis of Cleves, duke of Nevers, and Margaret of Bourbon), the widow of a Huguenot nobleman, Antoine de Croy, prince of Porcien Presently he ended his disgrace by an apparent reconciliation with Henry of Valois and an alliance with Catherine de' Medici He was an accomplice in the first attack on Coligny's life, and when permission for the massacre of Saint Bartholomew had been extorted from Charles IX he roused Paris against the Huguenots, and satisfied his personal vengeance by superintending the murder of Coligny

Henry was now the acknowledged chief of the Catholic party, and the power of his family was further increased by the marriage (1575) of Henry III with Louise of Vaudémont, who belonged to the elder branch of the house of Lorraine In a fight at Dormans (Oct 10, 1575), the only Catholic victory in a disastrous campaign, Guise received a face wound which won for him his father's name of Balafré and helped to secure the passionate attachment of the Parisians He refused to acquiesce in the treaty of Beaulieu (May 5, 1576), and with the support of the

GENEALOGICAL TABLE OF THE HOUSE OF GUISE

René II. (who united the two branches of the house of Lorraine), duke of Lorraine, and Philippa of Gelderland, had (besides two older boys who died in childhood, and four unmarried daughters)

- Antoine, duke of Lorraine, †1544, ancestor of the dukes of Lorraine and the house of Mercoeur
- Claude, 1st duke of Guise, †1550, = Antoinette of Bourbon
  - Francis, 2nd duke of Guise, †1563, = Anne of Este
    - Henry, 3rd duke, †1588 = Catherine of Cleves (and had 14 children),
      - Charles, 4th duke of Guise, †1640
        - Henry, archbishop of Reims, and 5th duke, †1664
        - Marie, called Mlle de Guise, succeeded to the duchy in 1675 and sold her rights to Louis Augustus, duke of Maine.
        - Louis, chevalier of Guise and duke of Joyeuse, †1654
          - Louis-Joseph, 6th duke of Guise, †1671
            - Francis-Joseph, 7th and last duke of Guise, †1675
        - And 8 more.
      - Claude, duke of Chevreuse, = Marie de Rohan, widow of the duke of Luynes
      - Louis, 3rd cardinal of Guise, †1621
      - And 11 more.
    - Charles, duke of Mayenne, †1611
      - Henry duke of Mayenne, †1621
    - Louis, 2nd cardinal of Guise, †1588
    - Catherine = Louis de Bourbon, duke of Montpensier.
    - And 5 others.
  - Charles, 2nd cardinal of Lorraine, †1574
  - Claude, marquis of Mayenne and duke of Aumale, †1573, = Louise de Brézé
    - Charles, duke of Aumale †1031
  - Louis, 1st cardinal of Guise, †1578
  - Francis, grand prior.
  - René, marquis of Elbeuf, †1566
    - Charles, duke of Elbeuf, †1605
  - Marie = (1) duke of Longueville, (2) James V of Scotland
    - Mary Stuart, queen of Scots.
  - And 5 others.
- John, 1st cardinal of Lorraine
- Ferri, killed at Marignano.
- Louis, killed at Naples.
- Francis, killed at Pavia.

†Date of death

Jesuits proceeded to form a "holy league" for the defence of the Roman Catholic Church The terms of enrolment enjoined offensive action against all who refused to join This association had been preceded by various provincial leagues among the Catholics, notably one at Péronne Condé had been imposed on this town as governor by the terms of the peace, and the local nobility banded together to resist him This, like the Holy League itself, was political as well as religious in its aims, and was partly inspired by revolt against the royal authority In the direction of the League Guise was hampered by Philip of Spain, who subsidized the movement, while he also had to submit to the dictation of the Parisian democracy. Ulterior ambitions were freely ascribed to him It was asserted that papers seized from his envoy to Rome, Jean David, revealed a definite design of substituting the Lorraines, who represented themselves as the successors of Charlemagne, for the Valois; but these papers were probably a Huguenot forgery. Henry III eventually placed himself at the head of the League, and resumed the war against the Huguenots; but on the conclusion of peace (Sept 1577) he seized the opportunity of disbanding the Catholic associations The king's jealousy of Guise increased with the duke's popularity, but he did not venture on an open attack, nor did he dare to avenge the murder by Guise's partisans of one of his personal favourites, Saint-Mégrin, who had been set on by the court to compromise the reputation of the duchess of Guise. This incident supplied Alexandre Dumas *père* with the subject of his *Henri III et sa cour* (1829).

Meanwhile the duke had entered on an equivocal alliance with Don John of Austria He was also in constant correspondence with Mary of Lorraine, and meditated a descent on Scotland in support of the Catholic cause But the great riches of the Guises were being rapidly dissipated, and in 1578 the duke became a pensioner of Philip II When in 1584 the death of the duke of Anjou made Henry of Navarre the next heir to the throne, the prospect of a Huguenot dynasty roused the Catholics to forget their differences, and led to the formation of a new league of the Catholic nobles At the end of the same year Guise and his brother, the duke of Mayenne, with the assent of other Catholic nobles, signed a treaty at Joinville with Philip II , fixing the succession to the crown on Charles, cardinal of Bourbon, to the exclusion of the Protestant princes of his house In March 1585 the chiefs of the League issued the Declaration of Péronne, exposing their grievances against the Government and announcing their intention to restore the dignity of religion by force of arms On the refusal of Henry III to accept Spanish help against his Huguenot subjects, war broke out The chief cities of France declared for the League, and Guise, who had recruited his forces in Germany and Switzerland, took up his headquarters at Châlons, while Mayenne occupied Dijon, and his relatives, the dukes of Elbeuf, Aumale and Mercoeur, roused Normandy and Brittany. Henry III accepted, or feigned to accept, the terms imposed by the Guises at Nemours (July 7, 1585) The edicts in favour of the Huguenots were immediately revoked

Guise added to his reputation as the Catholic champion by defeating the German auxiliaries of the Huguenots at Vimory (Oct 1587) and Auneau (Nov 1587) The protestations of loyalty to Henry III. which had marked the earlier manifestoes of the League were modified Obedience to the king was now stated to depend on his giving proof of Catholic zeal and showing no favour to heresy. In April 1588 Guise arrived in Paris, where he put himself at the head of the Parisian mob, and on May 12, known as the Day of the Barricades, he actually had the crown within his grasp He refused to treat with Catherine de' Medici, who was prepared to make peace at any cost, but restrained the populace from revolution and permitted Henry to escape from Paris Henry came to terms with the League in May, and made Guise lieutenant-general of the royal armies The estates-general, which were assembled at Blois, were devoted to the Guise interest, and alarmed the king by giving voice to the political as well as the religious aspirations of the League Guise remained at the court of Blois after receiving repeated warnings that Henry meditated treason On Dec. 25 he was summoned to the king's chamber during a sitting of the royal council, and was murdered by assassins carefully posted by Henry III himself The cardinal of Lorraine was murdered in prison on the next day. The history of the Guises thenceforward centres in the duke of Mayenne (*q v.*).

By his wife, Catherine of Cleves, the third duke had 14 children. among them Charles, 4th duke of Guise (1571–1640), Claude, duke of Chevreuse (1578–1657), whose wife, Marie de Rohan, duchess of Chevreuse, became famous for her intrigues, Louis (1585–1621), 3rd cardinal of Guise, archbishop of Reims, remembered for his liaison with Charlotte des Essarts, mistress of Henry IV

CHARLES, 4th duke of Guise (1571–1640), was imprisoned for three years after his father's death He married Henriette Catherine de Joyeuse, widow of the duke of Montpensier His eldest son predeceased him, and he was succeeded by his second son HENRY (1614–64), who had been archbishop of Reims, but renounced the ecclesiastical estate and became 5th duke He made an attempt (1647) on the crown of Naples, and was a prisoner in Spain from 1648 to 1652 A second expedition to Naples in 1654 was a fiasco He was succeeded by his nephew, LOUIS JOSEPH (1650–1671), as 6th duke With his son, FRANCIS JOSEPH (1670–75), the line failed, and the title and estates passed to his great-aunt, Marie of Lorraine, duchess of Guise (1615–88), daughter of the 4th duke, and with her the title became extinct The title is now vested in the family of the Bourbon-Orleans princes

BIBLIOGRAPHY —A number of contemporary documents relating to the Guises are included by L Cimber and F Danjou in their *Archives curieuses de l'histoire de France* (1834, etc) Vol iii contains a soldier's diary of the siege of Metz, first published in Italian (Lyons, 1553), accounts of the sieges of Calais (Tours, 1558), of Thionville (1558); vol iv an account of the tumult of Amboise from the *Mémoires* of Condé, and four accounts of the affair of Vassy, vol v four accounts of the battle of Dreux, one dictated by Guise, and accounts of the murder of Guise, vol. xi. accounts of the Parisian revolution of 1558, and vol xii numerous pamphlets and pieces dealing with the murder of Henry of Guise and his brother An account of the murder of Guise and of the subsequent measures taken by Mayenne, which was supplied by the Venetian ambassador, G. Mocenigo, to his Government, is printed by H Brown in the *Eng Hist Rev* (April 1895) For the foreign policy of the Guises, and especially their relations with Scotland, there is abundant material in the English *Calendar of State Papers* of Queen Elizabeth (Foreign Series) and in the correspondence of Cardinal Granvella The memoirs of Francis, duke of Guise, covering the years 1547 to 1563, were published by Michel and Poujoulat in series i, vol iv of their *Coll de mémoires* Among contemporary memoirs *see* especially those of the prince of Condé, of Blaise de Monluc and of Gaspard de Saulx-Tavannes. *See* also J B. H. du Trousset de Valincourt, *La Vie de F de Lorraine, duc de Guise* (1681), A de Ruble, *L'Assassinat de F de Lorraine, duc de Guise* (1897), where there is a list of the ms sources available for a history of the house, R de Bouillé *Hist des ducs de Guise* (4 vols, 1849); H Forneron, *Les Guise et leur époque* (2 vols, 1887), H M. Williams, *The Brood of False Lorraine: the History of the Ducs de Guise, 1496–1588* (2 vols, 1918).

GUITAR (Fr *guitarre*, Ger *Guitarre*, Ital *chitarra*), a musical instrument strung with gut strings twanged by the fingers, having a body with a flat back and graceful incurvations in complete contrast to the members of the family of the lute (*q v*), whose back is vaulted

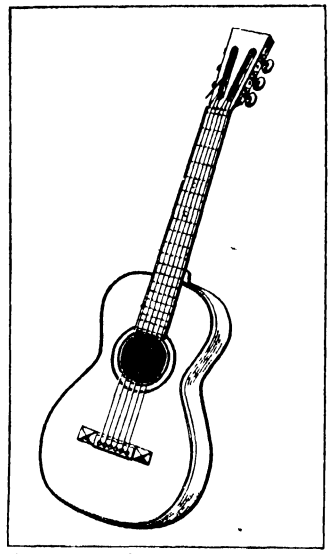
The construction of the instrument is of paramount importance in assigning to the guitar its true position in the history of musical instruments, midway between the cithara (*q v*) and the violin The mediaeval stringed instruments with neck fall into two classes, characterized mainly by the construction of the body (1) those which, like their archetype the cithara, had a body composed of a flat or delicately arched back and soundboard joined by ribs, (2) those which, like the lyre, had a body consisting of a vaulted back over which was glued a flat soundboard without the intermediary of ribs

The latter method of construction predominates among oriental instruments and is greatly inferior to the first A striking proof of this inferiority is afforded by the fact that instruments with vaulted backs, such as the rebab or rebec, although extensively represented during the middle ages in all parts of Europe by numerous types, have shown but little or no development

during the course of some 12 centuries, and have dropped out one by one from the realm of practical music, leaving only the mandolin as survivor.

The guitar must be referred to the first of these classes, having been derived from the cithara, both structurally and etymologically

One of the earliest representations of a guitar in Western Europe occurs in a Passionale from Zwifalten, A D 1180, now in the Royal Library at Stuttgart St Pelagia, seated on an ass, holds a rotta, or cithara in transition, while one of the men-servants leading her ass holds her guitar Both instruments have three strings and the characteristic guitar outline with incurvations, the rotta differing in having no neck



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A MODERN SIX-STRINGED GUITAR

GUITAR FIDDLE (*Troubadour Fiddle*), a modern name bestowed retrospectively upon certain precursors of the violin, possessing characteristics of both guitar and fiddle The name "guitar fiddle" is intended to emphasize the fact that the instrument, in the shape of the guitar, which during the middle ages represented the most perfect principle of construction for stringed instruments with necks, adopted at a certain period the use of the bow from instruments of a less perfect type, the rebab and its hybrids The use of the bow with the guitar entailed certain structural changes in the instrument The large central rose sound-hole was replaced by lateral holes of various shapes, the flat bridge, suitable for instruments whose strings were plucked, gave place to the arched bridge required in order to enable the bow to vibrate each string separately, the arched bridge, by raising the strings higher above the sound-board, made the stopping of strings on the neck extremely difficult if not impossible—a matter which was adjusted by the addition of a finger-board of suitable shape and dimensions At this stage the guitar fiddle possesses the essential features of the violin, and may justly claim to be its immediate predecessor, not so much through the viols (which were the outcome of the Minnesinger fiddle with sloping shoulders) as through the intermediary of the Italian *lyra*, a guitar-shaped bowed instrument with from seven to 12 strings From such evidence as we now possess, it would seem that the evolution of the early guitar with a neck from the Greek cithara took place under Greek influence in the Christian East (*see* GUITAR)

GUITRY, LUCIEN GERMAIN (1860–1925), French actor, was born in Paris on Dec 13, 1860, and died there on June 1, 1925 He first appeared at the Gymnase, immediately after leaving the Conservatoire in *La Dame aux Camélias* (1878) His style of acting, sparing in gesture and theatrical effects, at first surprised rather than pleased the public and the critics, this impression was still stronger when, in 1891, he played with studied restraint in the part of Kean, which had been created by the romantic actor Frédérick Lemaître Sarah Bernhardt asked him to play at the Théâtre de la Renaissance, and it was here that he achieved his first successes He appeared in plays of the most varied character, from Maurice Donnay's *Amants* (1895) to Anatole France's *Crainquebille* It was perhaps in Bernstein's plays that he reached his zenith He succeeded in representing the utmost frenzy of passion with the greatest economy of method; his acting was exceedingly restrained and at the same time marvellously expressive From 1919 onwards he frequently acted in the plays of his son, M Sacha Guitry, he was remarkably successful in creating the principal parts in *Pasteur* and *Mon Père avait Raison* The last part he played was in *On ne joue pas pour s'amuser* (1925).

GUITRY, SACHA (1885–), French dramatist, born at St. Petersburg on Feb. 21, 1885, was the son of the actor Lucien Guitry. He was only 21 when he achieved a success with his first play, *Nono* This was followed by *Chez les Zoaques* (1906), *Petite Hollande* (1908), *Le Scandale de Monte Carlo* (1908); *Le Veilleur de Nuit* (1911)—one of his best plays—and *Le Beau Mariage* (1912) The latter contains scenes of rich comedy which almost suggest a comparison with Molière Sacha Guitry generally acts in his own plays; it is difficult to draw an absolute distinction between his work as an actor and as a playwright, for his art is always to some extent in the nature of improvisation For this reason his plays act far better than they read His output is enormous, by 1928 he had written about 60 plays Special mention is due to those which he wrote for his father to act in. *Deburau* (1918), *Bérenger* (1920) and *Pasteur* (1923), which form a series of pictures of a strikingly original character His more serious plays include *Jacqueline*, the plot of which is taken from a story by H Duvernois, and *Un Sujet de Roman*, in which Sarah Bernhardt acted with Lucien Guitry See *Sacha Guitry* (1926) in the series *Ecrivains et poètes d'aujourd'hui*

GUITTONE D'AREZZO (*c* 1230–1294), Italian poet Fra Guittone, who belonged to the religious and military order of the Cavalieri di Santa Maria, wrote sonnets and love poems, which can be studied in a good modern edition, *Le rime di Fra Guittone* (1901), by Pellegrini He is more famous as the writer of the earliest extant letters written in the Italian language, they are addressed to various eminent contemporaries

See Pellizzari *La vita e le opere di Guittone d'Arezzo* (1906).

GUIZOT, FRANÇOIS PIERRE GUILLAUME (1787–1874), French historian and statesman, was born at Nîmes on Oct 4, 1787, of Protestant parents. His father perished on the scaffold (April 8, 1794), and the boy was brought up by his mother in Geneva In 1805 he began the study of law in Paris, living in the house of M Stapfer, formerly Swiss minister in France, as tutor He also contributed to the *Publiciste*, and married (1812) Pauline Meulan, who was also a contributor to Suard's journal After her death, in 1827, Guizot married her niece, Elisa Dillon (d 1833) The son of this marriage, Maurice Guillaume (1833–1892) became a well known scholar and writer

Under the Empire, Guizot devoted himself exclusively to literary works, which included, among others, a translation of Gibbon's *Decline and Fall* This work led to his appointment (1812) to the chair of modern history at the Sorbonne But, though he took no public part in politics, he was closely associated with leading Liberals, notably with Royer-Collard, who secured for him the position of secretary-general of the Ministry of the Interior at the first Restoration During the Hundred Days he returned to his literary pursuits He then went to see Louis XVIII at Ghent, and, in the name of the Liberal Party, told him frankly that the open adoption of a liberal policy was the essential condition of a permanent monarchy The advice was ill-received by the king's advisers, and the visit itself brought him into disgrace with the Bonapartists

After the second Restoration Guizot had two short spells of official work, as secretary-general of the Ministry of Justice (1815–16) and as a director at the Ministry of the Interior (1819–20) He was one of the leaders of the *Doctrinaires*, monarchists who desired a *juste milieu* between absolutism and democracy Their motives were honourable Their views were philosophical But they were opposed alike to the democratic spirit of the age, to the military traditions of the empire, and to the bigotry and absolutism of the court They lived by a policy of resistance; they perished by another revolution (1830) They are remembered more for their constant opposition to popular demands than by their undoubted services

In 1820, when the reaction was at its height after the murder of the duc de Berri and the fall of the ministry of the duc Decazes, Guizot was deprived of his offices, and from 1822 to 1828 even his course of lectures were interdicted He was now one of the leaders of the Liberal opposition to the Government of Charles X His numerous works at this period include. *Histoire des origines du gouvernement représentatif* (1821–22, 2 vols ; Eng trans.

1852); *Histoire de la révolution d'Angleterre depuis Charles Ier à Charles II* (2 vols, 1826–27; Eng. trans., 1838), revised by him in his later years; *Histoire de la civilisation en Europe* (1828; Eng trans. by W. Hazlitt, 3 vols, 1846); and *Histoire de la civilisation en France* (4 vols., 1830). In addition he published during this period two great collections of sources for English and French history, a revised translation of Shakespeare, essays and pamphlets.

Hitherto Guizot's fame rested on his merits as a writer on public affairs and as a lecturer on modern history. In Jan 1830 he was elected by Lisieux to the Chamber of Deputies, and he retained that seat during the whole of his political life His first speech in the chamber was in defence of the celebrated address of the 221, in answer to the menacing speech from the throne, which was followed by the dissolution of the chamber, and was the precursor of another revolution On July 27 Guizot was called upon by his friends Casimir-Périer, Laffitte, Villemain and Dupin to draw up the protest of the Liberal deputies against the royal ordinances of July, whilst he applied himself with them to control the revolutionary character of the late contest Personally, Guizot deprecated a change in the hereditary line of succession But once convinced that it was inevitable, he became one of the most ardent supporters of Louis-Philippe From August to November Guizot was minister of the interior He had now passed into the ranks of the Conservatives, and for the next 18 years was the most determined foe of democracy, the unyielding champion of "a monarchy limited by a limited number of bourgeois" In Marshal Soult's Government formed on Oct 11, 1832, Guizot was minister of public instruction. Guizot applied himself in the first instance to carry the law of June 28, 1833, establishing and organizing primary education The branch of the Institute of France known as the Académie des Sciences Morales et Politiques, suppressed by Napoleon, was revived by Guizot Some of the old members of this learned body—Talleyrand, Siéyès, Roederer and Lakanal—again took their seats there, and new members were elected The "Société de l'Histoire de France" was founded for the publication of historical works, and a vast publication of mediaeval chronicles and diplomatic papers was undertaken at the expense of the State (*see* HISTORY; and FRANCE, *History*)

The object of the cabinet of Oct 1832 was to organize a Conservative Party, and to resist the Republican faction, which threatened the existence of the monarchy The real strength of the ministry lay not in its nominal heads, but in the fact that in this Government and this alone, Guizot and Thiers acted in cordial co-operation But in 1840 parliamentary difficulties arose and Guizot was not sorry to accept the post of ambassador in London, which withdrew him for a time from parliamentary contests This was in the spring of 1840, and Thiers succeeded shortly afterwards to the Ministry of Foreign Affairs

Thiers' policy regarding the Syrian question led France to the brink of war, until the king put an end to the crisis by refusing his assent to the military preparations of Thiers, and by summoning Guizot from London to form a ministry and to aid his majesty in what he termed "ma lutte tenace contre l'anarchie" Thus began, under dark and adverse circumstances, on Oct 29, 1840, the administration in which Guizot remained the master-spirit for nearly eight years He himself took the portfolio of foreign affairs, to which he added some years later, on Soult's retirement, the ostensible rank of prime minister His first care was the restoration of amicable relations with the other Powers of Europe His success in calming the troubled elements and healing the wounded pride of France was due mainly to the indomitable courage and splendid eloquence with which he faced a raging opposition, gave unity and strength to the Conservative Party, and appealed to the thrift and prudence of the nation rather than to their vanity and their ambition. In his pacific task he was fortunately seconded by the formation of the Peel administration in England, in the autumn of 1841. Lord Palmerston held (as it appears from his own letters) that war between England and France was, sooner or later, inevitable. Guizot held that such a war would be the greatest of all calamities, and certainly never contemplated it In Lord Aberdeen, the foreign secretary, Guizot found a friend and an ally Both of them held the common interest of peace and friendship to be paramount, and when differences arose, as they did arise, in remote parts of the world—in Tahiti, in Morocco, on the Gold Coast—they were reduced by this principle to their proper insignificance

The history of Guizot's administration is dealt with in the article FRANCE; *History* It was the longest and the last which existed under the constitutional monarchy of France, and bears the stamp of the great qualities and the great defects of his political character, for he was throughout the master-spirit of that Government. He united and disciplined the Conservative Party, which had been broken up by previous dissensions and ministerial changes No one ever doubted the purity and disinterestedness of Guizot's own conduct He despised money, he lived and died poor, and though he encouraged the fever of money-getting in the French nation, his own habits retained their primitive simplicity But some of his instruments were mean, he employed them to deal with meanness after its kind Gross abuses and breaches of trust came to light, and under an incorruptible minister the administration was denounced as corrupt

Of his parliamentary eloquence it is impossible to speak too highly It was terse, austere, demonstrative and commanding—not persuasive, not humorous, seldom adorned, but condensed with the force of a supreme authority in the fewest words. He was essentially a ministerial speaker, far more powerful in defence than in opposition Like Pitt he was the type of authority and resistance, unmoved by the brilliant charges, the wit, the gaiety, the irony and the discursive power of his great rival Nor was he less a master of parliamentary tactics and of those sudden changes and movements in debate which, as in a battle, sometimes change the fortune of the day His confidence in himself, and in the majority of the chamber which he had moulded to his will, was unbounded, and long success and the habit of authority led him to forget that in a country like France there was a people outside the chamber elected by a small constituency, to which the minister and the king himself were held responsible

After the fall of the monarchy in 1848 Guizot found a temporary refuge in Paris and then escaped via Belgium to London, where he arrived on March 3

He stayed in England about a year, devoting himself again to history He published two more volumes on the English revolution, and in 1854 his *Histoire de la république d'Angleterre et de Cromwell* (2 vols, 1854), then his *Histoire du protectorat de Cromwell et du rétablissement des Stuarts* (2 vols, 1856) He also published an essay on Peel, and the extensive *Mémoires pour servir à l'histoire de mon temps* (9 vols, 1858–68) His speeches were included in his *Histoire parlementaire de la France* (5 vols, 1863)

Guizot survived the fall of the monarchy and the Government he had served 26 years He was of no party, a member of no political body, no murmur of disappointed ambition, no language of asperity, ever passed his lips, it seemed as if the fever of oratorical debate and ministerial power had passed from him and left him a greater man than he had been before, in the pursuit of letters, in the conversation of his friends, and as head of the patriarchal circle of those he loved The greater part of the year he spent at his residence at Val Richer, an Augustine monastery near Lisieux in Normandy, which had been sold at the time of the first Revolution His two daughters, who married two descendants of the illustrious Dutch family of De Witt, kept his house One of his sons-in-law farmed the estate And here Guizot devoted his later years with undiminished energy to literary labour, which was in fact his chief means of subsistence Proud, independent, simple and contented he remained to the last, and these years of retirement were perhaps the happiest and most serene portion of his life He was a member of three of the five academies into which the Institute of France is divided In these learned bodies Guizot continued for nearly 40 years to take a lively interest and to exercise a powerful influence He was the jealous champion of their independence His voice had the greatest weight in the choice of new candidates; the younger generation of French writers never looked in vain to him for encouragement, and his

constant aim was to maintain the dignity and purity of the profession of letters. In the consistory of the Protestant church in Paris Guizot exercised a similar influence He remained through life a firm believer in the truths of revelation, and a volume of *Meditations on the Christian Religion* was one of his latest works.

As his grandchildren grew up around him, Guizot began to direct their attention to the history of their country From these lessons sprang his last and not his least work, the *Histoire de France racontée à mes petits enfants,* which came down to 1789, and was continued to 1870 by his daughter Madame Guizot de Witt from her father's notes (7 vols, 1870) Guizot died on Sept 12, 1874.

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GUJARAT, a region of India, Bombay Presidency In the widest sense it includes the whole area of Gujarati speech, *i e*, the northern districts and states of the presidency from Palanpur to Daman, with Kathiawar and Cutch; but it is more properly confined to the country north of the Narbada and east of the Rann of Cutch and Kathiawar The name is used officially for the north division of the Bombay Presidency, which includes Ahmedabad, Broach, Kaira, Surat, Thana and the Panch Mahals, with an area of 13,579 sq m The name, also given to a district in the Punjab, is derived from the Gujars, who passed into India from the north-west, established a kingdom in Rajputana, and spread south in A D 400–600 The ancient Hindu capital was Anhilvada; the Mohammedan dynasty, which ruled from 1396 to 1572, founded Ahmedabad, which is still the largest city; but Gujarat owed much of its historical importance to the seaports of Broach, Cambay and Surat Its fertile plain, with regular rainfall and many rivers, is styled the "garden of India" Gujarat gives its name to the vernacular of northern Bombay, viz, Gujarati, one of the three great languages of that Presidency. It has an ancient literature and a peculiar character.

GUJARATI and **RAJASTHANI LANGUAGES,** two members of the western subgroup of the intermediate group of Indo-Aryan languages (*q v*) (*See* HINDUSTANI) The two languages are closely connected and might almost be termed co-dialects of the same form of speech Together they occupy an almost square block of country, some 400m broad, reaching from near Agra and Delhi on the river Jumna to the Arabian sea Gujarati (properly *Gujarātī*) is spoken in Gujarat, the northern maritime province of the Bombay Presidency, and also in Baroda and the native States adjoining Rajasthani (properly *Rājasthānī* from *"Rājasthān,"* the native name for Rajputana) is spoken in Rajputana and the adjoining parts of Central India

Gujarati is an intermediate language derived from a mixture of the Apabhraṁśa forms of Saurāstrī and Saurasēnī, in which the latter predominated On the other hand, on the east and north-east it has Rajasthani, into which it merges so gradually and imperceptibly that at the conventional border-line, in the State of Palanpur, the inhabitants of Rajputana say that the local dialect is a form of Gujarati, while the inhabitants of Gujarat say that it is Rajasthani

Language.—Gujarati has no important local dialects, but there is considerable variation in the speeches of different classes of the community Parsees and Muslims (when the latter use the language—as a rule the Gujarat Muslims speak Hindustani) have some striking peculiarities of pronunciation, the most noticeable of which is the disregard by the latter of the distinction between cerebral and dental letters The uneducated Hindus do not pronounce the language in the same way as their betters, and this difference is accentuated in northern Gujarat, where the lower classes substitute *ē* for *ī*, *c* for *k*, *ch* for *kh*, *s* for *c* and *ch*, *h* for *s*, and drop *h* as readily as any cockney. There is also (as in the case of the Muslims) a tendency to confuse cerebral and dental consonants, to substitute *r* for *d* and *l*, to double medial consonants, and to pronounce the letter *ā* as *å*, something like the *a* in "all." The Bhils of the hills east of Gujarat also speak a rude Gujarati, with special dialectic peculiarities of their own, further mixed with corruptions of Marathi idioms in Nimar and Khandesh, where we have almost a new language.

Rajasthani has numerous dialects, each State claiming one or more of its own. All Rajasthani dialects can, however, be easily classed in four well-defined groups, a north-eastern, a southern, a western and an east-central The north-eastern (Mēwātī) is that form of Rajasthani which is merging into the Western Hindi of the Midland It is a mixed form of speech Similarly, the southern (Mālvī) is much mixed with the neighbouring Bundēlī form of Western Hindi The western (Mārwāṛī) spoken in Marwar and its neighbourhood, and the east-central (Jaipurī) spoken in Jaipur and its neighbourhood, may be taken as the typical Rajasthani dialects

(Abbreviations·—Skr =Sanskrit Pr =Prakrit Ap =Apabhraṁśa G =Gujarātī R =Rājasthānī. H =Hindōstānī)

Vocabulary—The vocabulary of both Gujarati and Rajasthani is very free from *tatsama* words The great mass of both vocabularies is *tadbhava* (*see* INDO-ARYAN LANGUAGES) Gujarati has perhaps more *tatsama* words than Rajasthani, but their employment is not excessive On the other hand, Parsees and Muslims employ Persian and Arabic words with great freedom; while, owing to its maritime connections, the language has also borrowed occasional words from other parts of Asia and from Europe This is specially marked in the strange dialect of the Kathiawar boatmen who travel all over the world as lascars on the great steamships Their language is a mixture of Hindustani and Gujarati with a heterogeneous vocabulary

Phonetics—With a few exceptions, the sound-system of the two languages is the same as that of Sanskrit (*q v*) The sibilants *s* and *ś* are colloquially pronounced *h* (as in several outer languages), especially in the north An original aspirate is, however, often dropped Standard G is fond of pronouncing an *h* where it is not written, as in *amē,* we, pronounced *ahmē* In other respects both G and R closely agree in their phonetical systems with the Apabhraṁśa form of Śaurasēnī Prakrit from which the Midland language is derived

Declension—Gujarati retains the neuter gender of Sanskrit and Prakrit Moreover, the neuter gender is often employed to indicate living beings of which the sex is uncertain In R there are only sporadic instances of the neuter, which grow more and more rare as we approach the Midland Nouns in both G and R may be weak or strong Long forms corresponding to the Eastern Hindi *ghoṛ^awā,* a horse, are not much used, but we frequently meet another long form made by suffixing a pleonastic termination in R, where it is used contemptuously In G and R this termination in *-ā* has survived, but for all nouns as the case sign of the agent and locative cases The general oblique case is the same as the nominative, except in the case of strong masculine and neuter nouns in *ō* and *ũ* respectively This *-ā*-termination is characteristic of the outer band of languages, and is derived from the Apabhraṁśa genitive form in *-āha*

In G the nominative and oblique plural for all nouns are formed by adding *ō* to the oblique form singular, but in the neuter strong forms the oblique singular is nasalized The real plural is the same in form as the oblique singular in the case of masculines, and as a nasalized oblique singular in the case of neuter strong forms, and the added *ō* is a further plural termination, making a double plural, which is often dropped In R the nominative plural of masculine nouns is the same in form as the oblique case singular, and the oblique plural ends in *ā* The feminine has *ā* both in the nominative and in the oblique plural

The general oblique case can be employed for any case except the nominative, but, in order to define the meaning, it is customary to add postpositions.

Strong adjectives agree with the nouns they qualify in gender,

number and case Weak adjectives are immutable

Pronouns closely agree with those found in Hindustani

Conjugation.—The old present has survived as in Hindustani and other Indian languages The derivation of the G 1 plural is unknown The imperative closely follows but as usual has no termination in the second person singular

In R. the future may be formed by adding *gō* (*cf* Hindustani *gā*), *lō* or *lā* to the old present. The *gō* and *lō* agree in gender and number with the subject, but *lā* is immutable Another form of the future has *s* or *h* for its characteristic letter, and is the only one employed in G

In G the infinitive is simply the neuter of the future passive participle The participles are employed to form finite tenses If the verb is transitive the passive meaning of the past participle comes into force The subject is put into the case of the agent, and the participle inflects to agree with the object, or, if there is no object, is employed impersonally in the neuter (in G) or in the masculine (in R) In Hindustani, if the object is expressed in the dative, the participle is also employed impersonally, in the masculine, in G and R , even if the object is in the dative, the past participle agrees with it The idiom of R is exactly the same, except that the masculine must be used where G has the neuter. The future passive participle is construed in much the same way, but the subject may be put into the dative

G also forms a past participle in *ēlō* (*cālēlō*), one of the many survivals of the outer language

The usual verbs substantive are as follows G *chū*, R *hă* or *chū*, I am, which are conjugated regularly as old presents, and G *hatō*, R *hō* or *chō*, was, which is a past participle, like the Hindustani (*q v*) *thō* The use of this base is one of the outer band survivals Using these as auxiliaries the finite verb makes a whole series of periphrastic tenses. A present definite is formed by conjugating the old present tense (not the present participle) with the present tense of the verb substantive In G and R , however, the imperfect is formed with the present participle as in H So, as in H , we have a perfect and a pluperfect. The R periphrastic tenses are made on the same principles With the genitive of the G future passive participle, we have a kind of gerundive

The same series of derivative verbs occurs in G and R as in H Thus, we have a potential passive (a simple passive in G) formed by adding *ā* to the base, and a causal by adding *āv* or *ād* A new passive may be formed in G from the causal Several verbs have irregular past participles The compound verbs are numerous

Literature.—The literature of Rajputana includes a number of bardic chronicles and a considerable religious literature, still in ms Most of the authors wrote in Braj Bhasha, the Hindu literary dialect of Hindustani In Marwar the literature falls into two branches, one called *Pingal* and couched in *Braj Bhasha*, and the other called *Dingal* and couched in Rajasthani

An important side of Gujarati literature is its bardic chronicles. Modern Gujarati literature mostly consists of translations or imitations of English works An investigation of the Rajputana Bardic Chronicles was undertaken by L. P Tessitori under the auspices of the Asiatic Society of Bengal, but was brought to an abrupt conclusion by the death of the writer after he had published some contributions to the *Journal* of the Society

Bibliography.—Volume ix of the *Linguistic Survey of India* contains a full and complete account of Gujarati and Rajasthani, including their various dialectic forms

For Rajasthani, *see* S H Kellogg, *Grammar of the Hindi Language* (2nd ed , 1893) In this are described several dialects of Rajasthani *See* also Rām Karn Śarmā, *Mārwāri Vyākarana* (Jodhpur, 1901) (a Marwari grammar written in that language), and G Macalister, *Specimens of the Dialects spoken in the State of Jaipur* (contains specimens, vocabularies and grammars) (Allahabad, 1898) *See* also "Notes on the Grammar of the Old Western Râjasthānī" by L P Tessitori in *Indian Antiquary*, 1914–15 (vols. xliii.–xlv)

For Gujarati, there are numerous grammars, amongst which we may note W St C Tisdall, *Simplified Grammar of the Gujarati Language* (1892) and (the most complete) G P Taylor, *The Student's Gujarati Grammar* (2nd ed , Bombay, 1908) As for dictionaries, the most authoritative is the *Narma-kōś* of Narmadā Śankar (Bhaunagar and Surat, 1873), in Gujarati throughout. For English readers we may mention Shahpurji Edalji's (2nd ed , Bombay, 1868), the introduction to which contains an account of Gujarati literature by J Glasgow, Belsare's (Ahmedabad, 1895), and Karbhari's (Ahmedabad, 1899).

GUJRANWALA, a town and district of British India, in the Punjab The town is situated 40 m N of Lahore by rail It is of modern growth, and owes its importance to the father and grandfather of Maharaja Ranjit Singh, whose capital it formed during the early period of the Sikh power Pop (1921), 37,887 There are manufactures of brassware, jewellery and silk and cotton scarves

The District comprises an area of 2,309 sq.m In 1921 the population was 623,581 It seems likely that the district once contained the capital of the Punjab, at an epoch when Lahore had not begun to exist. We learn from the Chinese Buddhist pilgrim, Hiuan Tsang, that about the year 630 he visited a town known as Tse-kia (or Taki), the metropolis of the whole country of the five rivers A mound near the modern village of Asarur has been identified by some as the site of the ancient capital. Under Mohammedan rule the district flourished for a time; but a mysterious depopulation fell upon the tract, and the whole region seems to have been almost entirely abandoned. On the rise of Sikh power, Charat Singh took possession of the village of Gujranwala, and here his grandson the great Maharaja Ranjit Singh was born In 1847 the district came under British influence in connection with the regency at Lahore, and in 1849 it was included in the territory annexed after the second Sikh war The district was the scene of serious riots during the unrest of 1919. A large export trade is carried on in cotton, wheat and other grains The district is served by the main line and branches of the North-Western railway The entire aspect of the district has been altered by recent extensions of irrigation, from the Lower Chenab canal in 1892 and from the Upper Chenab canal in 1912

GUJRAT, a town and district of British India, in the Punjab The town stands about 5 m from the right bank of the river Chenab, 70 m N of Lahore by rail Pop. (1921) 21,974 It is built upon an ancient site, formerly occupied, according to tradition, by two successive cities, the second of which is supposed to have been destroyed in 1303, the year of a Mongol invasion More than 200 years later either Sher Shah or Akbar founded the existing town Though standing in the midst of a Jat neighbourhood, the fort was first garrisoned by Gujars, and took the name of Gujrat The fort stands in the centre of the town The neighbouring shrine of the saint Shah Daula serves as a kind of asylum for lunatics The town has manufactures of furniture, brass-ware, boots, cotton goods and shawls.

The District of Gujrat comprises a narrow wedge of sub-Himalayan plain country, possessing few natural advantages A range of low hills, known as the Pabbi, traverses the northern angle They are composed of a friable Tertiary sandstone and conglomerate, destitute of vegetation, and presenting a mere barren chaos of naked rock, deeply scored with ravines

Numerous relics of antiquity stud the surface of the district A mound now occupied by the village of Moga or Mong has been identified by some as the site of Nicaea, the city built by Alexander the Great on the field of his victory over Porus In 1846 Gujrat first came under the supervision of British officials Two years later the district became the theatre for the important engagements which decided the event of the second Sikh war After several bloody battles in which the British were unsuccessful, the Sikh power was irretrievably broken at the battle of Gujrat in February 1849 The Punjab then passed by annexation under British rule

The district comprises an area of 2,563 sq m In 1921 the population was 826,046 The district has a large export trade in wheat and other grains, oil, wool, cotton and hides The main line and the Sind-Sagar branch of the North-Western railway traverse it

The southern part of the district has since 1915 received irrigation for the Upper Jhelan Canal and it contains the headworks of the Lower Jhelan Canal

GULA, a Sumerian goddess, patroness of Medicine, the consort of Nin-urta She is identical with another goddess, known as Bau, though it would seem that the two were originally independent The name Bau is more common in the oldest period and

gives way in the post-Khammurabic age to Gula. Other names borne by this goddess are Nin-Karrak, Ga-tum-dug and Nin-din-dug, the latter signifying "the lady who restores to life" The designation well emphasizes the chief trait of Bau-Gula which is that of healer. She is often spoken of as "the great physician," and accordingly plays a specially prominent rôle in incantations and incantation rituals intended to relieve those suffering from disease. She is, however, also invoked to curse those who trample upon the rights of rulers or those who do wrong with poisonous potions As in the case of Nin-urta, the cult of Bau-Gula is prominent in Lagash and in Nippur, but her principal cult was at Isin. While generally in close association with her consort, she is also invoked by herself, and thus retains a larger measure of independence than most of the goddesses of Babylonia and Assyria She appears in a prominent position on the designs accompanying the Kudurrus boundary-stone monuments of Babylonia, being represented by a statue attended by a dog when other gods and goddesses are merely pictured by their shrines, by sacred animals or by weapons In neo-Babylonian days her cult continued to occupy a prominent position, and Nebuchadrezzar II speaks of no less than three chapels or shrines within the sacred precincts of E-Zida in the city of Borsippa, besides a temple in her honour at Babylon

Another deity, namely the heaven god Anu is often called *Gula*, for the word means simply "the great one"

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GULBARGA, a city of India, in the Nizam's dominions, 70 m S E of Sholapur Pop (1921) 35 820 Originally Hindu, it was made the capital of the Bahmani kings when that dynasty established their independence in the Deccan in 1347, and it remained such until 1422 The palaces, mosques, fort and tombs of these kings still stand half-ruined The most notable building is a mosque modelled after that of Cordova in Spain, and almost unique in India as being entirely covered in Since the opening of a station on the Great Indian Peninsula railway, Gulbarga has become an important centre of trade, with cotton-spinning and weaving mills, ginning and pressing factories and flour, paint and oil mills State offices have been built between the town and the railway station It is also the headquarters of the largest division of Hyderabad and a district of the same name, with an area of 6,975 sq m, and pop (1921) 1,095,753

GULDEN. The monetary unit of Holland and the Dutch East Indies, variously termed the "Guilder" or "Florin," of which the last is in most general use It dates from 1875, when Holland adopted the gold standard

The florin was originally a silver coin, divided into 20 stivers, and until a comparatively modern date, London quoted the Dutch exchange in florins and stivers Owing to the fall in the value of silver last century, the silver standard was abandoned in 1873, and after an interregnum of two years, the gold standard was adopted

The par of exchange with the pound is Fl 12 107 to the pound At par in New York, the florin is equivalent to 40 196 cents

The florin occupied an unique position during the war, as it was probably the most important of the neutral currencies, and pounds, francs and marks were regularly quoted against it It thus provided the only test of the relative financial strength of the belligerent nations, and it was in Amsterdam that the weakness of the mark was first revealed Like other neutral currencies, the florin was affected by the war and the post-war inflation boom, and while for many years after the war it was worth more even than sterling, it failed for a long time to get on terms with the dollar At the end of 1920, it was quoted at 30 92 cents, it averaged 33 64 cents in 1921, improved to 39 10 cents in 1923, only to slip back to 38 22 cents in 1924 In 1925, Holland followed England in returning to the gold standard, and since then the exchange has been about parity

As regards its internal purchasing power, wholesale prices rose from 100 in 1913 to 376 in 1918, the closing year of the war This proved the peak, and by Oct, 1927, the index figure had slipped back to 150 This was commensurate with British and American index figures, though if anything a little on the high side

Notes are issued by the Bank and by the Government, as in England, but in Holland the vast majority of notes emanate from the Bank The amount in circulation at the end of 1927 was Fl 811,000,000, as against Fl 313,000,000 in 1913 Until as late as 1923, the note circulation was over Fl 1,098,000,000, but it is notorious that during the periods of the collapse of the mark, Germany was to some extent dependent upon neighbouring currencies for the proper conduct of her internal trade It was the collapse of the mark which also accounted for the growth of the Amsterdam money market during the years immediately succeeding the war With the stabilization of the mark, Amsterdam declined in importance as an international financial centre, though in 1927 Holland occupied a more important position in this respect than she did before the war (*see* CURRENCY) (N E C)

GULFPORT, a city of south-eastern Mississippi, U S A, on Mississippi sound (Gulf of Mexico), about half-way between Mobile and New Orleans; a port of entry and the county seat of Harrison county It is on Federal highways 49 and 90 (the Old Spanish trail), and is served by the Illinois Central and the Louisville and Nashville railways, and by numerous ocean steamship lines The population was 8,157 in 1920 (24% negroes) and was estimated at over 14,000 in 1928 Gulfport has an area of 15 sq m, with a frontage of 6m on the gulf and a good deep-water harbour (constructed since 1901) The shore is protected by a 24m sea-wall of reinforced concrete, faced with steps leading from the promenade along the top down to the bathing beaches below The commerce of the port in 1925 amounted to 603,722 tons, valued at $13 488,011 (65% exports to foreign countries), and consisted largely of receipts of lumber, salt of potash, phosphate rock and acid phosphate, fish and oysters, groceries, grain and sugar, and shipments of lumber, staves and headings, creosoted piling, cotton-seed cake and meal, rosin, glucose and crushed oyster shells There are large lumber mills and railroad shops Gulfport is both a summer and a winter resort, and is the seat of a U S Veterans' Bureau hospital Harrison county was the second in the United States to provide a county health department and as a result malaria and hookworm disease have been practically eliminated and tuberculosis reduced to relatively few cases Gulfport was founded in 1898

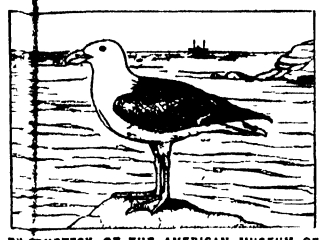
GULF STREAM, the name applied to the North Atlantic current which issues from the Gulf of Mexico and after being reinforced by a branch of the trade-wind current off Florida, flows north-eastward along the eastern coast of North America (from which it is separated by a narrow strip of cold water—the *Cold Wall*), to a point east of the Grand Banks off Newfoundland The initial Gulf Stream is a narrow, deep current, and its greatest velocity is estimated at over 40 m p h, but tends to drag other water along with it As more water becomes involved its speed decreases to about 10 m per day and its boundaries become indefinite, so that it is recognized by its temperature and colour rather than by its motion East of the Banks it tends to fuse with the Labrador current and its character changes so considerably that new names are given to it, *e g*, North Atlantic Drift (*see* ATLANTIC OCEAN)

GULFWEED, in botany, a popular name for the seaweed *Sargassum bacciferum*, one of the brown seaweeds (Phaeophyceae), large quantities of which are found floating in the Gulf of Mexico, whence it is carried northwards by the Gulf Stream, small portions sometimes being borne as far as the British coasts It was observed by Columbus, and is remarkable among seaweeds for its form, which resembles branches bearing leaves and berries, the latter are hollow floats answering the same purpose as the bladders in another brown seaweed, *Fucus vesiculosus*, common round the British Isles between high and low water

GULL, the common name for sea-birds of the family *Laridae*, sub-family *Larinae*.

Perhaps the most beautiful of all gulls is the ivory gull (*Pagophila eburnea*), which breeds in the high Arctic The plumage is

pure white, the legs black. The well-known kittiwake (*Rissa tridactyla*) inhabits the seas of the northern hemisphere, breeding as far south as the coasts of Britain in this species the hind toe is lacking Of the numerous species of the genus *Larus*, the largest are the glaucous and greater black-backed gulls (*L glaucus* and *L marinus*), of which the former is circumpolar, the latter nearly so, not occurring, however, between Labrador and Japan These species are more or less raptorial in their habits, eating the eggs, young, and even adults of many other birds. *L minutus* of Europe is the smallest species. The black-headed gull, *L ridibundus*, breeds in large colonies in marshes, but most species prefer cliffs The silvery gull (*L novae-hollandiae*) has a southern habitat The rare and beautiful roseate gull (*Rhodostethia rosea*) is recognized by the pink tinge in its plumage; it is an Arctic form Sabine's gull, *Xerna sabini*, breeds in Arctic America and Siberia It has a forked tail Franklin's gull (*L franklini*) inhabits the interior of North America, breeding in marshes It is the only bird with a monument to it—there being one in Salt Lake City to commemorate its services in the destruction of grasshoppers The herring gull (*L argentatus*) is the commonest Atlantic species



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THE PACIFIC GULL, A POWERFULLY WINGED SEA-BIRD THAT INHABITS THE WESTERN SHORES OF THE UNITED STATES, FEEDING ON FISH, AND SHIPS' FOOD REFUSE

GULLAH, the name of a tribe of negroes brought from the west coast of Africa to the slave states of Georgia and South Carolina in the early 18th century and to the dialect spoken by them and by their lingual descendants to-day along the coast of these States and on the sea islands nearby Whatever their origin, the Gullah negroes were a potent force on the coast plantations of South Carolina, where, isolated in large numbers in the rice and cotton fields, "they seized upon the peasant English used by some of the early settlers and the white servants of the wealthy colonists, wrapped their clumsy tongues about it . and enriched with certain expressive African words it issued through their flat noses and thick lips in so workable a form that it . became in time the accepted negro speech of the lower districts of South Carolina and Georgia" The salient characteristics of "Gullah," which cannot be read without a glossary, are the use of "who" for "a" and "er", of one gender for three as "e" for he, she, it, "um" for him, her, it and them, "Uh shum" for "I saw him," "I have seen them," and the total disregard of singular and plural numbers Perhaps the truth of the statement that Gullah is the worst negro English in the United States can be exemplified best by the quotation used by Mr Bennett in the *Literary Review* for Dec 9, 1922 A negro in protesting to a white hunter against taking a new position on a deer run says, "No Shuh Shuh! Ef 'e duh dey, de dee duh no dey-dey, ef 'e no dey, de dee duh dey-dey" (No Sir, if you go there, the deer will not go there, if you don't go, the deer will)

For Gullah at its best in the quaint simile, wit, and philosophy of its users and for a glossary, *see* Ambrose E Gonzales, *The Black Border, Gullah Stories of the Carolina Coast* (Charleston, S C , 1922)

GULLSTRAND, ALLVAR (1862–), Swedish physician, was born on June 5, 1862, at Landskrona In 1894 he became professor of diseases of the eye at Uppsala, and in 1913 was appointed professor of physiological and physical optics at the same university His investigations concerned the general laws of dioptrics, a new conception of the theory of optical images, the extrication of the optical images in the eye, and the eye's relation to the diffusion of light In 1911 he was awarded the Nobel prize for medicine. Among Gullstrand's works are *Allgemeine Theorie der monochromatischen Aberrationen* (1900), *Die optische Abbildung in heterogenen Medien und die Dioptrik der Kristallinse des Menschen* (1908) and *Einfuhrung in die Methoden der Dioptrik des Auges des Menschen* (1911) He received the honorary degree of Sc D at Dublin in 1912.

GULLY, JOHN (1783–1863), English boxer and politician, was born at Wick, near Bath, on Aug 21, 1783, the son of an innkeeper In 1805 he was matched against Henry Pearce, the "Game Chicken," before the duke of Clarence (afterwards William IV), and was beaten after fighting 64 rounds, which occupied an hour and seventeen minutes In 1807 he twice fought Bob Gregson, the Lancashire giant, for 200 guineas a side, winning on both occasions As the landlord of the "Plough" tavern in Carey Street, London, he retired from the ring in 1808, and took to horse-racing In 1827 he lost £40,000 by backing his horse "Mameluke" (for which he had paid 4,000 guineas) for the St Leger In partnership with Robert Ridskale, in 1832, he made £85,000 by winning the Derby and St Leger with "St Giles" and "Margrave" In partnership with John Day he won the Two Thousand Guineas with "Ugly Buck" in 1844, and two years later he took the Derby and the Oaks with "Pyrrhus the First" and "Mendicant," in 1854 the Two Thousand Guineas with "Hermit," and in the same year, in partnership with Henry Padwick, the Derby with "Andover" He bought Ackworth Park, near Pontefract, and was M P from Dec 1832 to July 1837 In 1862 he purchased the Wingate Grange estate and collieries Gully died on March 9, 1863

GULPAIGAN, one of the smaller provinces of Persia, lying north-west of Isfahan province It is mainly agricultural and a good deal of opium and wool are produced The revenue in 1926–27 amounted to 702,576 krans (£=45 krans) The administrative centre is Gulpaigan, a straggling town with a population according to Lorini of 9,000, on the road from Isfahan to Hamadan, where good wood-carving is carried on and coarse woollen yarns made It is surrounded with orchards, and there is a large export of carved wooden spoons to all parts of Persia

GUM ARABIC, an exudation from various varieties of acacia, much used in the arts (*see* GUMS)

GÜMBEL, KARL WILHELM VON, BARON (1823–1898), German geologist, was born at Dannenfels, in the Palatinate of the Rhine, on Feb 11, 1823 He was professor of geognosy in Munich and director of the geological survey in Bavaria His geological map of Bavaria appeared in 1858; the official memoir descriptive of the detailed work, entitled *Geognostische Beschreibung des Konigreichs Bayern* was issued in three parts (1861, 1868 and 1879) He wrote *Geologie von Bayern* (1884–1894), an elaborate treatise on geology, with special reference to the geology of Bavaria In 1861 Gumbel introduced the term Rhaetic for the uppermost division of that system, he supported at first the view of the organic nature of *Eozoon* (1866 and 1876), he devoted special attention to Foraminifera, and described those of the Eocene strata of the northern Alps (1868), he dealt also with Receptaculites (1875) which he regarded as a genus belonging to the Foraminifera He died on June 18, 1898

GUMBINNEN, a town in the Prussian province of East Prussia, on the Pissa, an affluent of the Pregel, 70 m E of Konigsberg Pop (1925) 18,948 Frederick William I in 1724 raised Gumbinnen to the rank of a town, and in 1732 brought to it a number of persons who had been driven from Salzburg by religious persecution The manufacture of agricultural machinery, cotton and linen weaving, tanning, brewing and distilling are the principal industries There are horse and cattle markets, and some trade in corn and timber

GUMBO or OKRA, an herbaceous hairy annual plant (*Hibiscus esculentus*) of the mallow family (Malvaceae), probably of African origin, and now widely cultivated or naturalized in tropical and sub-tropical countries The leaves are cordate, and 3- to 5-lobed, and the flowers yellow, with a crimson centre, the fruit or pod, the *Bendi-Kai* of the Europeans of southern India, is a tapering, 10-angled capsule, 4 in to 10 in in length, except in the dwarf varieties, and contains numerous oval dark-coloured seeds, hairy at the base The unripe fruit is eaten either pickled or prepared like asparagus It is also an ingredient in various dishes, *e g*, the *gumbo* of the southern United States, and on account of the large amount of mucilage it contains, it is extensively used for thickening broths and soups The fruit is grown on a large scale in the vicinity of Constantinople The seeds of the gumbo are used as a substitute for coffee From their demulcent and emolli-

ent properties, the leaves and immature fruit have long been in repute in the East for use in poultices and fomentations.

The musk okra (*Hibiscus Abelmoschus* or *Abelmoschus moschatus*), indigenous to India, and cultivated in most warm regions of the globe, is a low, slightly woody plant, bearing a conical 5-ridged pod about 3 in. in length, within which are numerous brown reniform seeds, smaller than those of *H. esculentus*. The seeds possess a musky odour, due to an oleo-resin present in the integument, and are known to perfumers under the name of *ambrette* as a substitute for musk. They are said to be used by the Arabs for scenting coffee. The seeds are used in Africa as beads The plant yields an excellent fibre, and, being rich in mucilage, is employed in Upper India for clarifying sugar The best-perfumed seeds are reported to come from Martinique

See P Alpinus, *De plantis Aegypti* (Venice, 1592); G Watt, *Dictionary of the Economic Products of India* (1890).

GUMMIC ACID: *see* ARABIC ACID

GUMS. The generic name given to a class of uncrystallizable substances, composed of carbon, hydrogen and oxygen, which occur widely in plants, and to a limited extent in animals Their characteristic property is that they form viscous solutions or mucilages either by dissolving in water (soluble gums) or by absorbing many times their own volume of that solvent (insoluble gums) Commercial gums contain more or less mineral matter, chiefly calcium, magnesium and potassium A little nitrogen is also often present, but it is not an essential constituent. In this the gums differ from the gelatins, glues and proteins, which form solutions of a similar character; but which are definitely nitrogenous bodies

The best known gum is *gum arabic* (gum acacia), which has been used in the arts from the earliest times It is a product of the various varieties of acacia which grow widely throughout Africa and in India and Australia The gum exudes from the tree, the process being sometimes assisted by making incisions in the bark The world's supply of gum arabic is obtained chiefly from the Sudan (especially from the province of Kordofan) and from the French colony of Senegal, while smaller quantities come from Northern Nigeria, Morocco, India and Australia In the Sudan (where the trees are often cultivated in groves) and in Senegal the grey-barked acacia, *Acacia Senegal*, is the chief gum-producing tree. The Sudanese name for this tree is *hashab* The gum is collected in the dry season and shipped to European ports where it is sorted into grades for the market.

The origin and function of the gums in plant life is not yet clearly understood They are generally regarded, in the case of trees at least, as being due to the breaking down of cellular tissue; but while some authorities hold that they are normal products of plant metabolism, others believe that they are caused by an unorganized ferment or enzyme produced by an invading fungus, and others again suggest that they are due to bacterial action It is said that the more sickly the tree the better the yield of gum; but of course in such cases it may be that a body typical of healthy life in the plant is being overproduced owing to functional disturbances, without the intervention of fungi or bacteria. It is certain that soil, climate and season affect the yield from a given variety of tree.

Gum arabic comes on the market in the form of rounded or vermiform nodules or "tears" The best qualities are Sudan or Kordofan gum (also known as *hashab* gum and picked Turkey gum) and *gomme blanche* from Senegal These are colourless or slightly yellow; whereas the lower grades have a distinctly yellow colour The most remarkable property of gum is the viscous colloidal solution it forms with water (*see* COLLOIDS) It is insoluble in alcohol and the addition of the latter in sufficient quantity to an aqueous solution precipitates the gum

Chemistry of Gum.—Up to the middle of the 19th century when modern organic chemistry was still in its infancy, it was supposed that living matter was composed of a relatively small number of compounds which were called proximate principles, and we find the gums classed among the "proximate principles of the vegetals" (W T. Brande, *Manual of Chemistry*, 1848) In 1854 Neubauer showed that the chief constituent of commercial gum arabic was an acid substance which he called *arabin* or *arabic acid*. This body was composed of carbon, hydrogen and oxygen, and analysis appeared to show that the two latter elements were in the proportion in which they are present in water. The gums were, therefore, placed among the carbohydrates (*q.v.*) In 1868 Scheibler obtained, by the decomposition of arabin, a new sugar which he called arabinose. Notwithstanding this important discovery, the chemistry of the gums remained obscure for many years, no doubt because their uncrystallizable character made purification difficult and uncertain The key to the problem was finally found by C O'Sullivan, in a series of researches, the results of which appeared in the journal of the Chemical Society between 1884 and 1901 By introducing a novel method of treatment, O'Sullivan was able to show that arabin consisted of an acid nucleus to which a number of molecules of the sugars galactose and arabinose were chemically united. To the acid he gave the formula $C_{25}H_{38}O_{22}$ and the name *arabic acid*, while to arabin he assigned the formula

$$2C_{10}H_{16}O_8,4C_{12}H_{20}O_{10},C_{25}H_{30}O_{18}$$

and named it *di-arabinan-tetragalactan-arabic acid*. The words arabinan and galactan refer respectively to two molecules of the sugars arabinose ($C_5H_{10}O_5$) and galactose ($C_6H_{12}O_6$) *minus* two molecules of water. It will be observed that the acid in the compound is *minus* $4H_2O$

It is interesting to note that the *pectins* which cause fruit juices to "gel" in the making of jam have recently been shown to consist of compounds of sugars with an acid

Gum tragacanth is the chief insoluble gum It is derived from various species of Astragalus occurring in south-west Europe, Greece and Turkey It consists of a mixture of several gum acids combined with sugars (O'Sullivan)

Gums have a great variety of uses, all of which depend on their viscosity or their adhesiveness. The best qualities are used in clearing liqueurs, in sizing silk, textiles and paper, in confectionery, pharmacy and calico printing Inferior kinds find application in the manufacture of stationery, matches and ink

Gum resins are mixtures of gums and resins exuded by certain plants The best known are ammoniacum, asafoetida, galbanum, gamboge, myrrh and olibanum or frankincense

For the history of the gums *see* Fluckiger and Hanbury's *Pharmacographia* For the chemistry *see* H. H Robinson, Report of the British Association, 1906, p 227 For a general account, with statistics of production *see* Bulletin of the Imperial Institute, vol 6, 1908; also H S Blunt, *Gum Arabic, with special reference to its Production in the Sudan* (Oxford, 1926).

See also DEXTRIN. (T D)

GUMTI, a river of northern India It rises in a depression in the Pilibhit district of the United Provinces, and after a sinuous but generally south-easterly course of 500 m past Lucknow and Jaunpur joins the Ganges in Ghazipar district At Jaunpur it is spanned by a fine 16th-century bridge, and is navigable by small vessels There is also a small river of the same name in the Tippera district of Assam.

GÜMÜLJINA or **KOMOTINA,** a town of European Turkey, in western Thrace Pop (1920) 21,294, of whom the bulk are Greek immigrants, Jews or Armenians Gumuljina is situated on the river Karaja-Su, south of the eastern extremity of the Rhodope range of mountains and 13 m inland from the Aegean sea It has a station on the railway between Salonica and Dédéagatch The district produces wheat, maize, barley and tobacco; sericulture and viticulture are both practised on a limited scale A cattle fair is held annually on Greek Palm Sunday Copper and antimony are found in the neighbourhood

GUMUS, a Shangalla tribe, in the mountainous district of Fazogli on the Sudan-Abyssinian frontier; others are settled on the banks of the Blue Nile They live in independent groups Gumz in the native tongue signifies "people," and the sub-tribes have distinctive names The Gumus are nature-worshippers, God and the sun being synonymous On ceremonial occasions they carry parasols of honour (*see* SHANGALLA)

GÜMÜSH-KHANEH, the chief town of a vilayet of the same name in Asiatic Turkey, situated on high ground (4,400 ft)

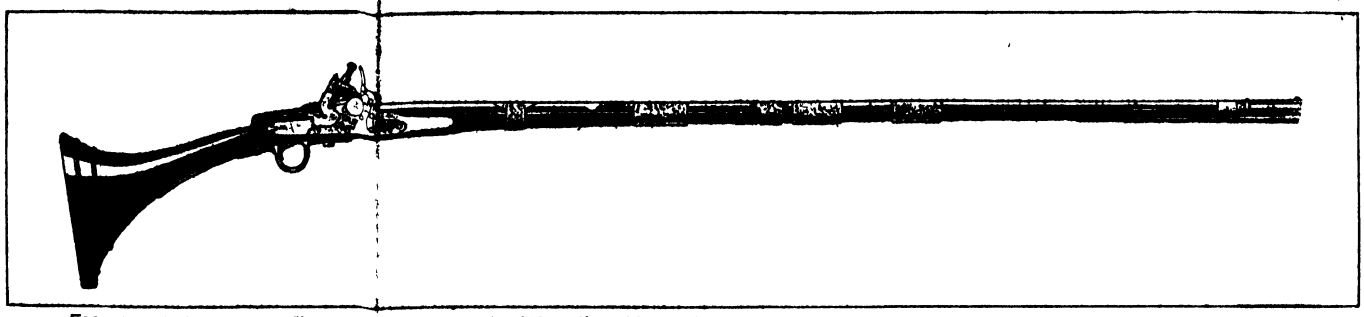

FIG 1 —MOORISH FLINTLOCK THE FLINTLOCK WAS INVENTED ABOUT 1635, ITS MAIN IMPROVEMENT OVER EARLIER FIREARMS BEING THAT THE COVER OF THE PAN FORMED PART OF THE STEEL STRUCK BY THE FLINT

in the valley of the Kharshut Su, about ½ m S of the Trebizond-Erzerum *chaussée* The silver mines from which the place takes its name were noted in ancient times and are mentioned by Marco Polo Pop (1927) 23,863

GUN, a general term for a weapon, tubular in form, from which a projectile is discharged by means of an explosive. When applied to artillery (*q v*) the word is confined to those pieces of ordnance which have a direct as opposed to a high-angle fire, in which case the terms "howitzer" and "mortar" are used (*See* ORDNANCE) "Gun" as applied to firearms which are carried in the hand and fired from the shoulder, the old "hand gun," is now chiefly used of the sporting shot-gun, with which this article mainly deals, in military usage this type of weapon, whether rifle, carbine, etc, is known collectively as "small arms" (*See* SMALL ARMS and PISTOL) The origin of the word, which in M E is *gonne* or *gunne,* is obscure

Firearms are said to have been first used in European warfare in the 14th century The hand gun, as it is found, came into practical use in 1446 and was of very rude construction It consisted of a simple iron or brass tube with a touch-hole at the top fixed in a straight stock of wood, the end of which passed under the right armpit when the "gonne" was about to be fired A somewhat similar weapon was also used by the horse-soldier, with a ring at the end of the stock, by which it was suspended by a cord round the neck, a forked rest, fitted by a ring to the saddlebow, served to steady the gun This rest, when not in use, hung down in front of the right leg A match was made of cotton or hemp spun slack, and boiled in a strong solution of saltpetre or in the lees of wine The touch-hole was first placed on the top of the barrel, but afterwards at the side, with a small pan underneath to hold the priming, and guarded by a cover moving on a pivot

The Matchlock.—An improvement in firearms took place in the first year of the reign of Henry VII, or at the close of Edward IV, by fixing a cock (Fr *serpentine*) on the hand gun to hold the match, which was brought down to the priming by a trigger, whence the term matchlock. This weapon is still in use among the Chinese, Tatars, Sikhs Persians and Turks An improvement in the stock was also made during this period by forming it with a wide butt end to be placed against the right breast Subsequently the stock was bent, a German invention, and the arm was called a hackbutt or hagbut, and the smaller variety of demihague. The arquebus (*q.v*) and hackbutt were about a yard in length, including barrel and stock, and the demihague was about half the size and weight, the forerunner of the pistol The arquebus was the standard infantry firearm in Europe from the battle of Pavia to the introduction of the heavier and more powerful musket It did not as a rule require a rest, as did the musket (*q v*)

The Wheel-lock.—The wheel-lock, an improvement on the matchlock, was invented in Nuremberg in 1517, was first used at the siege of Parma in 1521; was brought to England in 1530, and continued in partial use there until the time of Charles II This wheel-lock consisted of a fluted or grooved steel wheel which protruded into the priming pan, and was connected with a strong spring The cock, also regulated by a spring, was fitted with a piece of iron pyrites In order to discharge the gun the lock was wound up by a key, the cock was let down on the priming pan, the pyrites resting on the wheel, on the trigger being pressed the wheel was released and rapidly revolved, emitting sparks, which ignited the powder in the pan The complicated and expensive nature of this lock, with its liability to injury, no doubt prevented its general adoption

About 1540 the Spaniards constructed a larger and heavier firearm (matchlock), carrying a ball of 10 to the pound, called a musket This weapon was introduced into England before the middle of the 16th century, and soon came into general use throughout Europe The snaphance was invented about this period in Germany, and from its comparative cheapness was much used in England, France and Holland It held a flint instead of the pyrites of the wheel or firelock, which ignited the powder in the pan by striking on a piece of furrowed steel, when released by the trigger, and emitting sparks

As a sporting weapon the gun may be said to date from the invention of the wheel-lock in the beginning of the 16th century, though firearms were used for sporting purposes in Italy, Spain, Germany, and to some extent in France, in the 15th century Before that period the longbow in England and the crossbow on the Continent were the usual weapons of the chase In Great Britain little use appears to have been made of firearms for game shooting until the latter half of the 17th century, and the arms then used for the purpose were entirely of foreign make

The Flint-lock.—The French gunmakers of St Etienne claim for their town that it is the oldest centre of the firearms industry. They do not appear to have made more than the barrels of the finest sporting arms, and these even were sometimes made in Paris The production of firearms by the artists of Paris reached

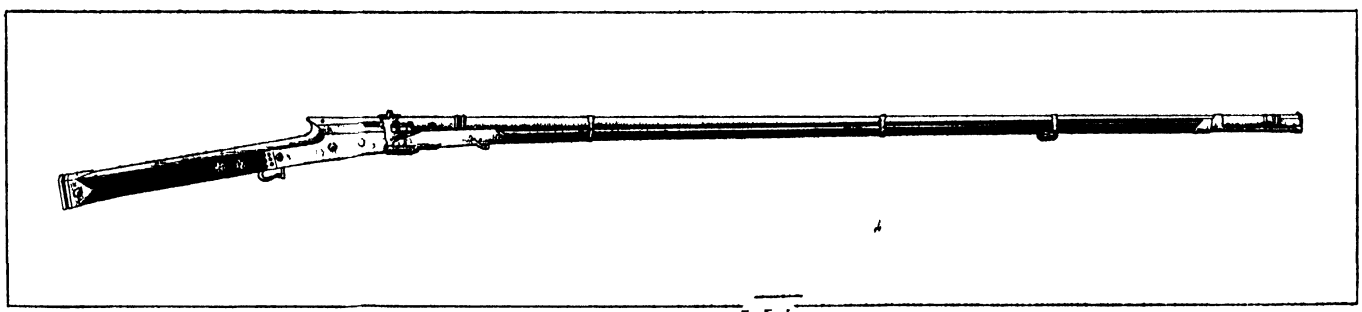

FIG 2 —INDIAN MATCHLOCK THE MATCHLOCK WAS INTRODUCED IN THE EARLY PART OF THE 16TH CENTURY AND ATTAINED WIDE POPULARITY

it zenith about the middle of the 17th century The Italian, German, Spanish and Russian gunsmiths also showed great skill in the elegance and design of their firearms, the Spaniards in particular being makers of fine barrels. The pistol (*q v.*) is understood to have been made for the first time about 1540 at Pistoia in Italy About 1635 the modern firelock or flint-lock was invented, which only differed from the snaphance by the cover of

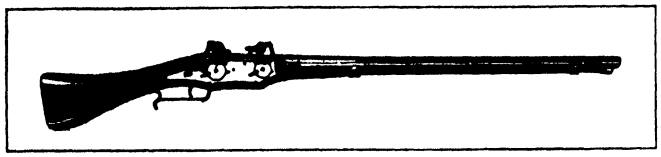

FIG 3 —16TH CENTURY GERMAN CARBINE WITH DOUBLE WHEEL LOCK

the pan forming part of the furrowed steel struck by the flint Originally the priming was put into the pan from a flask containing a fine-grained powder called serpentine powder Later the top of the cartridge was bitten off and the pan filled therefrom before loading The mechanism of the flint-lock musket rendered all this unnecessary, as, in loading, a portion of the charge passed through the vent into the pan, where it was held by the cover or hammer The matchlock, as a military weapon, gradually gave way to the firelock, which came into general use in the last half of the 17th century, and, with slight changes, was the weapon both of Marlborough's and of Wellington's armies The famous "Brown Bess" of the British army in the Napoleonic Wars was a flint-lock smooth-bore musket with its barrel shortened, and browned, instead of bright, as a result of experience in the American Revolution The highest development of the flint-lock is found in the fowling-pieces of the end of the 18th and beginning of the 19th centuries, particularly those made by Joseph Manton, the celebrated English gunsmith and inventor The Napoleonic wars afforded English gunmakers an opportunity, which they fully utilized, of gaining the supremacy over their foreign competitors in the gunmaking trade English gunmakers reduced the weight, improved the shooting powers, and perfected the lock mechanism of the sporting gun, and increased the range and efficiency of the rifle This transference of the gunmaking craft from the Continent to England was also assisted by the tyranny of the foreign gunmaking gilds In 1637 the London gunmakers obtained their charter of incorporation The important gunmaking industry of Birmingham dates from 1603, and soon rivalled that of London Double shot-guns do not appear to have been generally used until the 19th century The first successful double guns were built with the barrels over and under, and not side by side, and were in-

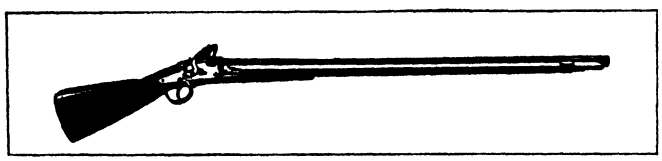

FIG 4 —ENGLISH 'BROWN BESS' OF THE TIME OF WILLIAM II

vented about 1616 by one Guilliano Bossi of Rome In 1784 double shot-guns were described as a novelt[y] . Joseph Manton patented the elevated rib which rested on the [ba]rties . The general success of the double gun was eventually due [to] pick[ed] weight which the better material and workmanship of the [gu]n colourmakers made possible, and to the quickness and certainty of [fi]ring yon of the modern cartridge [wi]th co[m]-

The Percussion Principle.—The objections to the flint-lock were that it did not entirely preserve the priming from wet, and that the flint sparks sometimes failed to ignite the charge In 1807 the Rev Alexander John Forsyth obtained a patent for priming with a fulminating powder made of chlorate of potash, sulphur and charcoal, which exploded by concussion This important improvement in firearms was not recognized and adopted by the military authorities until more than 30 years later In the meantime it was gradually developed, and the copper percussion cap invented by various gunmakers and private individuals Thomas Shaw of Philadelphia first used fulminate in a steel cap in 1814, which he changed to a copper cap in 1816. It was not until the introduction of the copper cap that the percussion gun could be considered in every way superior to the flint In 1834, in the reign of William IV., Forsyth's invention was tested at Woolwich by firing 6,000 rounds from six flint-lock muskets, and a similar number from six percussion muskets, in all weathers This trial established the percussion principle. The shooting was found to be more accurate, the recoil less, the charge of powder having been reduced from 6 to 4½ dr , the rapidity of firing greater and the number of miss-fires much reduced, being as 1 to 26 nearly in favour of the percussion system In consequence of this successful trial the military flint-lock in 1839 was altered to suit the percussion principle This was easily accomplished by replacing the hammer and pan by a nipple with a hole through its centre to the vent or touch-hole, and by replacing the cock which held the flint by a smaller cock or hammer with a hollow to fit on the

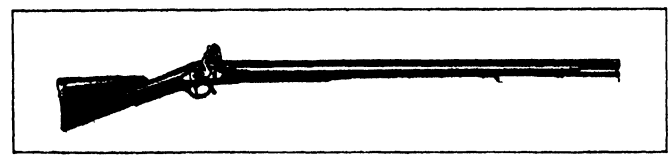

FIG 5 —ENGLISH "BROWN BESS," TIME OF GEORGE III

nipple when released by the trigger On the nipple was placed the copper cap containing the detonating composition, now made of three parts of chlorate of potash, two of fulminate of mercury and one of powdered glass

In 1840 the Austrian army was supplied with the percussion musket, and in 1842 a new model percussion musket with a block or back-sight for 150 yd. was issued to the British army, 11 lb 6 oz in weight, 4 ft 6¾ in in length without bayonet, 6 ft with bayonet and with a barrel 3 ft 3 in in length, firing a bullet of 14½ to the lb with 4½ drs of powder This musket was larger in bore than that of France, Belgium, Russia and Austria, and thus had the advantage of being able to fire their balls, while the English balls could not be fired from their barrels. But the greater weight and momentum of the English ball was counteracted by the excess of windage This percussion musket of 1842, the latest development of the renowned Brown Bess, continued in use in the British army until partially superseded in 1851 by the Minié rifle, and altogether by the Enfield rifle in 1855 For further information as to the history and development of military, target and sporting rifles *see* SMALL ARMS, DEVELOPMENT OF

Modern Shot-Guns.—The modern sporting breech-loaders may be said to have originated with the invention of the cartridge-case containing its own means of ignition The breech-loading mechanism antedated the cartridge by many years, the earliest breech-loading hand guns dating back to 1537 Another distinct type of breech-loader was invented in France about the middle of the 17th century During the 17th and 18th centuries breech-loading arms were very numerous and of considerable variety The original cartridge, a charge of powder and bullet in a paper envelope, dates from 1586 These were used with muzzle-loaders, the base of the cartridge being ripped or bitten off by the soldier

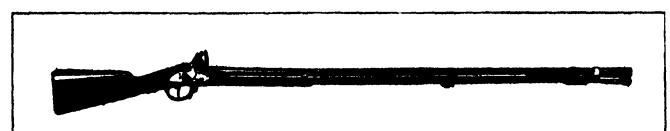

FIG 6 —FRENCH 'BROWN BESS" OF THE NAPOLEONIC WARS

[in] before placing in the barrel It was only when the detonating cap came into use that the paper cartridge answered well in breech-loaders The modern breech-loader has resulted from a gradual series of improvements, and not from any one great invention Its essential feature is the prevention of all escape of gas at the breech when the gun is fired by means of an expansive cartridge-case containing its own means of ignition The earlier breech-loaders were not gas-tight, because the cartridge-cases were either consumable or the load was placed in a strong non-expansive breech-plug The earliest efficient modern cartridge-

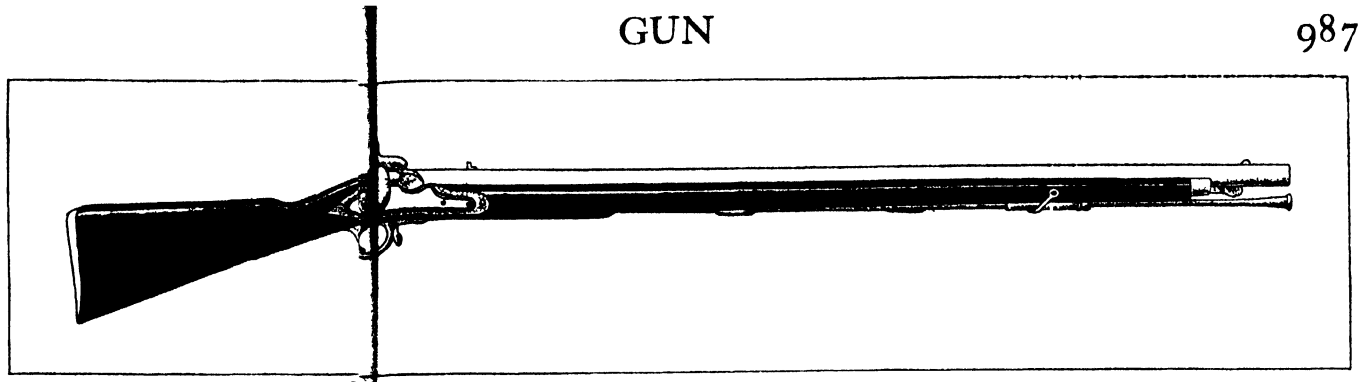

FIG. 7.—PERCUSSION MUSKET ADOPTED IN THE BRITISH SERVICE IN 1839

case was the pin-fire, patented by Lefaucheux, a Paris gunsmith, in 1847, with a thin weak shell which expanded by the force of the explosion, fitted perfectly in the barrel, and thus formed an efficient gas check Probably no invention connected with firearms has wrought such changes in the principle of gun-construction as those effected by the expansive cartridge-case This invention has completely revolutionized the art of gun-making, has been successfully applied to all descriptions of firearms, and has produced a new and important industry—that of cartridge manufacture

About 1836, C Lefaucheux, a Paris gunsmith, improved the old Pauly system of breech-loading but its breech action was a crude mechanism, with single grip worked by a bottom lever The double grip for the barrels was the subsequent invention of a Birmingham gunmaker The central-fire cartridge, practically as now in use, was introduced into England in 1861 by Daw It is said to have been the invention of Pottet, of Paris, improved upon by Schneider, and gave rise to considerable litigation in respect of its patent rights Daw, who controlled the English patents, was the only exhibitor of central-fire guns and cartridges at the International Exhibition of 1862 In his system the barrels work on a hinge joint, the bottom lever withdraws the holding-down bolt, the cartridge is of the modern type, the cap being detonated by a striker passing through the standing breech to the inner face The cartridge-case is withdrawn by a sliding extractor fitted to the breech ends of the barrels Daw was subsequently defeated in his control of the patent by Eley Bros, owing to the patent not having been kept in force in France The modern breech-loading gun has been gradually and steadily improved since 1860 Westley Richards adopted and improved Matthews' top-lever mechanism About 1866 the rebounding lock was introduced, and improved in 1869 The reble wedge-fast mechanism for holding down the barrels was originated by W W Greener in 1865, and perfected in 1873 A very important improvement was the introduction of the hammerless gun, in which the mechanism for firing is placed entirely within the gun This was made possible by the introduction of the central-fire cartridge In 1862 Daw, and in 1866 Green, introduced hammerless guns in which the cocking was effected by the under lever These guns did not attain popularity In 1871 T Murcott patented a hammerless gun, the first to obtain distinct success This also was a lever-cocking gun About the same time Needham introduced the principle of utilizing the weight of the barrels to assist in cocking In 1875 Anson and Deeley utilized the fore-end attached to the barrels to cock the locks From this date hammerless guns became really popular Subsequently minor improvements were made by many other gun-makers, including alternative movements introduced by Purdey and Rogers Improvements were also introduced by Westley Richards, Purdey and others, including cocking by means of the mainspring In 1874 J Needham introduced the ejector mechanism, by which each empty cartridge-case is separately and automatically thrown out of the gun when the breech is opened, the necessary force being provided by the mainspring of the lock W W Greener and some other gun-makers have since introduced minor modifications and improvements of this mechanism Next in turn came Perks and other inventors, who separated the ejector mechanism from the lock work This very decided improvement is universal to-day A later innovation in the modern breech-loader is the single trigger mechanism introduced by some of the leading English gun-makers, by which both barrels can be fired in succession by a single trigger This improvement enables both barrels to be rapidly fired without altering the grip of the right hand, but deprives the shooter of the power of selecting his barrel

Repeating or magazine shot-guns on the principle of the repeating rifle with a magazine below the single firing barrel, are also made by some American and Continental gun-makers, but as yet have not come into general use, being comparatively cumbersome and not well balanced The difficulty of a shifting balance as each cartridge is fired has also yet to be overcome Several varieties of a combination rifle and shot-gun are also made

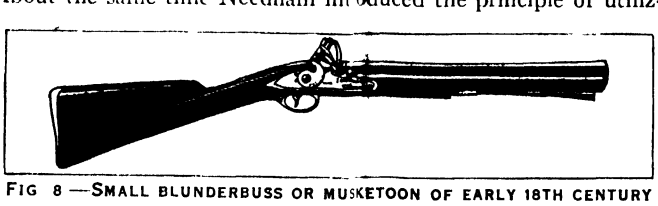

FIG 8 —SMALL BLUNDERBUSS OR MUSKETOON OF EARLY 18TH CENTURY

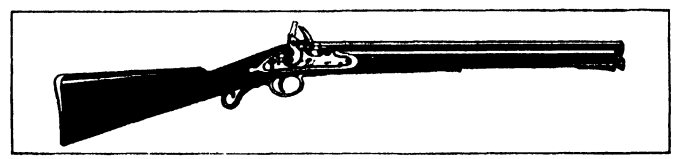

FIG 9 —FLINTLOCK CAVALRY CARBINE OF ABOUT 1825

The chief purposes for which modern shot-guns are required are game-shooting, trap-shooting at pigeons and wild-fowling The game gun may be any bore from 32 to 10 gauge The usual standard bore is 12 gauge unless it be for a boy, when it is 20 gauge The usual weight of the 12-bore double-barrelled game gun is from 6 to 7 lb with barrels 30 in long, there, however, being a present tendency to barrels of a shorter length These barrels are made of steel, as being a stronger and more homogeneous material than the barrels formerly produced, which were mostly of Damascus pattern, a mixture of iron and steel Steel barrels, drilled from the solid block, were originally produced by Whitworth To-day the makers of steel for this purpose are many The standard charge for the 12-bore is 42 grains of smokeless powder and 1 oz to 1⅛th oz of shot Powder of a lighter gravimetric density is occasionally employed, when the weight of the charge is reduced to 33 grains This charge of powder corresponds to the 3 drams of black powder formerly used The ordinary game gun should have a killing [illegible]30 in at 30 yd with the first barrel and at 40 yd with the second Improved materials and methods of manufacture [illegible]d what is known as "choke" boring of the barrels, have enabled modern gun-makers to regulate the shooting of guns to a nicety Choke-boring is the constriction of the diameter of the barrel near the muzzle, and was known in America in the early part of the 19th century In 1875 Pape of Newcastle was awarded a prize for the invention of choke-boring, there being no other claimant The methods of choke-boring have since been varied and improved by the leading English gun-makers The pigeon gun is usually heavier than the game gun and more choked It generally weighs from 7 to 8 lb Its weight, by club rules, is frequently restricted to 7½ lb and its bore to 12 gauge The standard wild-fowling gun is a double 8-bore with 30-in barrels weighing 15 lb and firing a charge of 7 drams of powder and 2¾ to 3 oz of shot These guns are also made in both smaller

and larger varieties, including a single barrel 4-bore, which is the largest gun that can be used from the shoulder, and single barrel punt guns of 1½-in. bore, weighing 100 lb While no conspicuous advance in improved gun-mechanism and invention has been made during recent years, the materials and methods of manufacture, and the quality and exactitude of the gun-maker's work, have continued gradually and steadily to improve English, and particularly London-made, guns stand pre-eminent all over the world (H S-K)

GUNA, a town and military station in Central India, in the state of Gwalior After the Mutiny, it became the headquarters of the Central India Horse, whose commanding officer acts as ex officio assistant to the resident of Gwalior

GUNCOTTON, the final product of the intensive treatment of cotton with a mixture of nitric and sulphuric acids, is a white inodorous, tasteless solid, retaining the structure of the original cotton (*see* EXPLOSIVES) It is insoluble in water, alcohol, ether and glacial acetic acid, but dissolves in acetone, alkyl acetates and nitrobenzene When the strongest acids are employed in nitration, the amount of nitrogen present as nitrate in the nitrated cotton approximates to 14 14% If cellulose, the essential constituent of the cotton fibre, be regarded as having the simplest empirical formula, $C_6H_{10}O_5$, then guncotton is trinitrocellulose (cellulose trinitrate), $C_6H_7O_2(O\,NO_2)_3$ With a doubled formula for cellulose, as $C_{12}H_{20}O_{10}$, guncotton becomes hexanitrocellulose, $C_{12}H_{14}O_4(O\,NO_2)_6$ Vieille, who stated (1882) that nitration of cellulose occurred in eight stages, assumed that cellulose was $C_{24}H_{40}O_{20}$ Of these nitration products only the undeca- and deca-nitrocelluloses, $C_{24}H_{29}O_9(O\,NO_2)_{11}$ and $C_{24}H_{30}O_{10}(O\,NO_2)_{10}$, have the characteristic property essential to guncotton of being insoluble in a mixture of ether and alcohol. This property distinguishes guncotton from the less nitrated celluloses which are referred to as collodion cotton or soluble nitrocellulose owing to the fact that they dissolve in the ether–alcohol solvent Guncotton has superior explosive properties to those of collodion and has been extensively employed in conjunction with nitroglycerine for the production of cordite, the British service explosive. The blending of the two ingredients is brought about by acetone, but by the use of collodion with a larger proportion of nitroglycerine a cordite is obtainable without the employment of acetone

Cf T. E Thorpe, *Dictionary of Applied Chemistry*, vol. iii (1922).

GUNDULIĆ, IVAN (1588–1638), known also as Giovanni Gondola, Serbian poet, was born at Ragusa on Jan. 8, 1588 His father, Franco Gundulić, once the Ragusan envoy to Constantinople and councillor of the republic, gave him an excellent education He studied the "humanities" with the Jesuit, Father Muzzi, and philosophy with Father Ricasoli After that he studied Roman law and jurisprudence in general He was member of the Lower Council and once served as the chief magistrate of the republic He died on Dec 8, 1638. He made many translations from contemporary Italian poets into Serbian. He is known to have written 18 works, of which 11 were dramas, mostly translations from the Italian, but of these only three have been fully preserved, others having perished during the great earthquake and fire in 1667 His greatest and justly celebrated work is an epic, entitled *Osman*, in 20 cantos. It is the first political epic on the Eastern Question, glorifying the victory of the Poles over Turks and Tatars in the campaign of 1621, and encouraging a league of the Christian nations, under the guidance of Vladislaus, the king of Poland, for the purpose of driving away the Turks from Europe The 14th and 15th cantos are lost It is generally believed that the Ragusan Government suppressed them out of consideration for the Sultan, the protector of the republic, those two cantos having been violently anti-Turkish.

Osman was printed for the first time in Ragusa in 1826, the two missing cantos being replaced by songs written by Pietro Sorgo (or Sorkochević). From this edition Francesco Appendini made an Italian translation (1827). The best editions are those of the South Slavonic Academy in Agram (1877) and the edition published in Semlin (1889) by Yovan Boshkovich In the edition of 1844 (Agram) the last cantos, 14 and 15 were replaced by very fine compositions of the Serbo-Croatian poet, Mažuranić. The complete works of Gundulić have been published in Agram, 1847, by V. Babukić and by the South Slavonic Academy of Agram in 1889

GUNG'L, JOSEF (1810–1889), Hungarian composer and conductor, was born on Dec 1, 1810, at Zsámbék, Hungary He was bandmaster in an Austrian regiment, but in 1843 established an orchestra in Berlin, with which he toured Europe and America. He died at Weimar on Jan 31, 1889 Gung'l's dances number over 300, perhaps the most popular being the "Amoretten" and "Dreams on the Ocean" waltzes

GUN-METAL. A kind of bronze; an alloy of copper and tin which gained its name from the use of bronze for ordnance The use of such an alloy for guns became obsolete with the manufacture of steel ordnance Hard bronze for gun-metal was composed of 16 parts of copper to 2 of tin The use of gun-metal is now confined to engine parts which need considerable strength but for which steel cannot be used



END OF TENTH VOLUME

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